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The usual winter troubles seem this season to be found in extremes. In such portions of the country as have had snow they have had it in abundance, even to the extent of three feet on the level; while in other sections the plows have not yet left the barns. In the central western states the winter thus far has been a phenomenal one for mild and clear weather.

The Railroad Commissioners of Connecticut have issued instructions to the effect that the street railways of that state shall after June 30, 1900, keep their accounts according to the "Standard System" developed by the Street Railway Accountants' Association of America and approved by the Convention of Railroad Commissioners. The intention of the Connecticut commissioners to issue such instructions was announced at the Chicago convention of the Accountants' Association, but their formal action may be taken as the real beginning of that long desired era when the reports shall be uniform.

Mention was made in our editorial columns last month of the position taken by an appellate division of the New York supreme court on the question of a street railway operating special cars for the transportation of freight only, and those interested in this subject will find an abstract of the decision in the legal department of this issue. This ruling to the effect that cars for freight only are permissible on street railways so long as they do not increase the burden of use of the street is a decided gain for such roads as have broad franchises and desire to engage in the express business.

Two other cases on this subject were decided in favor of the railway companies by lower courts last month, one in Connecticut and one in Ohio. In the former case the city of Hartford sought to enjoin the Hartford Street Ry. from the transportation of freight, but the court held that cities had no power to regulate the property

to be carried on street railways. The laws of Connecticut provide that street railways may carry bundles and small parcels belonging to passengers, but in the transportation of any other merchandise they shall be subject at all times to the regulations prescribed by the superior court or by a judge thereof. The same applies to "all steam and horse railroads or those run by other motive powers." The clear inference would seem to be that the Legislature intended that the street railways should be permitted to engage in freight traffic under proper regulations, and that this should not be dependent upon the city.

In the Ohio case the court held a provision in the franchise that freight should not be carried was void, because repugnant to the principal thing granted, that is, the right to use the streets. This ruling will be very important, if sustained by the higher courts.

Another indication that the freight business of electric roads is daily becoming of more importance is the fact that there is now pending in the Detroit common council a general suburban freight ordinance.

We have always believed that this part of the street railway field would well repay cultivation, and are gratified to note the increasing number of roads engaged in handling freight.

At the Boston convention of the American Street Railway Association in 1898, a report on carrying United States mail on street railways was presented; both the report and discussion brought out the facts the compensation offered by the government for this service was in nearly every case grossly inadequate. Elsewhere we give a statement showing that in Syracuse, N. Y., the postoffice paid 28 cents per mile to a wagon mail route contractor in the city and 3.1 cents per mile to the street railway company for interurban mail service.

It is possibly true that the postoffice department would not be justified in giving the same service to the suburban towns were it obliged to pay at the same rate per mile as for the wagon route to the city depots. The latter is a necessity and must be had at any cost. Nevertheless it is scarcely fair to pay the electric railway only one-ninth as much as the contractor.

In his presidential address before the Institution of Electrical Engineers (England), Professor Silvanus P. Thompson gave an interesting account of the present status of electric traction in Europe. He believes that the world must now look to Switzerland for guidance in the equipment of heavy (steam) railroads for electric working, the inauguration in July last of the three-phase system on the Burgdorf-Thun railway displacing America as leader in this branch of the traction field. He regards the question of whether, where there is a long distance to transmit current, a simple three-phase system throughout is, or is not, more economical than direct current or a mixed system with three-phase transmission and rotary converters, as the only important question in electric railway work that is not yet settled. Professor Thompson is a warm advocate of surface contact systems for urban roads and has great hopes of the lines now being tried in Paris.

Employes' clubs, such as that at Denver, which is described on another page, are becoming more numerous and we believe that all street railway companies should encourage their formation. The first step in the case of all such organizations that have come to our notice is for the company to provide at its operating barn or station suitable rooms, and light, heat and janitor service are also furnished free of charge, so that the cost of maintenance to the men is reduced to a minimum. This is as it should be, since while the club is for the men it is also solely for employes of the company, and on leaving the service a man loses his membership in the club, and under these circumstances the men could not be expected to bear the heavier dues that would be reasonable were membership independent of occupation.

The cost to the company in providing the quarters is insignificant, as it would in any case be necessary to have waiting rooms for the extras and other men awaiting their turns to go on duty. In the case of the Denver club the company met the men half way in contributing funds to furnish the club rooms, and the result was something more elaborate than is ordinarily found. But the furnishings need not be costly, and with the rooms provided there is no danger but that the club will make them attractive.

The advantages to the service resulting from the club are that the men spend their leisure hours in the rooms when off duty and

can always be found when needed for an emergency, they are not tempted to spend their time at the "workingmen's resorts" usually found in the neighborhood of a car barn or large shop, and above all their general condition, mental and physical, is improved by means of the healthful recreation found at the club. The men also find in the club far more pleasant surroundings than in the regulation waiting room.

Governor Pingree and his large following who favor the municipal ownership and operation of the so-called public utilities are making strong efforts to have an amendment to the state constitution adopted, which will permit the cities so desiring to embark in these enterprises. The League of Michigan Municipalities, which met in Grand Rapids in September last, strongly endorsed the plan, and an active campaign is in progress. The lower house of the Legislature, however, recently tabled a resolution asking the governor to submit a special message on the subject, and the conservative element may prevail and the municipalities of Michigan be spared the bitter experience similar to that the state had in its building and operating of railroads and canals.

The experience of the state of Michigan as a railroad owner between 1835 and 1850 was epitomized in the opinion of the Supreme Court of Michigan in the case against the Detroit Railway Commissioners. The state enterprises for internal improvements which had been specially commended in the constitution of 1835 were expressly prohibited in that of 1850, but now the cycle is complete and in 1900 it is proposed to give public ownership of improvements another trial. This time, however, it is not the Legislature which is to be given power to bond and tax, but those notoriously incompetent administrators—the municipalities the most glaringly faulty of our political institutions.

One element that is very active in promoting the cause of municipal ownership of electrical enterprise comprises certain promoters and bond brokers, who will agree to build a plant with almost any desired guaranty as to cost and performance, and take their pay in bonds. By the time that plant needs repairs or rebuilding, and the absence of a sinking fund confronts the city as a really serious condition, the bonds have all been disposed of. The city has nothing to do but pay interest and mayhap issue some more bonds to rebuild.

In Ohio there is a most startling plan to be placed before the Legislature for approval, whereby municipalities are to be authorized to issue bonds without limit for the purpose of buying street railway, electric lighting, gas and water properties, and, further, given the power to levy taxes to pay any deficits that may occur under municipal management. On another page there is a discussion of this subject by Mr. A. R. Foote, who points out the dangers in thus encouraging the wild speculation which all experience shows would surely follow.

The most serious difficulty in the way of making such schemes financially successful is, that with universal suffrage the majority of the voters are not tax-payers, and hence are very liberal when it is a question of spending other peoples' money.

During the last sixty days a portion of the employes of the street railway at Springfield, Ill., have been upon a strike, and as in nearly all of these unfortunate controversies, of which there were so many during 1899, between managers and employes the issue was the formal recognition of the employes' union. There was no grievance on the part of the men save that they were not permitted to pass upon the sufficiency of the company's reasons for discharging of some of their number.

The strike was begun November 10th and after a settlement had been agreed upon December 20th was at once renewed for insufficient and trivial reasons. As at Cleveland, London and elsewhere attempts were made to intimidate employes and patrons and on four occasions explosives were placed on the tracks.

The situation in Milwaukee at the present time is peculiar, in that the officials in charge of the city government are the allies, and not the opponents, of the street railway company, and both are defending suits in equity brought by two citizens who do not approve of the new ordinance passed on January 2d. The essential features of this compromise, which was accepted by the company as better than a continuation of the controversy so long pending, are: Special tickets, 6 for 25 cents and 25 for \$1, good for two hours in the mornings and evenings until 1905, and good at all hours of the day after that date; a ten-year extension of certain

franchises, with the proviso that all franchises shall expire in 1934; a provision for sale to the city in 1934, if it shall so elect; an agreement on the part of the company to extend its main lines to the city limits as the latter shall be from time to time established.

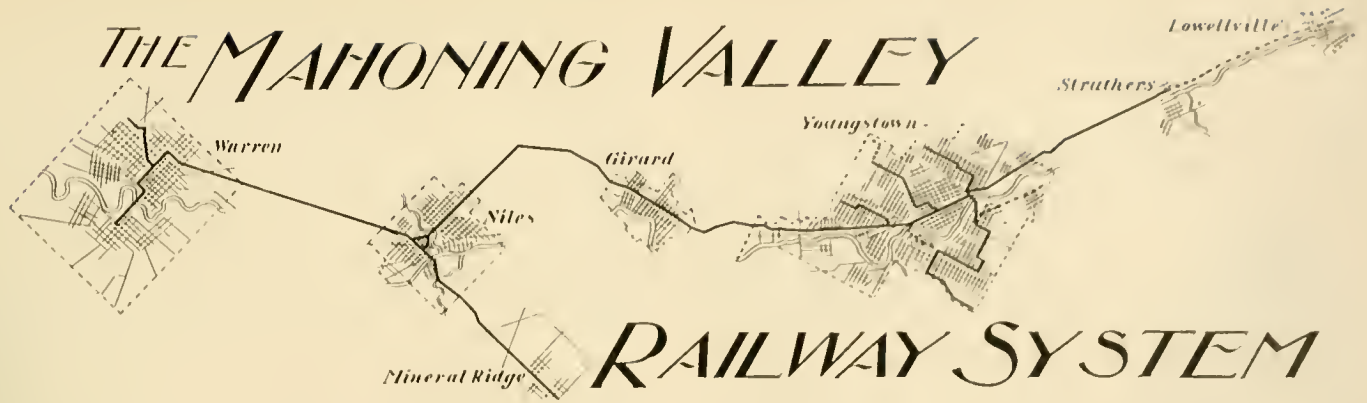
The mayor and council were twice enjoined, but the dilatory tactics of the complainants convinced them that the suits were not begun in good faith, but with the object of delaying action on the street railway question till after the next city election. Accordingly the orders of court were ignored and the ordinance passed. If the council is correct in its contention that being a legislative body the courts have no jurisdiction to enjoin it, the long-standing dispute may be considered as settled for 35 years to come, a result on which all parties are to be congratulated.

The report of the New York Railroad Commissioners for the year ending June 30, 1899, has just been issued, and elsewhere in this issue will be found extracts from those portions dealing with the elevated roads in Greater New York and the street surface railways throughout the state. The number of passengers carried on the elevated roads of Brooklyn is given as nearly 7 per cent less than for the preceding year, but this decrease in traffic is explained in large part by the fact that the returns of the Brooklyn Elevated Railroad are given for only nine months of the year, the returns of this company for the other three months being included in those of the Brooklyn Heights Rapid Transit Co. In the case of the Manhattan Elevated there is a decrease of over 5 per cent in the number of passengers carried. The street surface roads, on the other hand, show gains in traffic; the total for the entire state is nearly 7.7 per cent in excess of the preceding year, and of this over five-sevenths was on the lines in the boroughs of Manhattan and Bronx, New York City. The lines in these boroughs carried 55 per cent of the total of passengers in the state, and showed an increase amounting to nearly 74 per cent of the total increase of the state. In this connection it must be noted that the number of passengers as reported includes "transfers." The table of gross receipts and total expenses per passenger and per car-mile will be found very instructive.

The board dwells at length on the accidents, such as were formerly regarded as incidents alone of steam railroading, that have occurred on street railways. This class of accidents includes head-on and rear-end collisions, derailments and crossing accidents. In conclusion the Board restates its recommendations, made in previous reports, for the precautions which it is believed will prevent accidents of this nature.

The probable amount of new construction work to be done the coming season is very uncertain. Last year contract letting was left until late in many instances, and then it was found impossible to secure delivery at any but remote dates. This difficulty in securing material resulted in a very considerable amount of proposed work going over to this season. In the meantime the demands upon our manufacturers, many of whom have other interests to supply and which have been and are also very active, have steadily increased until prices have been advanced from 25 to 100 per cent and in some exceptional cases even more. The advance has been especially strong in those construction items which are always the heavy accounts. Rails, cars, engines and boilers, and all copper manufactures are now so high and the time of delivery on new contracts so uncertain for some of them, that much contemplated work will be forced over for another year. There will be a very respectable amount of work in the aggregate, but it will be confined to such lines as come within the limits of being a positive necessity. Scarcely a manager who is going to build a few miles but would have constructed twice as much could he have done so at last year's prices. The result is not, however, without its wholesome features. It is well to curb the ambitions of some promoters who think that once a line is built the balance sheet is bound to take care of itself. We want no repetition of the wild cat roads which came into existence by the score 10 years ago. Some of these are just now beginning to get upon a good paying basis. There are legitimate enterprises in abundance, and such are having a very fair degree of success in disposing of their securities, and at good prices, hence it is no great cause of regret that much other legitimate work is to be carried over another 12 months.

New city work is largely that of rebuilding worn out tracks, constructing extensions to care for the spread of population, and increasing the capacity of stations. The year will be an extremely busy one for contractors and manufacturers.



This system embraces 44 miles of track and connects Youngstown with a number of neighboring villages, as shown by the accompanying diagram. To the northwest of Youngstown the places, in order, include Girard, Niles, Warren and as an adjunct of Niles, Mineral Ridge. To the southeast are Struthers and Lowellville. The line connecting the two last named villages is to be built in the early spring and will be about four miles in length. Other extensions in Youngstown will also be built early in 1900, and part of the material is already on hand and the work of grading begun.

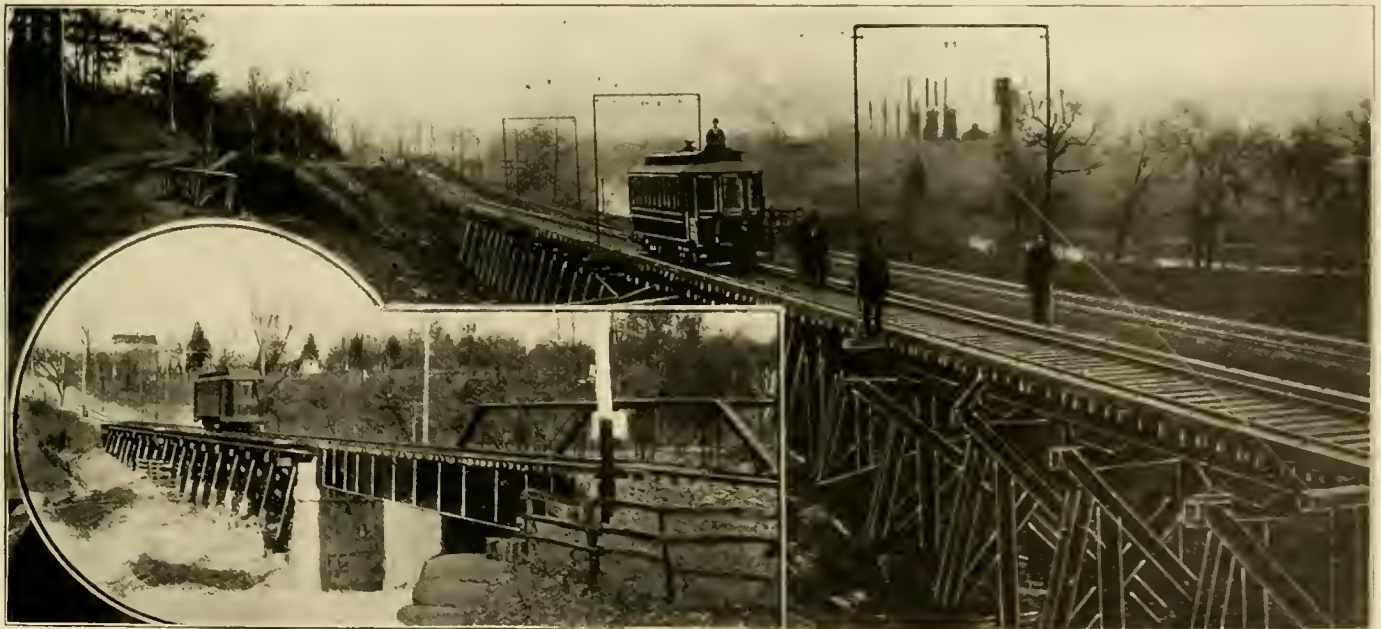
The service is both passenger and freight and is well patronized in both departments. A fast passenger service is maintained between Youngstown and Warren, which passes through the intervening villages, two large cars being used. These cars leave the respective cities every hour and make stops only at certain designated points; the trip each way is made in about 57 minutes, the distance being 16 miles.

The package and freight cars make two round trips each day between Warren and Struthers, and the indications from the growth of the patronage are that an additional car will soon be required. In the Youngstown division, which includes Struthers on the east

This is designed to be equal in strength to the work usually employed on steam roads. Heavy oak timbers compose the bent, and the structure is thoroughly braced to avoid any surging movement due to the starting and stopping of cars. Heavy guard beams are provided as shown, and the trolley wire is supported by span wires attached to arches composed of 3-in. iron pipe and thoroughly braced by wire guys having turnbuckles for adjustment. Other sections of trestle work and of the steel bridge are shown in the illustrations.

In the suburban track construction a 70-lb. T-rail of the American Society of Civil Engineers section, rolled by the Pennsylvania Steel Co., is used. The roadbed consists of a foundation of 6 in. of furnace slag, which is procured from the neighboring furnaces; on this the ties are placed 2 ft. c. to c. The space between the ties is then filled and tamped with gravel, but left to slant each way from the center for drainage. The rail joints are made with 6-hole splice bars and bonded with "Crown Fig. 8" bonds made by the American Steel & Wire Co. On a part of the old construction near Youngstown cast-welded joints are employed.

On the rear platform of some of the large cars is placed a guard rail composed of 1-in iron pipe, which is attached just to one side of



TRESTLES AND BRIDGES ON MAHONING VALLEY LINE.

and Niles on the west, 10 cars are operated, and on the Trumbull division, which includes Warren and Niles, 4 cars are required, and between Niles and Mineral Ridge 2 cars, making 27 cars in all. Twelve of these are long cars, with double trucks, and on some of these air brakes are about to be installed. It is the intention of the company to add eight more long cars to the equipment in the near future. These will be of the same length (36 ft.) as the present cars.

Considerable new track has been laid during the past season, and on some portions of the line trestle construction has been required.

the inside door post about 3 ft. above the platform. The door (accelerator type) is hung to one side of the end and the guard rails curve out toward the steps and are supported by an end post opposite the middle of the step. This serves to keep the passengers from obstructing the doorway when the platform is crowded, but gives room for the conductor to stand between the door and the rail without interfering with the entrance or exit of passengers.

The company is planning to erect a large power station during the coming season, from which the entire system will be operated:

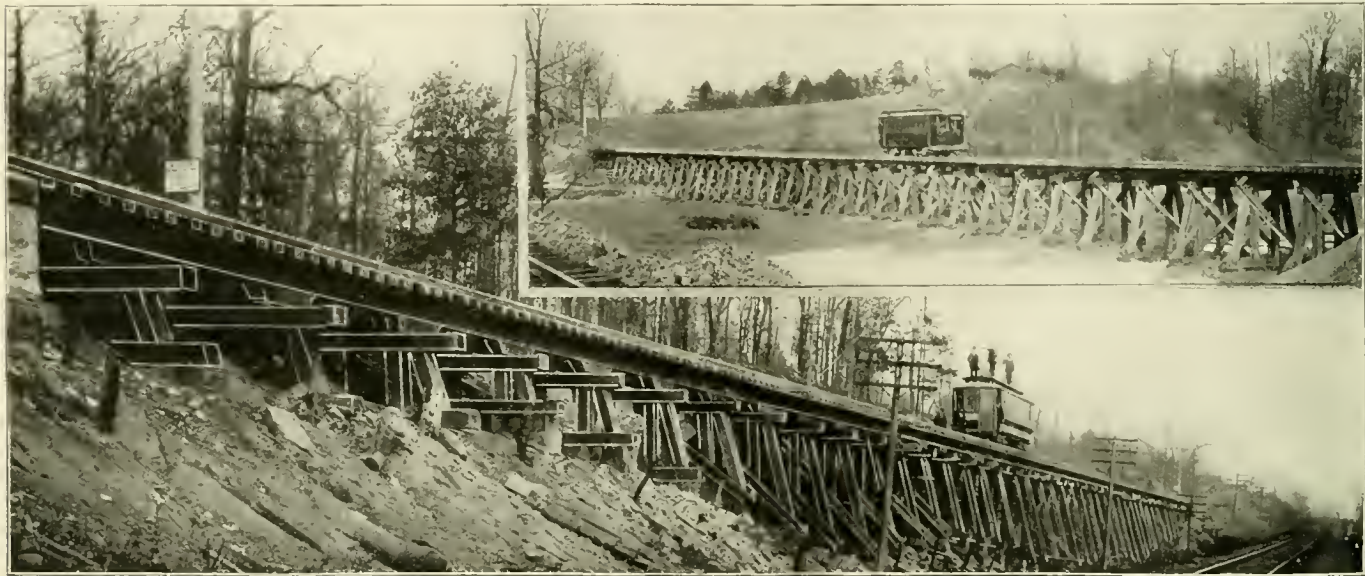
it is probable that a high tension alternating current will be generated, which will be conducted to transformer stations located at different points of the system.

This is one of the most promising interurban street railway systems in the country, for the reason that this section of the Mahoning Valley is rapidly being filled up with manufacturing establishments, consisting mostly of blast furnaces and steel and iron mills for rolling structural shapes. Doubtless at no distant day the system will be one of the links in the chain of electrical railways that is already projected to unite some of the larger Ohio cities with cities in Pennsylvania and possibly some in New York.

The affairs of the company are in charge of M. A. Verner, of Pittsburg, president, and A. A. Anderson, general manager and treasurer. Mr. Anderson has now been connected with the system about six years, and it is largely due to his foresight and executive ability that the various systems above described have been brought under a single management and the intercommunicating system established.



A. A. ANDERSON.



ALONG THE MAHONING VALLEY LINE.

A VISIONARY SCHEME.

How will the man who wishes to improve present conditions can sometimes be shown by the following extract from a letter to the Chicago Post:

"I would have the city government select a route ten miles long, beginning at the business center, or as near it as practicable, and running in a nearly straight line either west or south, take the whole of this street and construct in it four tramways; make the rails grooved at street crossings, 60 ft. in length, electrically welded, 90 lb. to the yard, with steam pipes laid in the outside neck. These pipes would keep the rails dry at all times and in winter free from snow and ice.

"The cars should be built with wheels at the ends; double floors with steam pipes between and a steam heater at one end. The under side of floors need not be more than 6 in. above the rails. All three tracks at the right should be used in one direction during rush hours, and the cars on the two inside tracks should stop only once in four blocks, and not at all for the mile and one-half just outside of the business district. At certain hours the two inside tracks could be used for freight, to be delivered anywhere on the line of the road. Traffic teaming should not be allowed, but the line could accommodate residents with their supplies, and the sidewalk could be used for delivery purposes for less than one block. Children should be prohibited from making this street a playground, but if they did, the fenders are expected to pick them up."

NEW ROADS IN CRIPPLE CREEK DISTRICT.

In our issue of October, 1898, page 707, we published a description of the Cripple Creek District Railway, which at that time comprised 61.4 miles of track between Cripple Creek and Victor, opened for traffic Jan. 2, 1898. The company was then making surveys for a line 26 miles long to connect the Cripple Creek district with Colorado Springs. Now the early completion of one road to connect these points is regarded as a certainty and a competing line is also proposed.

The Colorado Springs & Cripple Creek District Railroad Co. is closely allied to the Cripple Creek District Railway Co. and will build a road from Colorado Springs to Cameron, formerly called Grassy. This road will be operated by steam at first but the branches and spurs will be equipped electrically. At Cameron connection will be made with the Cripple Creek District Ry., its lines having been extended to that point. The operation of the main line by steam is to be temporary only, electricity being the power ultimately contemplated.

Another company, the Colorado Springs, Cripple Creek & Southern, proposes to apply for franchises for an electric line between the two towns, to carry passengers, freight, mail and express.

On December 19th the last rail of the Canon City & Cripple Creek Ry. (a steam line) was laid and several other steam roads are projected in the district to serve the new mines which are being opened.

STEEP GRADES IN FRANCE.

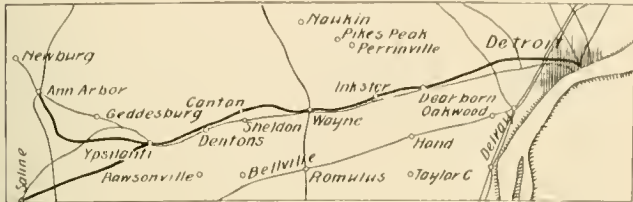
An electric railway recently opened at Laon, France, is remarkable for its steep gradients. The line is 1,479 m. long and one portion has a rise of 81 mm. to the m. Another section, about 860 m. long, has a grade of 10 per cent, and in a short run of 202 m. the rise is 130 mm. to the m. A rack and gear combination is provided as a safety measure to prevent cars from slipping, but it is stated this is seldom used as sufficient traction is secured between the rails and wheels under ordinary conditions. Combination baggage and passenger cars with capacity for 26 persons are in operation, each car having two G. E. 53 motors. Current at 120 volts is supplied from a generator of 1,200 amperes capacity.

CONNECTICUT ASSOCIATION.

At a meeting of the Connecticut State Street Railway Association, held at New Haven December 6th, the following officers were elected: President, H. S. Parmelee, New Haven; vice-president, A. M. Young, Waterbury; secretary, B. W. Porter, Derby; treasurer, E. S. Goodrich, Hartford.

The Detroit, Ypsilanti & Ann Arbor Electric Railway.

An excellent example of modern practice in the equipment of an interurban traction system is furnished by the Detroit, Ypsilanti & Ann Arbor Electric Ry. When the company was organized in 1897 the promoters determined to introduce the very highest types of machinery and equipment, to complete every detail in the most reliable manner, and to exercise a liberal policy toward the public. The result of the first year's operation shows the wisdom of this broad-minded policy, as a valuable freight and passenger traffic has been developed, and the property is already earning dividends for its stockholders.



MAP OF DETROIT ANN ARBOR LINE.

The length of the track is 50 miles. The main line from Detroit, passing through Wayne and Ypsilanti to Ann Arbor, is 40 miles, and a branch from Ypsilanti to Saline is 10 miles in length. From the City Hall, in the center of Detroit, cars pass down Michigan Ave. for six miles, using the tracks of the Citizens' Street Railway Co. From the city limits a new track was laid through Dearborn and Wayne to Ypsilanti, and thence to Ann Arbor. The franchises of the former railway from Ypsilanti to Ann Arbor, and of five miles of track in Ann Arbor City, were acquired by purchase, and the lines entirely rebuilt and re-equipped. The Saline division is a new construction.

The route passes through a rich agricultural country and through several thriving towns and cities, from which local and through traffic is drawn. Dearborn, 10 miles from Detroit, has about one thousand inhabitants. Inkster and Eloise are smaller places. Wayne, 20 miles from Detroit, is the junction of the Plymouth & Northfield Electric Ry. Canton and Denton are passed before reaching Ypsilanti, a manufacturing town of 4,000 inhabitants. In addition to the ordinary population of Ypsilanti the State Normal School has from two to three thousand students. Ann Arbor, the terminus of the line, has a regular population of 15,000 and is the seat of the University of Michigan.

The plans for the complete engineering equipment of this railway



FIG. 1.—POWER HOUSE AND CAR BARN, YPSILANTI.

were prepared by Westinghouse, Church, Kerr & Co., New York, and to the Detroit office of the same company was awarded the contract for furnishing the steam and electrical machinery for the two power houses and the motors and air brakes for the cars. The promoters of the railway stipulated for the most advanced type of

machinery and the introduction of the latest mechanical devices for securing economy in operation. It is no secret that the engineers were given a free hand, and the contract was in the nature of a confidential one. This latitude has been justified, for the installation is a model in all respects, embodying great simplicity yet completeness of design, and is an excellent illustration of economical practice where direct current electricity only is used for operating a railroad of considerable length. These desirable results are mainly to be attributed to concentrating the various branches of construction in the hands of capable engineers.

Two power houses have been built, 19 miles apart, one at Ypsilanti, 10 miles from the Ann Arbor terminus, and the other at Dearborn, 5 miles from the Detroit city limits. The equipment

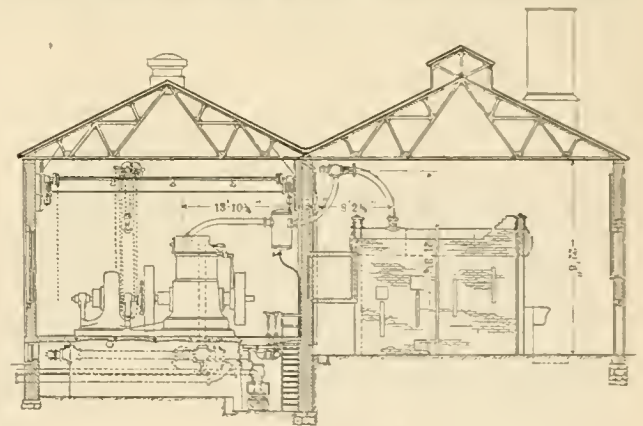
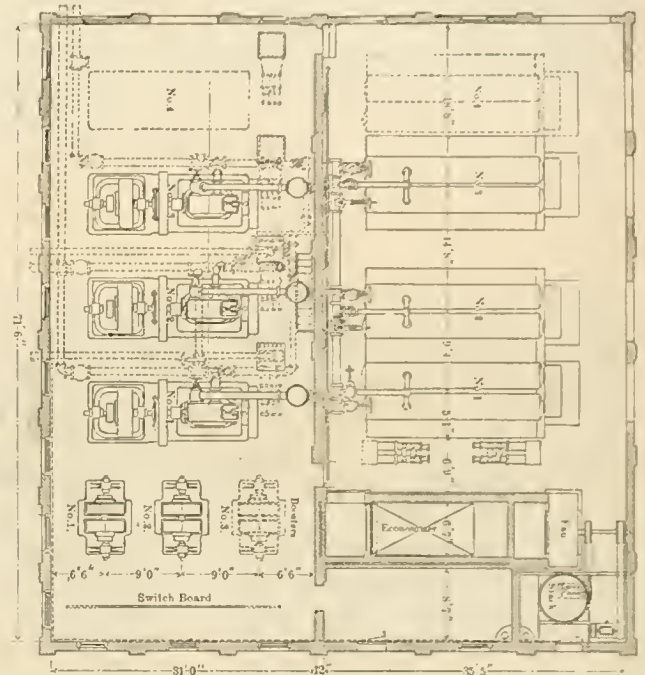


FIG. 2.—POWER HOUSE.

of both power houses is very similar, differing only in the feeders and in boiler feeding apparatus. A description of the Ypsilanti plant will therefore suffice for both.

The power house and car barns are attractive buildings and present a pleasing appearance upon the main road entering Ypsilanti from the east. They adjoin the Huron River, which affords an abundant supply of water for boilers and condensers at all seasons of the year. Facing the high road are the extensive car barns and repair shops, with the company's offices in front, a view of which is seen in Fig. 1. At the back stands the power house, a substantial fire-proof building, constructed of brick, measuring 67 ft. by 72 ft. A heavy brick wall divides the spaces about equally between

the boiler and generating rooms. The appearance of the interior of the generating room is very attractive, it being lofty, well lighted and ventilated. A few palms add greatly to the cheerfulness, and emphasize the neatness of the surroundings. The foundations are of concrete, the floors being cemented throughout.

The equipment of the steam plant shown in Fig. 4 includes the latest improvements and secures the utmost economy in operation. Three Babcock & Wilcox water-tube boilers, rated at 225 h. p. each, carry a steam pressure of 150 lb., are equipped with Roney mechanical stokers, which afford complete combustion of the fuel and enable the cheapest grades of coal to be burned with minimum labor in firing. Ohio slack coal, costing \$1.45 a ton delivered at the railway, is used. Reference to Fig. 1 shows the stack, which extends only a few feet above the roof of the building. The ground plan and a section of the power house are shown in Fig. 2.

The Westinghouse system of economizer mechanical draft has been introduced, with two vertical fans driven by an 8-h. p. Westinghouse steam engine. The blowers were furnished by the Fuller Co., of Detroit. The speed of the engine and therefore that of the fans is controlled by quick-acting regulators, so that as the steam pressure begins to rise upon the boilers a valve reduces the supply of steam. By this automatic arrangement the mechanical draft is regulated by the pressure in the boilers, as an increase of boiler pressure slows down the engine driving the fans. By combining fuel economizers with the mechanical draft, low temperature of the waste gases are secured and the heat is returned to the feed water.

The water for feeding the boilers and for the condensers is obtained from the Huron River alongside the power house, as shown in

Fig. 6. A crib has been carried into the river into which the water passes and then flows by an 18-in. pipe to a well 14 ft. deep. Feed water for the boilers is pumped from the well through a 4-in. pipe by two Worthington outside-packed pumps, each sufficient to care for the whole plant. The feed water passes through a Baragwanath exhaust heater, utilizing the heat of the exhaust steam from pumps, condensers and blower engine, and thence passes through a fuel economizer, where it takes up the heat of the waste gases from the boilers; the feed water is heated to 275° F. before it enters the boilers. Any or all of this apparatus between the feed pumps and the boilers may be by-passed at will. The steam passes through large separators before going to the engines, and the water of condensation is returned to the boilers by a system of Westinghouse steam loops.

The steam piping throughout the plant is very heavily constructed to carry a working pressure of 175 lb. The arrangement is very carefully designed to secure the greatest freedom from internal strains due to expansion or contraction. It may be noted from the diagrams of the power house that the steam pipes from the boilers to engines are curved, avoiding elbows, and there are no pockets except those purposely provided for handling entrained water. The valves and piping were furnished by Roe, Stephens & Co., Detroit.

Three Worthington compound condensers 6 and 9 x 12 x 10 are installed in the basement of the power house under the engine room. The independent condensers are so connected that the engines can be used either condensing or non-condensing. A 10-in. intake pipe from the well by the river supplies water for the condensers, which is returned direct to the river. The condensers and

engines are cross-connected, so that in the event of one being disabled the other can be used to furnish a vacuum.

The engine room shown in Fig. 3 contains three 450-h. p. Westinghouse condensing compound engines running at 250 r. p. m. direct coupled to the generators. These engines are of the constant terminal compound type specially designed for the widely fluctuating loads incidental to railroad work. They were built by the Westinghouse Machine Co., East Pittsburg, Pa.

The usual load upon the engines is from 650 h. p. to 680 h. p., but it is very fluctuating in character, as the 9 to 12 cars operated upon the tracks meet at certain times in the turnouts, which causes the load as registered by the ammeter to vary from 100 amperes to 1,300 amperes, equivalent to a variation of from 70 h. p. to 900 h. p. Two of the engines carry the usual load, the third being held as a reserve, two boilers only are habitually under steam.

The electrical equipment comprises three 225-k.w. Westinghouse direct current generators, 575 volts, connected to the engines by flexible couplings. They are of the standard Westinghouse type, as shown in Fig. 3. There have also been installed in the power house two Westinghouse motor-driven boosters, one 135-k.w. and one 125-k.w. The motor and booster armatures are mounted upon the same shaft. The fields of both machines are supported upon the same bedplate and are split in a vertical plane to permit the removal of either half horizontally from its armature. The motor receives power directly from the station bus bars and the booster is operated in series with the feeders. The full load voltage of the boosters is 325, making the voltage on the booster feeders at the station 900 volts. A view of one of the two boosters in the Ypsilanti station is

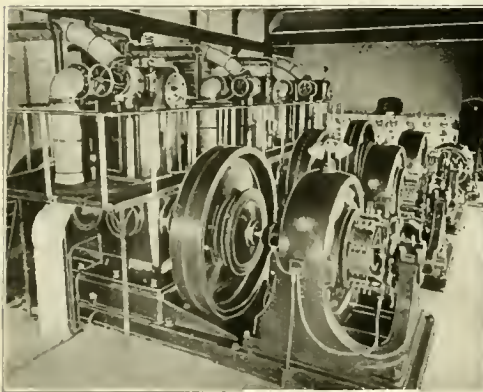


FIG. 3.—GENERATORS.



FIG. 4.—BOILER ROOM.

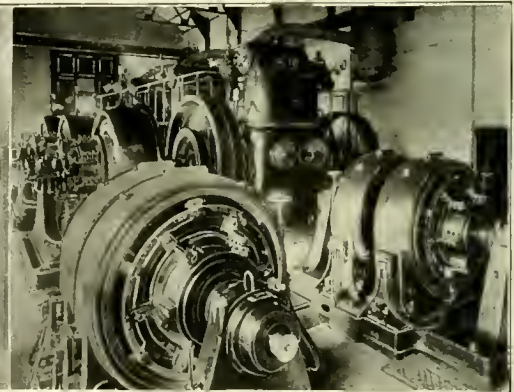


FIG. 5.—BOOSTERS.

shown in Fig. 5. One of the boosters supplies the line running westward to Ann Arbor, the feeder being tapped in at the Ann Arbor city limits, about 7½ miles from the power house. The feeder from the other booster going east taps in at Sheldon Corners, an equal distance from the station. The three feeder wires running east and west from the Ypsilanti power house and the one running west from the Dearborn power house each consists of 39,600 ft. of copper wire. The Ann Arbor line has a section of 550,000 cm., and the other two wires 400,000 cm.

The switchboard consists of 11 heavy marble panels mounted upon an iron frame work of very neat design, occupying one end of the generating room. The feed wires are carried from the bus bars through the side wall to brackets on the outside and thence to the overhead construction upon the tracks. There are three generator panels, following the standard Westinghouse practice. Upon the fourth panel is a voltmeter and wattmeter. Then follow the east and west feeder panels and four panels for the motors and motor-driven boosters. The eleventh panel controls the south feeder for the Saline division. Voltmeters upon swinging brackets at either end of the switchboard show the voltage upon the line. The panels are supplied with the usual meters, circuit breakers, switches and other apparatus for the complete control of the current under all conditions.

The stations at Ypsilanti and Dearborn are arranged to work in parallel, helping each other out in case of a very heavy load upon either station, but they can be separated in case of need. Either booster may be operated in series with either booster feeder. The switches are so arranged that the booster feeders may be used for

supplementing the direct fed feeders should it be desirable to shut down the boosters.

The power house is equipped with an overhead $7\frac{1}{2}$ -ton traveling crane for moving any part of the machinery.

From the city limits of Detroit to Ann Arbor a single track has been laid by the side of the high road of standard gage, with frequent turnouts; the contractors are J. Griffin & Co., Detroit. Profiles of the country show a mainly level surface, with a few grades up to $7\frac{1}{2}$ per cent in approaching bridges and where sudden dips occur. The track has been laid in the most substantial manner, with cedar ties upon a gravel bed, according to the best steam railroad practice. The Cleveland Frog & Crossing Co. furnished the special work. Upon the curves, which are few, the outer rail is elevated and the strong, substantial roadbed enables a speed of 45 miles an hour to be readily maintained by the cars. The standard rail is a T section weighing 77 lb., but parts of the track are laid with 70-lb. and 75-lb. rails. The rails are bonded with No. 0000 cross bonds every 500 ft., with joint bonds of No. 0000 wire. The Atkinson bonds are used.

The overhead construction was made by the Ohio Brass Co. and consists of two No. 000 figure 8 trolley wires, the two wires being used to avoid switches at the turnouts. The east bound cars run on one trolley wire and the west bound cars on the other. The two wires are in parallel, being tied together every 500 ft. Upon the Saline division a No. 000 figure 8 trolley wire is used, with a No. 0000 feeder wire in parallel. There are 25 miles of span construction work, the trolleys being suspended from the poles on either side, and about 18 miles of bracket construction.

The standard car used by the Detroit, Ypsilanti & Ann Arbor Railway Co., shown in Fig. 7, is 50 ft. in length, with motorman's cab at one end, the cars having a seating capacity for 56 passengers. The present equipment consists of 20 cars, built by the Barney & Smith Car Co., of Dayton, O. They are of extra width, the interior being handsomely finished and the cross seats upholstered with plush. Each car is warmed by Baker hot water heaters in the winter, and an ample supply of electric lights is provided. The cars are equipped with Westinghouse quick acting air brakes of special design. An air compressor driven by a direct connected motor is mounted in the cab of each car. The motor is automatically controlled by a pneumatic switch, so that it starts as soon as the air pressure in the reservoir falls below 70 lb. and stops when the pressure is raised to 100 lb. This automatic system of air brake apparatus is highly efficient and reliable in operation, working comparatively noiselessly, being devoid of the usual hum of high speed gearing and the knocking of reciprocative parts.

Each car is equipped with double trucks, upon which are mounted four 50-h. p. Westinghouse railway motors of the well known multipolar type, with iron clad armature. Each car is also provided with a series of multiple controllers for operating the motors in combination of pairs in series multiple and all motors in multiple; the canopy switch is in the form of an automatic circuit breaker, thus enhancing the ease of operation when using the heavy currents required. The cars also carry hand brakes. The cars weigh 26 tons each when loaded. The Wilson trolley pole catchers are used and give satisfaction.

A well equipped repair shop is in operation at the car barns at Ypsilanti, furnished with the necessary machinery for repairing breakdowns of the cars, for rewinding armatures, machinery car wheels and axles, and for general repairs of electrical machinery. Power is furnished for the repair shop by a 10-h. p. Westinghouse multipolar direct current motor. A regular half hour service is provided between Detroit and Ann Arbor, special cars for excursion parties being dispatched between the times of regular service. Occasionally the traffic necessitates 15-minute service. An operator at the Ypsilanti office dispatches all cars by telephone, the conductors reporting their arrival and departure from each point; a complete control is thus maintained. A single car provides for the service upon the Saline division.

The cash fare from Detroit to Ann Arbor, a distance of 40 miles, is 60 cents if paid upon the car, or 50 cents if a ticket is bought at the office before starting. Mileage books are sold for 1,000 miles at the rate of one cent a mile. The schedule time for the journey of 40 miles is $2\frac{1}{4}$ hours. The ordinary train on the steam railroad occupies 1 h. 43 min. between Detroit and Ann Arbor, the fare being \$1.12.

A very interesting calculation was made regarding the amount of local traffic upon the railroad between Ann Arbor and Detroit,

which is paralleled by the electric traction lines, it being found that immediately prior to the opening of the electric railway the local traffic averaged 200 passengers a day. The figures of the Detroit, Ypsilanti & Ann Arbor Railway Co. show that during the past year they have averaged 4,000 passengers a day and during the month of September the average fare per passenger was 15 9 10 cents. It is thus clearly shown that when the public is given facilities for travel at an economical rate a valuable traffic can be developed. It



FIG. 6.—YPSILANTI POWER HOUSE ON HURON RIVER.

must be borne in mind that the railway system under review has but just completed its first financial year. These excellent returns have enabled the company to earn a substantial dividend for the stockholders.

Fourteen cars have run 120,000 miles during one month. For such a service only the best materials, the strongest cars, the latest mechanical and electrical machinery and apparatus could make such continual strain possible.

The advent of the electric road has been of untold value to the country through which it passes. Building operations have had a marked stimulus along the route. In Wayne, hitherto a small village, 50 houses have sprung up, and a similar impetus has been given to other places. A considerable tract of land is now devoted to market gardening, since the way is opened for a frequent and rapid delivery of fresh fruits and vegetables to Detroit and to other markets. Various industries have been initiated, and a new life poured into the veins of the inhabitants, stimulating a healthy activity on all sides.

The railroad passes through a richly productive country, partly agricultural and partly horticultural, which yields a large freight traffic. At present only one freight car makes two round trips a day from Detroit to Ann Arbor, but so great is the demand for increasing this freight service that the company is making arrange-



FIG. 7. STANDARD CAR.

ments for a central clearing house in Detroit, where an exchange can be made with all the interurban lines running into the city. It is proposed to secure a separate building, in connection with which there will be a regular service of wagons for collection and delivery. At present the company is in the anomalous position of curbing the development of this branch of its business by charging very high rates on account of the poor facilities it has for receiving and distributing in Detroit. In spite of charging two-thirds more than the steam railway company, it receives far more freight than the car can take care of. Two rates of charge are in vogue, for freight and express matter. Express packages are carried in the baggage

department of the passenger cars. The rapid and prompt delivery of packages by electric cars is in itself sufficient to attract a large business. As soon as arrangements are completed at the Detroit end the company fully anticipates earning from \$3,000 to \$5,000 a month in place of the \$1,000 a month now received for freight. The country served by the railway produces a large quantity of raspberries, strawberries and other fresh fruits, as well as garden and dairy produce. Packages of merchandise can be picked up by the freight cars at all points along the line, and goods can be similarly delivered, affording the greatest facilities to shippers and receivers.

The great success attendant upon the operation of this electric railroad has led to the commencement of several projects of a similar nature.

The officers of the Detroit, Ypsilanti & Ann Arbor are: President, J. D. Hawks; vice-president, M. J. Griffin; treasurer, S. F. Angus; secretary, F. A. Hinchman; manager, F. E. Merrill.

NORTHWESTERN ELEVATED OPEN.

Shortly after 2 p. m. on Dec. 30, 1899, the first train on the Northwestern Elevated R. R., of Chicago, comprising motor car No. 1 and two trailers, all three cars gayly decorated with flags and bunting, left the Lincoln Ave. station of the road for a trip over the line. The party on board consisted of D. H. Louderback, president; Howard Abel, secretary and treasurer; George F. Jewett, auditor; Clarence A. Knight, general counsel; C. V. Weston, chief engineer; Frank Hedley, general superintendent of both the Lake Street Elevated and Northwestern Elevated; J. H. L. Waddell, consulting engineer; R. B. Stearns, assistant engineer; O. E. Morgensen, assistant engineer in charge of the design; and W. W. Miller of New York, counsel for Blair & Co.; John B. Dennis of Blair & Co., Caleb H. Marshall, ex-Mayor Washburne, T. G. Milstead of New York, Ben Marshall, Clarence Buckingham, F. C. Wheeler of London, W. A. Patterson, J. L. Cochran, A. P. Richardson, Mr. Angus of the Angus & Gindele Co., and a few other guests, among whom was a representative of the "Review."

When the train reached the bridge over the Chicago River it was welcomed by blasts from the whistles of tugboats and by cheers from the workmen along the line. On the trip around the loop President Louderback and Chief Engineer Weston occupied the front platform. The train completed the circuit of the loop at a few minutes before 3 o'clock and then ran to the northern end of the structure and back to Lincoln Ave. again.

Twenty-seven fares were collected on this trip. Chief Engineer Weston paid the first nickel to Superintendent Hedley, who acted as conductor till this formality was over.

It had not been the intention of the company to begin the operation of the road until March next, but when in December it became evident that the city council would not consent to a further extension of time and would seek to have the company's \$100,000 bond forfeited were the road not in operation before the close of the year, the company decided to have trains running before the time limit expired. At that time there was practically nothing done between Chicago Ave. and Lake St., a distance of 4,100 ft., except the foundations; by far the greater portion of the metal work of the structure had not reached Chicago, and over half of it had to be shipped from the mills by special trains. Forces of from 400 to 700 men were put on and the work pushed day and night; the company's men erected the metal work and the North American Railway Construction Co. laid the track, the track layers being followed close by the electrical force under the direction of J. R. Chapman, electrical engineer for the road. Power was taken from the stations of the Union and Consolidated Traction companies.

By noon of December 30th a single track to the loop was ready for trains and before midnight a run was made to Wilson Ave., the northern terminus; the structure at present stops 2,000 ft. south of that point and the incline to the surface was not completed till late that night. An enormous amount of work was done in two weeks and the men responsible for it received hearty congratulations when the task was accomplished.

Trains were run on the 31st, and on New Year's day over 500 fares were collected. The second track will be completed with all the expedition possible.

January 1st the commissioner of public works directed that work be stopped on the Northwestern Elevated, as he claimed the road had not been completed as required by the ordinance.

The daily trip on January 2d was the source of some entertainment to some 25 passengers and numerous spectators. The train started from the northern terminus and at Lincoln Ave. was met by four policemen who acted under orders from the city and arrested the train crew, taking the men to the police station, firm in the belief that the train would not pull out without motorman or conductor. There chanced to be a man on board who had both the necessary knowledge and authority and he promptly took the motorman's cab and started for the loop.

When Lake St. was reached the structure was found crowded with 50 or 60 policemen who had orders to stop the train. The acting motorman smiled and increased the speed, whereupon the patrolmen scrambled out of the way and watched the train enter the loop. Having been foiled in the attempt to hold up the train on the down trip the representatives of the city proceeded to block the track by piling timbers and ties across it so that the train would have to stop on the return trip.

Being advised as to what was happening, the Northwestern officials got the right of way over the Lake Street road and instead of stopping at the obstructions the Northwestern train proceeded out Lake St. to a nearby siding. Here it was finally overhauled by the police force and a detail spent the night in a cold car to be sure that it did not get away.

When the cases against the trainmen, against whom charges of criminal carelessness had been made, came before the court it was decided that the police had exceeded their authority in making the arrests. Following this the city officials agreed not to further molest the company in running its trains.

A new ordinance which the company and the city officials agreed upon is now under consideration.

SHELTON ACCIDENT CLAIMS SETTLED.

It has been announced that the Shelton Street Railway Co. last month settled the last of the claims for damages arising out of the accident near Bridgeport (Conn.), Aug. 6, 1899, when 29 persons were killed and 12 seriously injured. The terms of the settlements have not been made public, and the money cost to the company cannot, therefore, be stated; it is reported, however, that the amounts paid have been greatly underestimated by the general public.

EXTENSIONS AT SHEBOYGAN, WIS.

The Sheboygan (Wis.) Light, Power & Railway Co. has recently completed a six-mile line from Sheboygan to Sheboygan Falls over a toll road, over which long double truck cars will be operated giving a 30-minute service. The line was opened November 30th, and last month was operated with the single truck cars used on the urban lines. The business has been very good from the start and will increase in the future. Sheboygan Falls is a manufacturing town of some 1,500 people, and a large bath tub factory has been located on the line, which gives employment to several hundred men. In addition to passenger traffic, the inter-urban road will carry mail, express, milk and light freight.

The line was built under the personal supervision of Mr. John M. Saemann, vice-president and manager of the company.

UNIVERSAL TRANSFERS AT MEMPHIS.

In 1895 the city council of Memphis, Tenn., passed an ordinance under which franchise rights were granted to a street railway company to be formed by the consolidation of the four companies then operating in the city and suburbs. All of these four were controlled by A. M. Billings, of Chicago, and his associates, and they were promptly consolidated as the Memphis Street Railway Co.; the consolidation had only been prevented by the terms of the franchises to the several companies.

Under the ordinance which was agreed upon between Mr. Billings and the council a limited transfer system was to go into effect on Jan. 1, 1896, and a continuous ride between any two points in the city was to be given for 5 cents after Jan. 1, 1900, at all hours of the day.

In accordance with this agreement the universal transfer system was put in effect Dec. 25, 1899.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

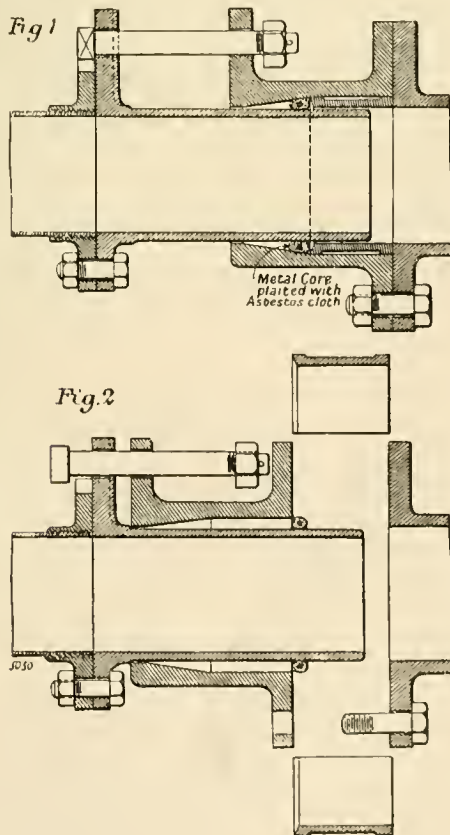
DROUGHTS CAUSE BOILER SCALE.

The Hartford Steam Boiler Inspection & Insurance Co. is authority for the statement that there is a direct relation between the amount of rainfall in any locality and the formation of scale in boilers depending for their feed water upon rivers, ponds or wells affected by the rainfall. The example is cited that the unusual lack of rain during the past season in many sections of the country is a matter of note, and the reports turned in by boiler inspectors in regions so affected show that more than the usual amount of scale has been found.

The explanation is advanced that the larger deposits of scale are due to the increased hardness of the water after a long dry spell. In times of drought the water is drawn necessarily from the lower levels, in reaching which it has become impregnated with lime, magnesia and other soluble substances contained in the overlying strata. Periods of dry weather, therefore, call for more frequent examination and cleaning of boilers than is necessary at other times.

IMPROVED EXPANSION JOINT.

The expansion joint for steam pipes, shown in the accompanying illustrations, designed to admit of all-round play as well as of a sliding movement was recently described by Engineering of Lon-



don. The assembled joint is shown in section in Fig. 1, from which it will be noted that the packing consists of a single ring of metal covered with asbestos; this is arranged in a conical box so that the steam itself does the setting up. Of course more than one packing

ring may be used if necessary. Fig. 2 shows the joint dismantled for repacking. This type of joint is reported as being in successful use on ships where boiler pressures up to 220 lb. are carried with only one packing ring.

EFFICIENCY TEST OF 125-H. P. GAS ENGINE.

At the recent meeting of the American Society of Mechanical Engineers, Mr. C. H. Robertson, of Purdue University, presented a paper giving the results of a test made upon a 125-h. p. Westinghouse gas engine in the plant of the Merchants' Electric Lighting Co., LaFayette, Ind. The engine tested is of the 3-cylinder Westinghouse type, using natural gas as fuel, running at about 270 r. p. m. and belted to a 60-kw. two-phase alternator of 2,000 volts with 60 cycles; the engine is one of the first lot of five of this type turned out for commercial service by the makers. The test was from 7:05 p. m., March 22d to 12:05 a. m., March 23d, one engine carrying the entire load of the station.

We reproduce herewith the graphical log of the test, together with other diagrams and portions of the paper explaining them. The heating value of 1 cu. ft. of "standard" natural gas is taken as 1,000 B. t. u. By "standard" is meant at a temperature of 62° F. and atmospheric pressure.

The distribution of the heat during each hour of the test was as follows:

Hour.	Heat Supplied, B. t. u.	Converted into work indicated, per cent.	Absorbed by jacket, per cent.	In exhaust, per cent.	Heat per i. h. p. per minute, B. t. u.
1 st	1,574,200	17.9	25.2	56.9	237.5
2 d	1,674,880	16.3	21.1	62.8	244.7
3 d	1,169,000	20.7	30.2	48.9	244.2
4 th	1,096,600	20.2	36.9	42.7	211.1
5 th	828,000	16.0	30.4	43.9	259.3

The author states that the whole sequence of events, from the gas meter to the engine and generator in a plant like this, follow each other so rapidly that it is entirely possible to run a satisfactory and reliable test of but a few minutes' duration. With this point in

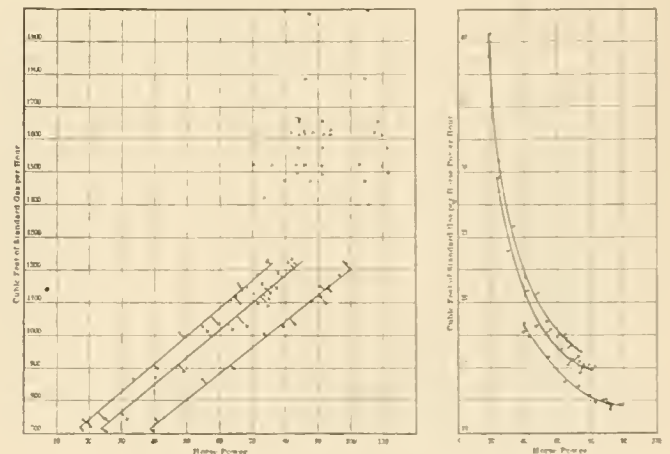


FIG. 1.

FIG. 2.

mind, the whole collection of data (consisting of five hours of five-minute observations) was divided up into a series of tests of ten minutes' duration, in each of which an observation was had at the

beginning, in the middle, and at the end of the ten-minute period under consideration.

The best performance, in cubic feet of standard gas, occurs at 10:00, and is per indicated horse-power-hour, 11.87; per brake horse-power-hour, 14.71; per electrical horse-power-hour, 16.52. The highest consumption (under a mixture of 1:12) comes at 11:50, and is per indicated horse-power-hour, 18.42; per brake horse-power-hour, 29.65; per electrical horse-power-hour, 40.59. By plotting the total gas per hour against the different horse-powers (Fig. 1), a very interesting law seems apparent. It is nothing more nor less than the parallel of the well-known Willans law for steam engines, namely, that the total steam per hour plotted against the indicated horse-power is a straight line. This has been stated to be true for at least one type of the steam turbine as well. (Trans. A. S. M. E., vol. xvii, "Tests of a 10-h. p. Steam Turbine.")

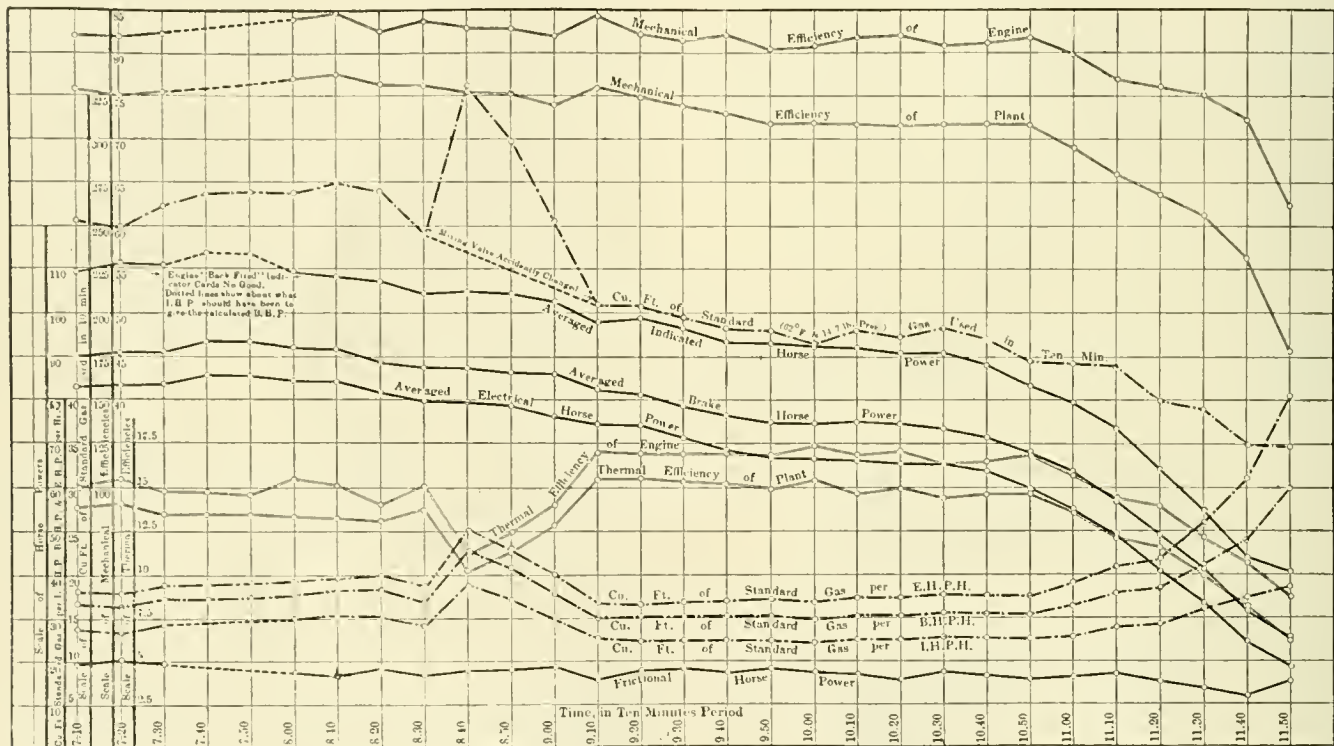
Referring to Fig. 1, the solid circles show the relation between total gas per hour and the indicated horse-power. The points up to 100 horse-power fall within a reasonable distance of the straight line drawn to represent their average. There are, beside these, two points near the top of the sheet, which should not be considered in drawing the line, because they came from that part of the

figure show gas consumption per brake horse-power-hour and per electrical horse-power-hour.

In conclusion, the author gives the following miscellaneous notes:

It should be borne in mind in considering the data here presented that engine No. 1 was the first of this make and size installed for commercial service in this country, and that engine No. 2 (the one tested) was of the same lot of five engines, and was put in a short time after No. 1. Since they were installed, gas enginery has made a considerable advance, and the performance of this machine is probably not as good as an up-to-date engine would give. It is expected that the engine will be thoroughly overhauled and brought up to date during the coming winter. In case this is done, another test will be run in the spring, whence will be possible some interesting comparisons.

Chief among the changes expected to give greater economy will be the substitution of solid oil in the crank case instead of oil and water, as at present. It is stated on good authority that the presence of water in the oil when exposed to the conditions met with in the cylinder, very much injures its lubricating effect, whence comes rapid wear of cylinders and bearings and, consequently, low mechanical efficiency. Care must be exercised in the amount of oil



GRAPHICAL LOG OF TESTS OF 125-H. P. GAS ENGINE.

test (between 8:30 and 9:10) when the mixing valve was accidentally changed. Between these two points and the upper end of the straight line is another group, made up of a considerable number of points, which, without exception, are from the observation taken before 9:15, when the ratio of mixture was 1:11, which, consequently, are not comparable with those points where the mixture was 1:12. The crosses represent the same relation for the brake horse-power, while the hollow circles are the points for the gas per hour against electrical horse-power; and the same general observation may be made for these as for the indicated horse-power line. Three quite important conclusions seem to be warranted by this comparison:

1. That the proportion of gas to air is a very important factor in fuel economy.
2. That one test at a light and one test at a heavy load would serve to locate the line, from which a quite approximate prediction could be made of the gas consumption under intermediate loads.
3. That these considerations hold for the fuel consumption per brake horse-power-hour and per electrical horse-power-hour.

By Fig. 2 is shown the relation between standard gas per indicated horse-power-hour and the indicated horse-power based upon observations when the mixture was 1:12. The other curves on this

permitted in the crank case, lest so much reach the cylinders as to carry flame over an exhaust stroke and ignite the next succeeding charge and with it the mixture in the distribution pipe. Any considerable amount of this "back firing" has a very detrimental effect on the engine in general, and seriously interferes with good governing. Back firing may also be caused by a leaky admission valve or a leak in the caging on which the admission valve is seated.

Cases have been reported where engines are running on gasoline in which a coating of burnt oil has collected on the end of the piston. This, it is thought, may come to high enough a temperature to ignite the incoming charge. At any rate, the "back firing" ceased with its removal.

The red glow of the exhaust pipe at night, or the red-hot condition of the copper ball used in determining the exhaust temperature, bore convincing evidence of the high temperature within the cylinder. This high temperature gives some trouble with the exhaust valves, making it necessary to watch them quite closely lest a little leak soon burns out into a hole of considerable dimension. This intense heat sometimes has caused the breaking off of the exhaust-valve stem. The use of more metal in the valves has practically ended these troubles.

In a gas-engine plant the certainty of action depends upon a

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH. 1899.	Monthly Output, Kilowatt- Hours.	Cost of Electrical Output per Kilowatt- Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricat- ing Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k.w.h.	Price of Fuel per Ton of 2,000 Lbs.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re- pairs.	Total.						
1.....	Sept.	1,410,678	.263	.175	.042	.032	.039	.551	4.07	1.47	11.88	2.51	\$2.10	Bituminous
5. Metropolitan Ele- vated, Chicago....	"	1,349,948	.396	.187	.023	.033	.046	.685	2.9	2.4	7.35	4.61	1.72	"
6.....	"	603,868	.608	.235	.041	...	.147	1.031	...	...	...	2.32	.8101**	Oil
8.....	"	815,950	.646	.264	.026	.051	.013	.999	...	...	...	...	...	Bituminous
9.....	"	701,305	.420	.215	.017	.042	.028	.722	...	...	...	...	...	"
10 Central Ave. Sta- tion, Metropolitan St. Ry., Kansas City, Mo.....	"	.....	...	...	.....	...	...	.....	...	...	...	...	...	"

**Cost of Oil per Barrel.

number of details such as quality and time of ignition, proper compression, right proportion of gas to air, control of cylinder temperatures, etc. Any one of these defective to any considerable degree is quite sure to stop or prevent the starting of the engine. In one of the preliminary tests on this engine an observer accidentally struck one of the incandescence lamps in the igniting circuit. The lamp was apparently uninjured, but the engine at once slowed down. An examination of the lamp showed that just the tip end of the bulb had been broken off, thus destroying the vacuum within and, consequently, the igniting circuit.

On another occasion sand was deposited in the jacket from the cooling water, making it impossible to cool the cylinder properly. The result was that the heat of compression furnished a high enough temperature to ignite the charge, and the engine was run for some time without the igniters in operation.

At various times the gas supply for the city has been shut off. Under such circumstances the engine (acting as a pump) has continued to draw gas from the mains, and to run through such shut-offs of thirty minutes' duration.

Soon after the gasoline vapor generator was installed, artificial gas was piped to the plant, and proved so much more convenient for emergency runs that the vapor generator was not used, and at the present writing has been removed.

In the warm months of summer some trouble has been experienced in cooling the jacket water in the cooling tower. As a result, a motor and pump was installed at the river bank some distance away, and the jacket water secured from that source. As soon as the warm months are over the cooling tower is used again. When the engine was first installed, cast steel gears were used which, on giving trouble, were replaced by steel cut gears. This change has ended the trouble from that source.

Natural gas is sold to the company by meter at the rate of \$.07 per 1,000 cu. ft.

GOOD ADVICE.

Before a recent meeting of the Ohio Electric Light Association of Cleveland, Mr. Geo. Hayler, jr., read a paper on "Some Suggestions to the Managers of Small Electric Light Central Stations," in the course of which occurred the following paragraph which is equally applicable to small street railway plants.

"It is a mistake to suppose that anyone who is familiar with steam machinery will be the man to operate an electric plant. It is hard to teach an old dog new tricks, and it will probably cost you more to teach an erstwhile engineer of a threshing machine or a sawmill how not to do things, than it would be to take a green man and teach him how things ought to be done. Don't make the mistake of employing one of those men who know it all and who has had his pockets full of credentials from plants where he has been employed. A letter of recommendation is often a mighty cheap price to pay for the privilege of dispensing with a man's services. Shun, also, as you would the Old Nick himself, the man who is continually and eternally skipping around with a monkey wrench in one hand and an oil can in the other, adjusting everything in sight. He will make you nervous, and eventually cause

you more trouble and expense than a man who sits down and deliberately neglects things until they will run no longer. Get good, sober, cool, reliable men, and then keep them; and if you can't find the men you want, get some good, young raw material and make them. It will take time and patience, and you will get your hands dirty, but in the end you will have men whose reliability, carefulness and loyalty will pay you a thousand times over for the time and patience spent in developing them."

TEST OF THE CAPITAL TRACTION POWER HOUSE, WASHINGTON.

The power plant of the Capital Traction Co., of Washington, D. C., which was built to replace that destroyed by fire in September, 1897, was recently tested by Messrs. William R. Miller, Nelson E. Otterson, Frank H. Eastman and H. Worthington Talbot and the results presented in their graduation theses at Cornell University.

The main equipment of this station comprises eight 350-h. p. Babcock & Wilcox boilers arranged in batteries of two, and fitted with Roney stokers, and five units in the engine room, each consisting of an 800-h. p. Reynolds-Corliss tandem compound engine, with cylinders 20 and 40 by 48 in. direct connected to a General Electric generator. Hartwell horizontal, exhaust feed heaters and Dean jet condensers are used.

The test was to find the efficiency of the main plant under ordinary working conditions during the whole 24 hours. The first of the main units is started at 5 a. m. and the last one shut down at 1:30 a. m.; the variation is of course great between these hours, the maximum loads occurring between 8 and 9:30 a. m. and 4:30 and 6 p. m.

The coal used during the test contained 2.16 per cent moisture, 16.85 per cent volatile matter, 72.23 per cent fixed carbon and 8.76 per cent ash; the heating value per pound was 14,708 B. t. u. and per pound of combustible 16,511 B. t. u.

Data from the test are as follows:

Dry coal per sq. ft. of grate per hour.....	11.4 lb.
Actual evaporation per lb. coal.....	10.44 lb.
Equivalent evaporation per lb. coal.....	12.37 lb.
Average horse power per boiler.....	218.8
Water per i. h. p. per hour.....	22.78 lb.
Coal per i. h. p. per hour.....	2.18 lb.
Coal per e. h. p. per hour.....	2.21 lb.
Cost of coal per i. h. p. hour.....	.204 cent.
Cost of coal per e. h. p. hour.....	.207 cent.

The Toledo Traction Co. has closed a contract with the E. P. Allis Co. for a 2,800-h. p. engine and with the General Electric Co. for a generator of the same capacity. These machines will be delivered next winter by which time the Traction company will have further increased the capacity of its power house by extending the addition built last year.

The Sioux City (Ia.) Traction Co. is installing a 600-h. p. engine and generator unit in its power house.

Power Plant Piping and Accessories.

BY WILLIAM D. ENNIS, M. E.

PART I.

The cost of the piping in a power plant is apt to be underestimated by a prospective investor. The piping contract is often as large an item as the boilers, and in some cases is greater than the amount paid for the engines to which it is auxiliary. Proper design and construction in this direction are, therefore, entitled to consideration, and from an engineering standpoint, as well as from that view which is purely commercial, there is no part of a plant of greater interest than that of steam and water connections and auxiliaries.

In five electric or power plants recently installed the relative costs of the three items mentioned were as follows:

Reference No.	Character of Plant.	Boilers.	Engines.	Generators	Piping.
A	Simple Condensing.	\$2,650	\$4,360	\$8,230	\$3,235
B	Comp. "	2,897	6,150	7,585	3,987
C	" "	2,200	5,300	7,010	4,140
D	" "	2,140	3,860	...	2,575
E	" "	3,397	4,268	5,135†	3,239

*Trans. A. S. M. E., decci.

†Switchboard included.

*Not the entire cost, as some of the exhaust connections were included in another contract.

It is difficult to base reliable comparisons on such data as these, for the reason that the "piping contract" does not in every case embody the same portions of a plant. In A, for instance, feed pumps, but not condensers, were included; in C both pumps and condensers were covered in the contract price; in D neither are included. Separators and heaters are included in each of the five cases, and in B, C, D and E, covering the pipes with heat insulating material as well. It should be noted that the "cost" of the piping includes erection, while the other apparatus is usually purchased f. o. b., excepting that expert superintendence is furnished.

Two general tendencies prevail at the present time among engineers, in drawing up specifications for pipe work. One is to leave as little as possible of the auxiliary apparatus in the hands of the steam fitter, excepting that he may be called upon to set it on its foundations. The other practice is radically different. The piping contractor is required to furnish practically all of the steam plant, engines and boilers excepted; and instances are known in which not only the piping and condensing apparatus, but also the stack, flue, blower, blower engine and the completion of a build-

items in the construction of a plant, it is natural that they, as well as their clients and those engineers whose work lies in this direction, should appreciate the importance of a thorough understanding of the details of design and erection in their work.

Piping is expensive, and from all points of view the first essential in any system of piping is careful and intelligent design. There is no more delicate and difficult problem to solve in the entire planning of a power station, than the arrangement of pipe, with the separators, condensers and heating apparatus to secure economy, flexibility, durability and convenience. No part of a plant can give more trouble than badly planned piping. Engines may be in duplicate, boilers are seldom worked to their full capacity, and when trouble comes there is a reserve to fall back upon; but, in this country at least, where duplicate-piped plants are rare, a single break or failure in the steam main or connections may close an entire mill for days. Mr. Bryan errs, if at all, on the side of moderation, when he says (Trans. A. S. M. E., decci), "The general arrangement of this work (piping) and the selection of proper apparatus, demand the most careful study."

The substance of the above is well stated by Mr. E. A. Darling in his paper in the power plant of Columbia University. (Trans. A. S. M. E., deccxxii):

"Simplicity, brevity and elasticity are of the very essence of good practice in this line, and we believe that these ends should be sought before all others in laying down a plant. It is better to make the engines and boilers fit the piping than to go the other way about it. An unnecessary turn or length of pipe occasions a never-ceasing waste from friction and radiation."

Mr. Darling goes on to enunciate the following maxims in piping design, considering a pipe system as "just so much machinery":

"Put it up so that it may adjust itself freely under the strains imposed by expansion and contraction.

"Consider the human element involved in its operation, by setting all valves where they can be easily and quickly handled without making undue calls on the heroism of the engine-room force in case of an emergency.

"Put the piping together in the way you would any other machinery, with bolted joints that can be easily made and unmade without destroying or damaging either pipe or fittings.

"Provide especially for free straight passages with exhaust steam and water pipes, on account of the less energy which they possess to overcome obstacles, as compared with live steam."

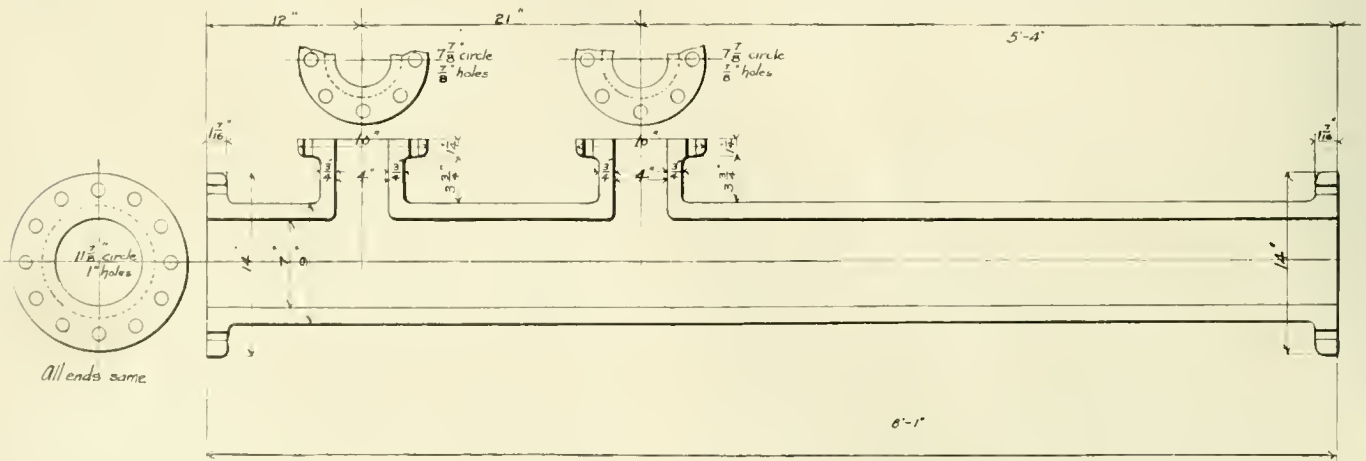


FIG. 6.—HEADER DESIGNED FOR A STREET RAILWAY

ing that had been partially erected by day work in charge of the owner, were merged into one contract with a firm of steam fitters.

Such work demands more engineering ability than the old time steam heating contractors manifested, and as more responsibility has been involved in pipe work, firms of general steam contractors have come into existence. With full charge of one of the largest

To these rules additional maxims might be laid down, such as the following:

a. Provide intelligently for the disposition of condensation, relying as little as possible on special devices, which in the case of live steam, should be used rather as safety apparatus than as ordinary necessities.

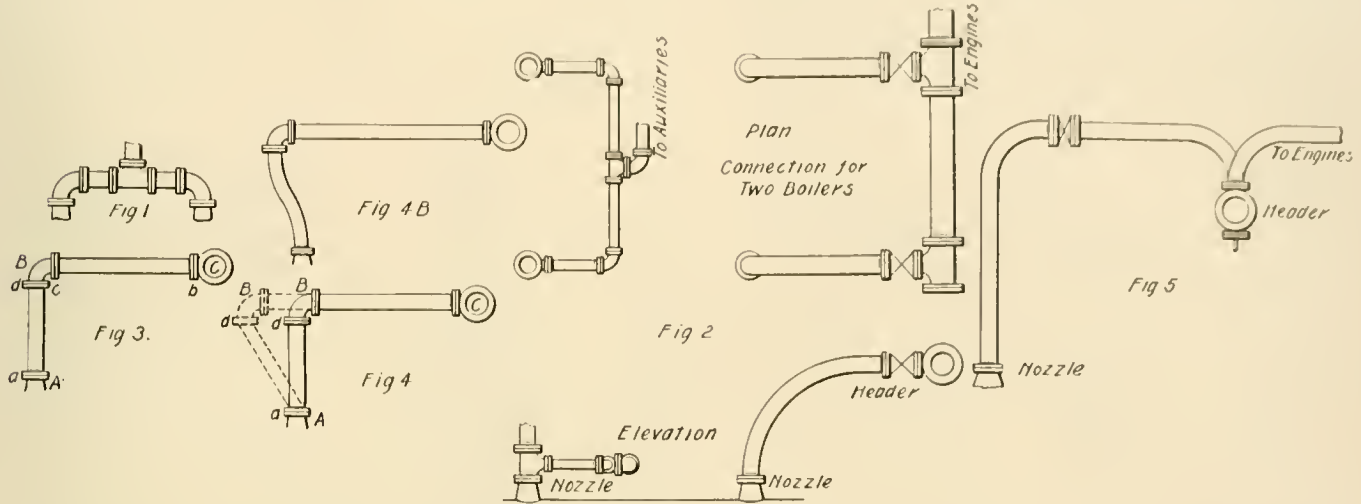
b. Make the losses due to condensation and friction as small as possible by computing from both standpoints the advantageous sizes of pipes to use.

c. Construct the system so as to be self-resisting and self-adjusting against vibratory strains due to the motion of steam and machinery, depending on hangers, brackets and supports only where their purpose cannot be fulfilled by the elements of the system themselves.

d. Obey everywhere the inviolable law of expansion. As an engineer remarked, the two leading characteristics of pipe are its expensiveness and its expansiveness.

which the main steam pipe may run. Horizontal water tube boilers have one or two nozzles. A common method of connecting the latter type of steam generator to the main pipe is that shown in Fig. 1, in which the boiler has two longitudinal drums with a nozzle in each. Two-nozzle fire tube boilers furnishing steam to the main at either end have the safety valve attached to the free nozzle. It is customary to extend a pipe the size of the nozzle upward some six feet from the (pop) valve outlet, and to drip the exhaust head thus formed. Boilers are occasionally built with four nozzles; two for steam connections and two for pop and lever safety valves.

The choice as to which nozzle shall be used for the main steam



Many other more or less familiar precepts might be enjoined at this point in connection with the engineering features of an efficient pipe system. It will be of greater value, however, to consider first the elements which enter into such a system, treating in this connection the principles which may be induced as applicable to an entire plant, made up of combinations of those elements.

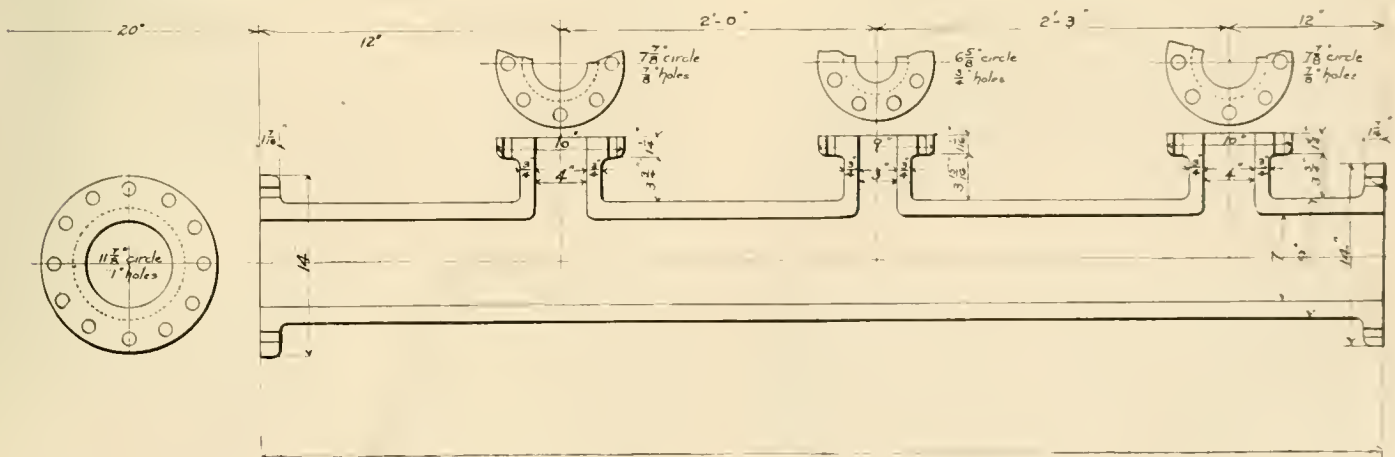
THE PIPING SYSTEM CONSIDERED IN ITS PARTS.

Adopting the foregoing characterization of a piping system as "so much machinery," there are certain principles governing its design and construction and, so to speak, its operation, apart from the properties and qualities of the elements of which it is composed. Some of these principles have been briefly mentioned, and we have now to consider the theories involved and their practical consequences.

In a steam plant, there are several distinct piping systems serving particular purposes and co-ordinating toward a definite object

connection is usually made with regard to the position of the engines. It is best, of course, to have all steam lines as short as possible, to avoid radiation and condensation. Sometimes the main steam is taken from one nozzle and the auxiliaries from the other. A plant where this system was adapted is shown in Fig. 2.

Starting from the main steam nozzle, the most important line of pipe in the plant runs in as direct a manner as possible to the engine. But in the case of steam, at least, it fails to be true that a straight line is the shortest distance between two points. The pipe should at first be run upward, making the header just below the highest point the steam reaches in its entire course. This run may be a piece of straight pipe terminating in an elbow, which in turn leads horizontally to the header (Fig. 3), from which steam is led to the engines, or it may be a bend like those shown in Fig. 2, which combine in one piece the two lengths of pipe and the elbow, avoid-



PLANT-CAST OF GUN IRON IN TWO PIECES.

—the economical transmission of the fluids used to and from their respective points of operation.

HIGH PRESSURE STEAM PIPES.

First is the main steam line and branches, carrying steam from the boilers to the engines, pumps, condensers, etc. Ordinary fire tube boilers are made with two nozzles, from either or both of

ing in this case two joints and consequent increased risk of leakage. The bend has other advantages. In Fig. 3, supposing the points C and A to be fixed, the four joints shown are subjected to a strain which forms one of the most important factors in all piping design. When high pressure steam is turned into these pipes an irresistible expansion takes place in both lengths, the amount of

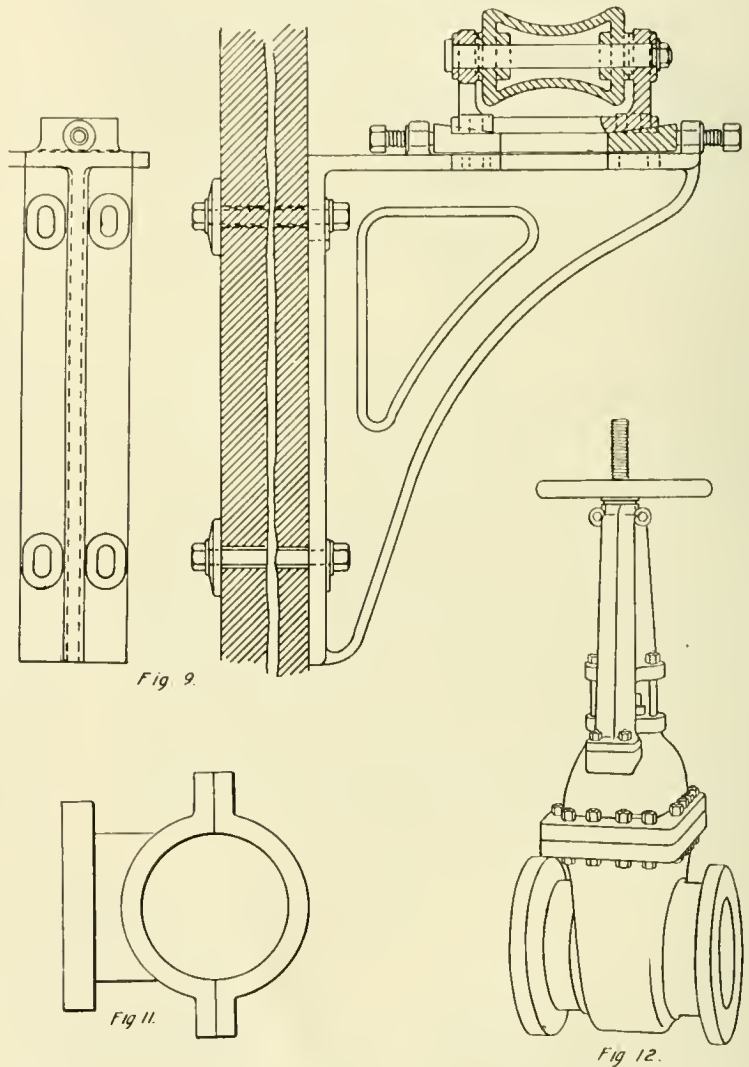
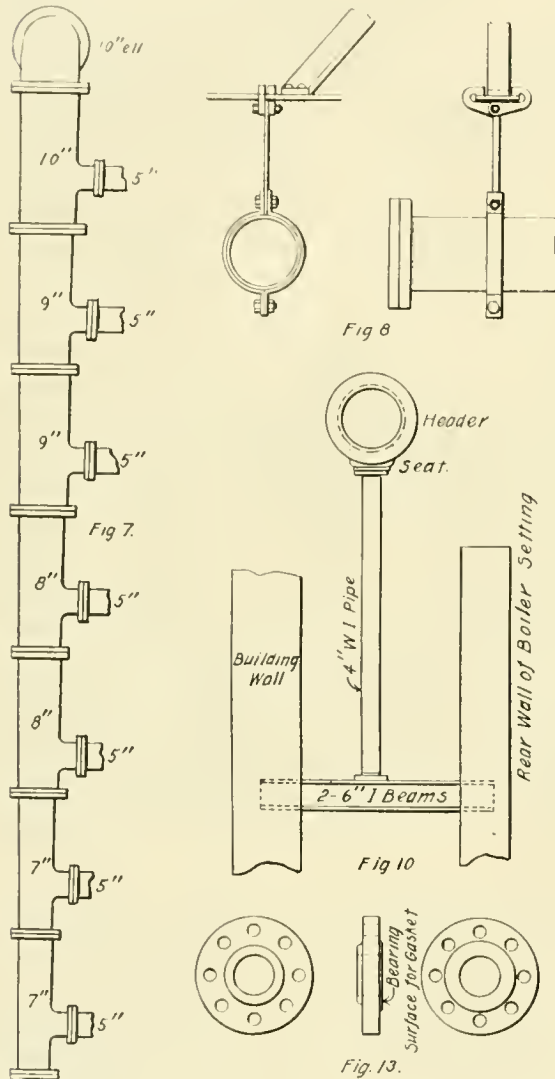
expansion depending upon the pressure (and temperature) of the steam. If the horizontal pipe is 6 ft. long, and the temperature at which the joints were made tight is 70° F., the increase in length at a pressure of 150 lb. is over $\frac{1}{8}$ in. This increase tends to throw back the elbow and the upper end of the vertical pipe, as shown in Fig. 4, and if the flange, A, remains rigid one of the joints, a or d, is sure to be impaired.

This effect is counteracted to some extent, though not perfectly, by the elasticity of the vertical pipe, which may take the shape shown in Fig. 4B. There is, even in this case, however, a destructive strain on the two joints. A bend, such as is shown in Fig. 2, simply a piece of ordinary pipe formed on rolls to the required radius, possesses a shape better adapted to withstand expansive and distortive strains, and is almost universally used for high pressure piping of large size in this part of the plant.

the latter be used the thickness should be liberal, and all corners should have large fillets, not less than 2 in. radius.

A cast-metal header of this kind is shown in Fig. 7. This was made up with the thickness $\frac{3}{4}$ in. for the section, 7 in. inside diameter; $\frac{7}{8}$ in. for the 8 in.; $\frac{7}{8}$ in. for the 9 in., and 1 in. for the 10 in. sections.

It was designed for a working pressure of 160 lb. The construction is open to criticism, because of the absence of any main valve in the header, but as steam for the engines was taken from the end of the run instead of midway along the boiler line, this objection is of less force than it otherwise would be. The complete set of castings cost \$275. Their equivalent in standard wrought pipe and heavy cast iron fittings would have cost \$185. The expense of making up and erecting the wrought iron header would have been somewhat greater than that of the cast iron.



Bends are sometimes made of copper, in rare instances of brass, but this latter practice is not to be recommended in any case. Copper bends should be made with brass or copper flanges and the ends of the pipe should be brazed into the flange, then peened over and faced. Even with this form of construction, there are several objections to the use of copper bends. They are expensive, as compared with iron. It is impossible to judge on inspection, whether the brazed joint has been properly made or not. A method of connecting mains to a header, which in the writer's opinion, is the best practiced, is shown in Fig. 5. With a system of this kind, a steam separator becomes almost superfluous. It requires considerable head room, however, and for pressures above 135 lb. the large number of joints necessary forms a drawback.

The main steam header, into which the boiler mains run and from which the supply is furnished to the engines, is made usually of wrought iron pipe or of a good quality of gray iron casting. If

Another form of cast iron metal header is shown in Fig. 6. This was cast of gun iron, in two pieces, the shell being 1 in. thick, and cost \$75. The working pressure was 140 lb.

The material and dimensions of the header being fixed, the next question is that of support. Where there is a trussed roof overhead, the common method is to hang the pipe from the trusses in some such manner as is shown in Fig. 8.

If the header is close to a stout wall, it may rest on brackets, one form of which is shown in Fig. 9. These should be made adjustable in every direction, and should be bolted clear through the wall, the bolt heads or nuts resting on plates or very large washers. A third method of supporting a header is shown in Fig. 10.

When the boiler plant consists of a large number of units, and the header is of any considerable length, it should be anchored at some point, to divide the expansion. This may be done by fixing strong clamps upon the pipe and guying them to the roof trusses

or walls. The best form of anchor is one bolted direct to the wall or floor, such as that shown in Fig 11.

The main supply from the header to the engines should be taken from the side, end, or (preferably) from the top of the header, and should be made up of pipe bends in preference to straight pipe and cast fittings. It is usually necessary to support this line of pipe from above, and provision should be made for tightening the hangers.

The pipe used for high pressure steam (100 lb. and above) should be of full standard weight, and the fittings should be of the "extra heavy" pattern. Valves should also be "extra heavy." These three grades of material are suitable for any pressure up to 140 lb., excepting in cases where the vibration is excessive. "Extra heavy" stock is built for a working pressure up to 200 lb. The standard weight pipes should never be used for pressures above 150 lb. per sq. in. Pipes larger than 3 in. are usually put together with flanges and flange fittings, those smaller than that size with unions or union flanges and screwed fittings. Valves for high pressure pipes, especially the larger sizes, should be of the "outside screw" type, which can be repacked under pressure. (Fig. 12) Valves larger than 7 in. should have a bypass in order to admit of a gradually opening passage for the steam. It is customary when valves are some distance above the floor, to set them with their spindles horizontal, and to provide a sprocket wheel and chain so that they can be operated from the floor.

Flanged joints on high pressure steam pipes should be made with corrugated copper gaskets, and the flanges should be screwed to bottom on the pipe thread, then faced off square with the axis of the pipe. The bolt holes on flanges are drilled 1-16 in. larger than the diameter of the bolts, and the gaskets should be cut so as to bear from the inside of the pipe to the inside of the bolt holes. The best form of flange for this purpose is shown in Fig. 13, a projecting ring of sufficient area being left on the inside of the bolt circle of the flange. This, when faced with the pipe on centers, forms the bearing surface for the gasket.

All high pressure pipe and fittings should be covered with a good non-conductor, and where the best economy is desired, valves and pipe flanges should also be covered. It is sometimes claimed that flanges should be left exposed in order that ready access may be had in case of leakage, but the sectional coverings now in use are readily removed, and the sharp corners of flanges present an outlet for thermal units that ought not to be neglected.

In determining the sizes of steam pipes it is customary to allow a velocity for live steam of 6,000 ft. per minute. Having determined the steam pressure and the number of pounds of steam required to flow through given pipes in that time, the volume of steam corresponding to the required weight can be found from the steam table, and this divided by the permissible velocity gives the area of the pipe required. The nearest commercial size of pipe to this should be chosen. A smaller size throttles the steam and diminishes the pressure at the outlet, and a larger size results in increased radiation and loss.

CARRIED A BAG OF DYNAMITE.

An Italian employed to do blasting, boarded a trolley car of the Union Railway Co., of New York City, recently, bound for Mount Vernon. He had a large feed bag, which he held in his lap until he reached Mount Vernon, where he went into the crowded waiting-room and dropped it carelessly on the floor.

A patrolman seeing the Italian get off the car and thinking that he might be one of the lead pipe thieves who have been at work in Westchester County, tapped the bag to see what it contained. There was a suspicious rattle and as the man appeared to be badly frightened the officer arrested him and took him to the police station, where it was found the bag held nearly 75 lb. of dynamite with caps and other explosives. The Italian was fined \$100 or 100 days in jail for carrying dangerous chemicals in the public streets.

Boston has again taken the lead in religious affairs. Two motor-men in the employ of the Boston Elevated R. R. have been suspended from the congregation of the Broadway Tabernacle church of that city for running their cars on Sunday. When the young men got their jobs they were warned by the pastor not to work on Sunday.

UNITED KINGDOM ELECTRIC TRAMWAY STATISTICS.

From the list of "Electric Tramways and Railways in the United Kingdom," now in operation, under construction, or for which the contracts are let, published by the Electrical Review, London, under date of Dec. 1, 1899, the following data are taken:

The overhead trolley lines owned by municipal corporations are located as follows: Aberdeen, 2 $\frac{1}{4}$ miles double, $\frac{1}{4}$ mile single; Blackburn, 4 miles; Blackpool, 11 $\frac{1}{2}$ miles single track running and arranged for; Bolton, 31 miles single; Bradford, 5 miles; Darwen, 2.84 miles double; Dover, 3 miles single, 1 $\frac{1}{2}$ miles double; Dundee, 3 $\frac{1}{2}$ miles double; East Ham, 1 $\frac{1}{2}$ miles double, 2 $\frac{1}{4}$ miles single; Glasgow, 3 $\frac{1}{4}$ miles double running, 1 $\frac{3}{4}$ miles double ready, 35 miles double under construction, 19 miles double to be constructed; Halifax, 11 $\frac{1}{4}$ miles, 24 miles under construction; Hull, 9 miles double, 1 mile single; Leeds, 7 miles double running, 22 miles under construction, 36 miles projected; Liverpool, 20.6 miles; Manchester; Nottingham, 14 $\frac{1}{4}$ miles double, 4 miles single; Oldham, 25 miles; Plymouth, 3.1 miles single working, 2.7 miles to be equipped; St. Helen (Lancashire), 6 miles running, 13 miles building; Salford, 40 miles single; Sheffield, 2 miles single, 9 miles double; Southampton, 7 miles single; Southport, 3 2-3 miles single, 1 mile double; Sunderland, 13 $\frac{1}{2}$ miles single.

The overhead trolley lines owned by companies or individuals are located as follows: Blackpool and Fleetwood, 6 $\frac{1}{2}$ miles enclosed road, 2 miles tramway; Brighton and Rottingdean, 3 miles; Bristol, 8 $\frac{1}{2}$ miles; Carlisle, 7 $\frac{1}{4}$ miles; Cork, 5 miles double, 2 miles single; Coventry, 5 $\frac{1}{2}$ miles double, 5 miles single; Devonport, 4 $\frac{1}{2}$ miles double, $\frac{1}{8}$ mile single; Dublin and District, 39 miles, mostly double; Dublin and Lucan, 6 $\frac{1}{4}$ miles single, $\frac{1}{2}$ mile double; Dudley, 5 $\frac{1}{2}$ miles; Giant's Causeway, Port Rush & Bush Valley, 8 $\frac{1}{2}$ miles single; Hartlepool, 4 $\frac{1}{2}$ miles single; Isle of Man (three lines each with one accumulator sub-station), 46 miles single; Kidderminster & Stourport, 4 $\frac{1}{2}$ miles; London, 20 miles; Middlesbrough, Stockton and Thornaby, 15 miles; Norwich, 13 miles single, 3 miles double; Oldham, Ashton and Hyde, 8 miles; Potteries (North Staffordshire), 33 miles; South Staffordshire, 8 miles; Swansea, 3 miles single, 2 $\frac{1}{2}$ miles double.

The only accumulator line is owned by the City of Birmingham Tramways Co., and comprises 3 miles of double track.

The "electric railways" in the United Kingdom comprise: Bessbrook & Newry Tramway, 3 miles double track, third rail system; Brighton, 1 mile single track owned by Magnus Volk, third rail; Herne Bay Pier Electric Ry., $\frac{3}{4}$ miles; Liverpool Overhead Electric Ry., 6 $\frac{1}{2}$ miles double track; Ryde Pier Electric Ry., $\frac{1}{2}$ mile, third rail; Southend-on-Sea Pier Electric Ry., 1 $\frac{1}{4}$ miles, third rail, owned by town council; Walton-on-the-Naze Pier Electric Ry., $\frac{1}{2}$ mile; and the following underground roads in London:

Baker Street & Waterloo Electric Ry., 3 $\frac{2}{3}$ miles, to be completed in about three years.

Central London Ry., 13 miles, nearing completion.

City & South London Electric Ry., twin tunnels, 3 $\frac{1}{2}$ miles.

Great Northern & City Electric Ry., to be completed June, 1902.

Metropolitan Underground Ry., experimental section equipped for electricity by the Metropolitan and the Metropolitan District Railway companies.

Waterloo & City Electric Ry., line opened August, 1868.

CONTRACTS LET AT BAY CITY.

Mr. E. S. Dimmock, general manager of the Bay Cities Consolidated Railway Co., of Bay City, Mich., writes us that his company has given out contracts for the construction of a new power house that it is believed will be one of the most attractive and economical stations in that part of the country. Arbuckle Ryan Co. will have general charge of construction work, and J. J. Thorne, of Bay City, will supply the switchboard; the Stirling Co., of Chicago, the boilers; Russell & Co., of Massillon, O., the engines, and the Westinghouse Co. the dynamos, which will be of 550 kw. capacity.

The power station will be 115 x 75 ft., built of pressed brick and finished on the inside in cream enamel brick. Mechanical draft, with blower attachment, will be employed, doing away with the necessity of erecting a stack. The plant is to be in operation by May 15 or June 1, 1900.

BUCKLAND PAVING BLOCK.

In our issue of October, 1899, page 725, we illustrated the Buckland paving block, which is the invention of S. J. Buckland, of Springfield, Mass., and was laid as an experiment on about 2,000 ft. of double track of the Springfield Street Ry. in the late fall of 1898. The block is of cast iron, 12 in. long, with a V-shaped slot in one edge, and when slipped over the inner flange of a tram head transforms it so far as the exposed surface is concerned into a full groove rail.

The result of this experiment is referred to in the report of the city engineer, Charles M. Slocum, for 1899, from which we take the following extracts:

"The use of the tram head girder rail on Dwight and lower Main Sts. as laid in 1866 and the roadway paved with vitrified brick has been a source of much dissatisfaction; complaints have been



LAYING BUCKLAND PAVING BLOCKS.

constant as to the discomfort and danger attending the use of these streets, owing to the form of rail head and the manner of paving between rails of each track, the paving inside of each track being an inch or more lower than outside.

"The Buckland device (designed to remedy this objection) has now withstood the action of the traffic for more than a year and shows no defect whatever and is evidently in every way a most satisfactory device, affording the public all the advantages of a street having a full grooved rail. It can be used at a great money saving over and above what would be required to take up the pavement and substitute a new full grooved rail."

A contract has lately been made for the relaying of the pavements between car tracks in the same manner on Main St., between William and Marble Sts., as soon as settled weather in the spring time will permit.

NEW INTERURBAN AT DENVER, COL.

The Denver, Boulder & Northern Railway Co. has not as yet made formal application for a franchise from the city of Denver, but will undoubtedly do so within a short time. A party is now in the field, and an office force at work preparing plans and specifications. T. J. Milner, formerly chief engineer of the Denver Board of Public Works, is chief engineer for the road.

The plan is to connect Denver with the northern Colorado coal fields, which are distant about 15 miles from this city. The present railroad transportation charges are 80 cents per short ton, which, for a down-hill pull, is very profitable. There is also considerable traffic, passenger and otherwise, between Denver and Lafayette, Louisville, Boulder, Longmont and Fort Collins, which it is proposed to compete for. The main business, however, is expected to

come from the transportation of coal. The present retail price of coal in Denver of \$4.00 per ton, will undoubtedly be lowered to \$3.00.

The line is not intended in any way to compete with the system of the Denver City Tramway Co. and traffic arrangements may be made with that company to enter the city over its tracks by laying a third rail, the gage of the City Tramway tracks being 3 ft. 6 in., while the gage of the new road will be 4 ft. 8½ in. The rail will be the 75-lb. A. S. C. E. standard, and will be rolled by the Colorado Fuel & Iron Co. at Bessemer, Col.

In connection with the railway a large electric power plant will be erected at Lafayette or Louisville, in the center of the lignite coal district, 16 miles northwest of Denver. Current will be transmitted to Denver by means of the three phase system and supplied for lighting and power purposes.

The general manager of the road is E. L. Bevington.

REMOVING SNOW IN MONTREAL.

The question of removing snow is now under discussion at Montreal. Under its franchises the Montreal Street Railway Co. is required to keep its tracks free from ice and snow and the city may at its option remove all or a part of the snow and ice in the street from curb to curb and recover one-half of the cost from the company. In 1894 the company agreed to pay \$1,650 per mile of street per annum for five years in lieu of its half of the cost for removing snow. During the next five years this sum proved to be 58 per cent, 61 per cent, 72 per cent, 94 per cent and 50 per cent, respectively, of the total cost. In the five years the company paid over \$255,000 for this service, the amount being nearly \$59,000 more than one-half the total cost.

The five-year agreement having now expired, the Montreal Street Ry. makes the following proposition:

"First, to pay the city monthly one-half of the cost of removing snow from the streets from curb to curb, without prejudice to the city's rights to recover any greater sum in the courts, if it can establish its rights thereto; secondly, or the company is prepared to submit article 16 of the contract to the courts, as a special case for immediate decision, and to facilitate the immediate decision of the case in every way; thirdly, or the company is prepared to enter into a contract that the city shall do the removing of the snow, for a period of five years, and shall receive \$1,125 per mile of street per annum as the company's contribution, that being estimated as one-half of the cost, based upon the experience of the last five years, with a proviso that a special case may be submitted if the city so desire, or the city may take such legal proceedings as it likes to get an interpretation of the contract, and if the courts interpret the contract as compelling the company not only to clear the snow from its tracks, but also to remove itself the snow so cleared, the company will pay an additional sum so as to bring this contribution up to \$1,650 per mile."

This will serve to explain a resolution of the road committee of the city approving of a notarial protest being served on the company to prevent it using snow sweepers on its tracks.

TRAMWAY IN SIAM.

Mr. Hamilton King, U. S. consul-general at Bangkok, Siam, writes the State Department as follows concerning the Bangkok Tramway Co., of which W. F. Jacobson is manager:

"A private syndicate in 1887 obtained a concession for street railway lines in Bangkok. These were built for horse cars in 1889 and changed to an electric trolley system in 1892. This line is crowded with passengers all day long and pays 12 per cent on the investment. The rolling stock, machinery and wire for this road have all been bought in America; the rails in Europe.

"It is probable that this line will be extended in the near future, and that another similar system will be built."

ELECTRIC FREIGHT LINE AT TORONTO.

The question of whether street railways shall be permitted to carry freight is a live one in Canada, the attorney general having asked for an injunction to restrain the Metropolitan Railway Co., Toronto, Ont., from making connection with the Canadian Pacific R. R., and from carrying freight into the city.

TRAMWAY SYSTEM OF SHEFFIELD, ENG.

(From Our Own Correspondent.)

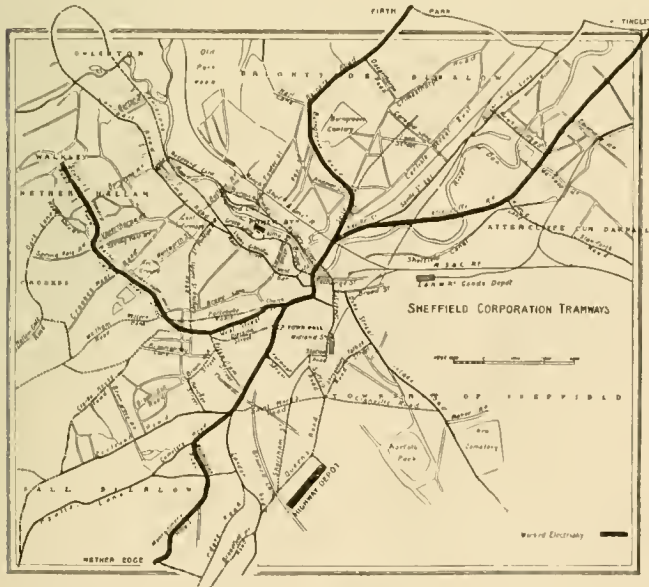
The world-famous cutlery producing city of Sheffield is now actively engaged in extending its tramway system and in adopting electrical power for traction. The lines were originally constructed by the municipality and leased to a company. The term expired in 1866, and the Town Council then began to operate the system. There were nine miles of double track worked by horses, and the corporation soon saw that in such an important town the system was capable of much development. The result of a delegation sent to inspect tramways in different parts of the country was a report strongly in favor of the overhead trolley system. Powers were obtained from Parliament to extend tramways to 36 miles—about three-fourths of which is to be double track—at an estimated cost of £600,000. When these extensions have been completed there will be about one mile of tramway to every ten miles of street in the city, and to every 10,000 of the population. The accompanying map shows the system clearly, but powers are now being sought for further extensions.

Some of the routes, especially those known as the Walkley, are very hilly, presenting gradients as steep as one in ten. A section is here given of the Walkley route, as it is believed to be one of the most severe not worked by cable traction in the United Kingdom.

Reconstruction was started in January last year on the Nether-edge & Tinsley route. Steel girder rails weighing 108 lb. per yd. supplied by the Barrow Hematite Steel Co. were laid, and the joints were made with fish-plates 3 ft. long and weighing 80 lb. per pair. The rails were laid direct on a concrete foundation after the usual British practice. The accompanying drawings show the very strong track construction which has been carried out. The paving for the most part is granite sets, and the laying of the permanent way was done by the corporations own workmen.

The first contract for the boilers, engines, dynamos, poles, cars, and electric cables was let to the British Thomson-Houston Co., the specifications and designs having been supplied by Mr. C. F. Wike, M. I. C. E., who also directed the permanent way construction. Both side and center poles are employed, and a good idea of the general appearance of the street design may be obtained from the photographic views here reproduced.

Other lines are now in hand, and the total length of the extensions so far constructed is equal to 24 miles of single track.



MAP OF THE SYSTEM.

The power station is situated on Kelham Island, and a continuous supply of condensing water is at hand. The contract for the building was let to Eshelby & Son, Sheffield, for £7,900. The building including boiler house, engine room and coal bunkers, is 183 ft. long by 109 ft. wide, and the general disposition of the machinery may be gathered from the plan and elevation here shown. The British Thomson-Houston Co. secured the first machinery con-

tract, including three boilers, engines and dynamos, pumps, condensers, switchboard, overhead crane, etc. The boilers are of marine type, 10 ft. x 10 ft., and the working steam pressure is 160 lb. The engines are tandem compound condensing corliss, made by the E. P. Allis Co., of Milwaukee. The cylinders are 12 in. and 22 in.



SHOWING OVERHEAD CONSTRUCTION.

diameter with a 30-in. stroke. The variation in speed allowed is 2 per cent. The flywheels are 12 ft. in diameter and weigh 15,000 lb. The generators are of the six-pole type of British Thomson-Houston Co., 225 kw. each.

Each car is provided with two G. E. 52 motors, wound for 500 volts, and the controllers are of the Thomson-Houston B. 13 type. The gear is so proportioned that with a 30-in. wheel each motor will



TYPE OF CAR.

develop a horizontal effort of 1,000 lb. at 8.4 miles per hour. The trolley arms and heads are of the swivelling type, so as to obviate the necessity of keeping the trolley wire over the center of the track. In many cases it is several feet away from the center.

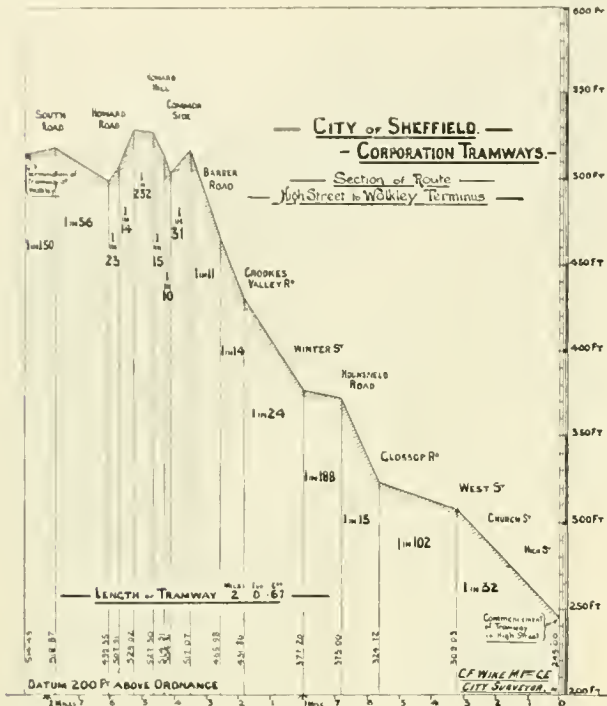
On account of the gradients the brake arrangements are of an unusually thorough nature. Beside the usual hand brake there is a trailing slipper brake, by means of which the weight of the car is

taken almost entirely off the wheels and transferred to the wooden brake blocks which slide along the rails. This brake is operated by turning a wheel immediately under the handle for the hand brake. There is also an electric brake operated by the same handle that starts and controls the motors. Trailing wedge blocks are a further provision. In addition to the above the driver can, in a case of great emergency, reverse his motors.

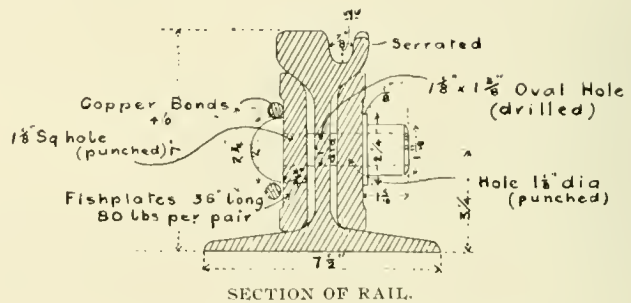
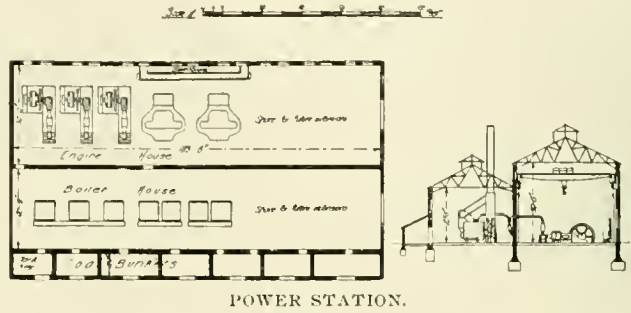
The cars already in use number 39, 25 being double-decked and 14 single decked. The total number of cars ordered up to the pres-

MAIL SERVICE IN SYRACUSE, N. Y.

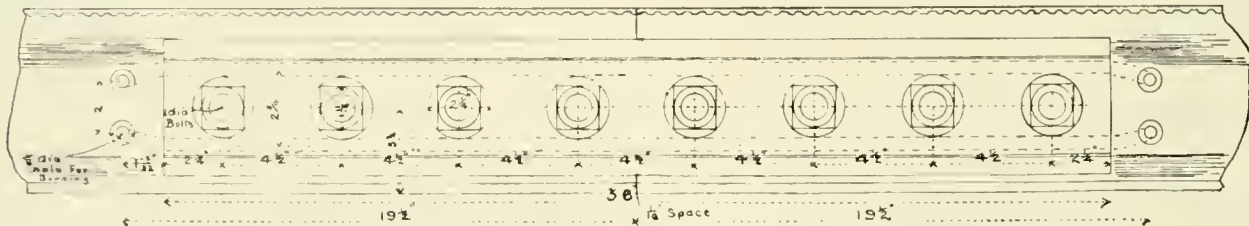
The Syracuse (N. Y.) Rapid Transit Railway Co. last year made 7,907.48 miles in carrying United States mail between Syracuse, East Onondaga, Onondaga Valley and Elmwood Park, receiving therefor \$250. A wagon route in Syracuse 1.27 miles long made 6,423.04 miles during the same period and for this service the contractor received \$1,795.



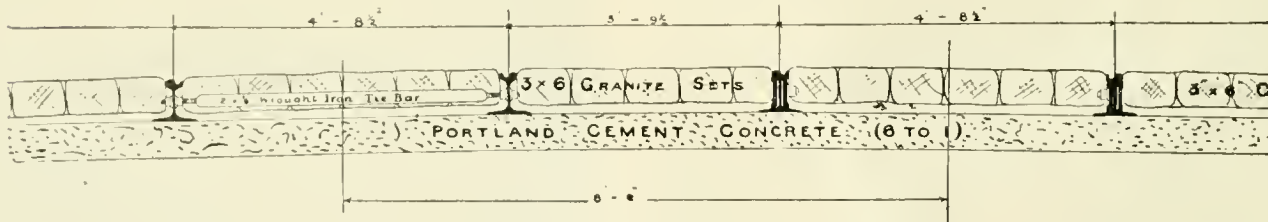
PROFILE OF WALKLEY ROUTE.



SECTION OF RAIL.



FISH PLATES AND BONDING OF JOINTS.



SECTION OF ROADBED.

ent is about 100, and if the traffic continues to increase at the present rate, there is no doubt the first estimate of the number of cars required, viz., 150, will be greatly exceeded.

The engines at present installed are barely sufficient to work the present number of cars, and in a few weeks new boilers, engine, and dynamo will be at work. Another unit is on order, and will be fixed as soon as the extension of the power station will permit.

Although the trolley has only been at work since the middle of September, the receipts have already shown an increase of about 80 per cent over the corresponding period of last year.

Feed trolley wires interfered with traffic on the Louisville (Ky.) road on December 14th.

ABUSE OF TRANSFER PRIVILEGES.

The United Railways & Electric Co., of Baltimore, is endeavoring to restrict the issue of transfers to those cases where it is necessary for a passenger to make use of two lines to reach his destination, and as an experiment has begun on one line by refusing to issue the transfers except when the passenger's fare is received and refusing to issue transfers on transfers. The company has assented to the proposed legislation removing the privilege of charging for transfers and is willing to encourage their legitimate use, but protests against abuse of them.

General Manager House estimates the loss of one fare for each half trip to amount to \$307,476 per year.

A POSSIBLE EXPERIMENT IN MUNICIPAL OWNERSHIP IN OHIO.

Extract from a lecture on "Economic Aspects of Municipal Franchises" by Allen Ripley Foote, delivered at the Ohio State University, Columbus, Dec. 19, 1899.

The Ohio Municipal Code Commission (a commission appointed by the governor to prepare a "Revised Municipal Code of Ohio") proposes to give municipalities power to own and operate the following public service industries: In Sec. 2073 a municipal garbage plant. In Sec. 2137 municipal gasworks, waterworks and lighting works. In Sec. 2165 to "levy and assess, upon the general tax list, an assessment on all taxable real and personal property in the corporation, for the payment of cost and repairs of the following improvements, including the cost of the necessary real estate therefor, waterworks, gasworks, and public lighting works." In Secs. 2277, 2278, 2279 and 2280, to buy waterworks by an issue of bonds at rate of interest not to exceed 6 per cent per annum and to run not more than 20 years, and to "levy a tax of sufficient amount to pay the interest of such bonds, and to provide for the redemption of the same." In Secs. 2383, 2384, 2385, 2386, to cities of 50,000 inhabitants and over to buy existing street railways, to issue 6 per cent, 20-year bonds therefor, and to "levy a tax of sufficient amount to pay the interest on such bonds, and to provide for the redemption of the same." In Secs. 2388, 2389, 2399, 2391, 2392, 2393, 2394, 2395, 2396, 2397, to cities of 50,000 inhabitants and over to construct and operate street railways, issue 6 per cent, 20-year bonds therefor, "and the council shall annually, after such street railway shall have been put into operation, if necessary, levy and assess such a tax, as, TOGETHER WITH THE RECEIPTS from the street railway and other moneys applicable to the purpose, shall be sufficient to provide for said interest and sinking fund, the same to be assessed and levied upon the entire taxable property of the corporation." In Secs. 2401, 2402, 2403, 2404, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, to buy or construct a telephone system, to issue 6 per cent, 20-year bonds therefor, and, "if necessary levy and assess such a tax, as, together with the receipts from the telephone service and other moneys applicable to the purpose, shall be sufficient to provide for said interest and a sinking fund, the same to be assessed and levied upon the entire taxable property of the corporation." In Sec. 2652, in addition to taxes specified in Sec. 2651, by sub-Sec. 26, "the council in each city and village may levy taxes, annually, for waterworks, gas plants, electric lighting plants, telephone plants, street railways or any of them, owned, operated and controlled by any municipal corporation, when the proceeds derived from the operation of such works, plant or plants or such street railway are found to be insufficient to pay the expenses of operating and conducting the same, respectively, and the council of such municipal corporation may levy the taxes on each dollar valuation of all the taxable property listed for taxation in the corporation, both real and personal, to pay the amount found to be due on the operating expenses thereof after applying them to the proceeds of such works or plant or plants and street railways." In Sec. 2683, "in determining the city's power to incur indebtedness there shall not be included the following classes of indebtedness: Bonds issued for the purpose of erecting or purchasing waterworks and supplying water to any city and the inhabitants thereof, for the purpose of erecting or purchasing gasworks, or electric light works, for supplying light to the city and its inhabitants, or for the purpose of constructing, erecting or providing any public service which shall permanently produce a revenue to the city, owned and operated by the city."

Here is a complete destruction of every barrier in existing law, placed there as the result of a bitter experience for the protection of property owners from the evils of excessive municipal indebtedness and taxation.

The theory upon which the Code Commission bases its proposed grant of powers is that public service industries are producers of revenue and therefore will provide for themselves. Would it not be wise in putting this theory into practice to provide that they shall do so, instead of destroying all inducement to hold them to a correct test by providing that taxpayers shall make good all failures to pay operating expenses, interest on bonds and provision for sinking fund? With a constituency taught to expect great reductions in prices for services as a result of municipal ownership

and operation, in which there is from ten to fifty voters who think they pay no taxes for every one who knows he does, how long will a city council be able to protect taxpayers by holding prices sufficiently high to pay all costs of ownership and operation and capital charges? Add to the deficit producing power of selling these services at less than cost, inefficient management by a committee of the council and the prospect for the taxpayers is truly appalling.

When a city has issued its bonds for the purpose of a garbage plant, waterworks, gasworks, electric lighting works, street car and telephone systems, and is operating all of these industries with no check on the prices it shall charge for the services rendered, but with special power to levy taxes to make good all deficiencies to cover cost of operation, interest and sinking fund provisions, can anyone tell what property in that city will be worth? Clear-headed business men can regard with complacency the proposals on this subject contained in the reports of the National Municipal League and the Ohio Municipal Code Commission only because they do not understand them.

A danger that cannot well be overestimated is found in the growing discontent with existing conditions. A mistake made now by adopting the proposals under consideration will do the municipalities of this country an injury from which they cannot recover in a generation. We have heard much about the crime of voting away the rights of unborn generations through granting long term franchises to corporations. What about the crime of placing a mortgage on unborn generations to satisfy a theoretical demand for the municipal ownership and operation of all public service industries? The vitality of the crime, in either case, is in the fact that such procedure is absolutely unnecessary to the attainment of the desired result, which is the best service at the lowest practicable price.

The lowest practicable price under municipal ownership and operation is one that will provide for all costs of ownership and operation and for a sinking fund to redeem the bonds issued on account of the industry. If a municipality having an absolute and perpetual monopoly, and the power to fix prices for the services it may render at any rate it pleases, cannot secure a sufficient revenue from the industry fully to pay all cost of ownership and operation and to provide for the redemption of the bonds issued for the purchase or construction of the works, it has no business to be in the business.

Municipalities should be prohibited from placing a mortgage upon taxpayers' property, and from raising any money whatever by taxation for the purchase or construction and operation of any public service industry. They should be authorized to secure funds for such industries only by mortgaging the property and franchise, and a pledge of revenue sufficient fully to pay all costs of ownership and operation and to provide for the redemption of the bonds issued in behalf of the industry.

With no possibility of competition, and absolute power to so fix prices that they will produce the revenue required, there is no necessary reason why any municipality cannot secure all the funds it may require for public service purposes on these conditions, and protect the property from foreclosure. If it cannot do this, that fact, or the fear of it, is sufficient reason why a municipality should not be given power to involve taxpayers in an inevitable disaster by mortgaging their property for such a purpose.

CARBONDALE BURGLARS CONVICTED.

In our issue of Apr. 15, 1899, was published an account of a daring burglary at Carbondale, Pa., six men entering the power house of the Carbondale Traction Co. early on the morning of March 27th and securing \$75. The six men were pursued, one killed and four of the other five captured; \$60 of the money was recovered.

Indictments were returned against the prisoners, and they were put on trial in December and all were convicted. December 9th they were each sentenced to 3 years and 10 months in the penitentiary and fined \$500, which is the maximum penalty for burglary where the house entered is not a dwelling house.

Mr. C. E. Flynn, superintendent of the Carbondale Traction Co., has as a souvenir the revolver carried by one of the men.

Mr. P. A. B. Widener has given \$2,000,000 for a Home for Crippled Children in Philadelphia.

ELECTRIC TRACTION.

Extract from the presidential address of Prof. Sylvanus P. Thompson, before the Institution of Electrical Engineers (Great Britain).

Passing from the generation of current to its utilization for electric traction, the most notable evolution now in progress is that of the application of electric power to heavy railways. The application to street railroads—in other words, to mere tramways—has been an accomplished fact for 10 years on the other side of the Atlantic, where there are now thousands of miles of electric tramways, mostly operated from overhead lines from which the current is taken by a contact trolley wheel. If in this country the development of electric tramways has been slower, we have at least the advantage that our cities are not disfigured by networks of overhead trolley lines. No such objections hold good for rural districts, and slowly but surely both the industrial and agricultural districts of England are being furnished with electric intercommunication with its many attendant advantages. It may come as a surprise to many who think England behindhand in this respect, when they learn that while the total subscribed capital invested in this country in 1899 for public electric supply is about £17,800,000, no less than £20,800,000 is already invested in electric traction. Of the effect of the introduction of electric traction as a social and economic factor I have spoken elsewhere. There can be no question of the immense social benefit, particularly to the artisan population, afforded by this means. But the electrical engineer is now engaged on the still greater problem of operating heavy railways, and the development in this branch is being watched with keen interest. The two deep level railways in London, the City & South London Ry. and the Waterloo & City Ry., both of which have amply justified their promoters, are shortly to be supplemented by the Central London Electric Ry., an undertaking of much greater magnitude, while several other similar schemes are either under construction or authorized. In the City & South London Ry., the rolling stock is designed for separate electric locomotives, each drawing three passenger cars. The gage is 4 ft. 8½ in. On the Waterloo & City line the trains consist each of four cars, of which the two end ones are fitted with motors, four motors on each terminal car, so that the train can be driven by either set of four motors. Each train can carry 204 passengers. The gage is 4 ft. 8½ in., but owing to the size of the tunnel, ordinary railway rolling stock could not be used. In the Central London line the gage is also 4 ft. 8½ in. The locomotives, each with four gearless motors, weigh 35 tons each. Each will draw a train of seven cars, with a seating capacity of 336 persons per train. The total length, including sidings and cross-over lines, exceeds eight miles of double track.

In all three of these railways the current is taken from a third rail on the surface, and the return current is through the ordinary rails, which, for this purpose, are bonded with copper bonds. All these lines are operated by continuous currents at 400 to 500 volts. In the case of the Central London line, part of the feeding is effected through rotary converters which receive three-phase currents from step-down transformers.

In sharp contrast to these three London undertakings is the Burgdorf-Thun railway in Switzerland, which was opened in July last. It is in every sense of the word a full-gage railway. Not only is its rolling stock full gage (the full gage of Switzerland is 4 ft. 8½ in.), but the railway admits of use by ordinary steam locomotives, drawing ordinary trains. The electric rolling stock is of two kinds—automobile cars carrying 66 passengers each, for use singly or in pairs, and locomotives of 300 h. p. each, for drawing trains of ordinary carriages or goods wagons. This railway is worked by alternating currents supplied in three phases, at 750 volts, the feeding being effected through stationary transformers at 16,000 volts. The currents are taken from two overhead conducting wires, the rails serving as the third conductor. The length of line thus electrically equipped is 40 kilometers, or 26 miles. The arrangements were designed, and the electrical equipment constructed, by Messrs. Brown, Boyer & Co., of Baden, who were the first to apply three-phase currents to traction. In the Lugano tramways as a commencement, then in the steep mountain light railways of Engelberg, of the Gornergrat, and lastly of the Jungfrau, they gained experience in this method, which now stands triumphantly demonstrated in its adaptability to the service of

heavy lines. In the United States heavy railways have been, to a very limited extent, operated by electric locomotives. Some built for the Baltimore & Ohio R. R., weighing about 90 tons, are employed to draw ordinary trains over a short line around part of the city of Baltimore. They work with continuous currents from overhead trolley lines.

There can be little doubt, however, that to Switzerland rather than to America we must look when desiring guidance as to the future development of this problem. All necessary data now exist for the exact working out of the necessary equipment of any given line, actual or projected. No experiments are needed to enable the constructor to proceed, so soon as it shall have been determined which kind of current is to be used. Already it has been found in the designing of the Central London line that continuous current methods, however suitable for light and short railways, and for tramways where frequent stoppages occur, fail when the current has to be supplied from a distance of several miles, alternating currents being brought in because of their greater economy in transmission. The extraordinary thing is, that this having been so far grasped, the whole of the rest of the equipment was not designed to match with three-phase motors, instead of introducing the complication of rotary converters to work continuous current motors. Time alone can show how the mixed system adopted will work in practice. To me the choice of the mixed system appears of doubtful wisdom. Perhaps the distinguished engineers who are understood to be spending £30,000 on experiments for the Metropolitan Ry. to enable them to recommend the best system for our inner circle underground line will shortly be able to report whether a simple three-phase system throughout is, or is not, more economical than either a continuous current system throughout or than a mixed system with converters. If they do not settle this question, which is today the one important question in electric railway work not yet settled, we must regard the expenditure as pure waste.

Returning to the question of electric tramways, the problem of the hour is the equipment of busy city thoroughfares, where, for obvious reasons, overhead wires are inadmissible. To all the three possible methods that dispense with overhead construction, viz., by accumulators carried on the car, by use of slot conduits in the road, and by use of surface contacts, objections are not wanting. Accumulators are found too heavy and too short-lived to be satisfactory. Conduit constructions are objected to as too costly, and as interfering too much with the roadway, while to surface contacts there is brought the terrible indictment—worse than any against the conduit—that nobody has had experience of them. You are aware that in this question of surface contact systems of tramways I am an interested party, and cannot be expected, even in a presidential address, to speak dispassionately. Yet you have never expected your president to banish from his inaugural address the topics to which he has devoted his thoughts, his energies, his time, or his resources. And with the examples before me of other presidents who have spoken of their own work, I take the liberty of speaking of mine. A paper dealing with some aspects of surface contact working was read by me at the Bristol meeting of the British Association, and in January last you listened here to a paper on some other points by Mr. Miles Walker, my former assistant, and partner in this matter. We have, indeed, worked out several different systems, of which the earlier only have yet been publicly described. We are at work on modified plans, the result of our experience gained on our short experimental line at Willesden; and before long we expect to demonstrate the advances we have in hand. Meantime we are not alone in the field. Since the time when the late Dr. Hopkinson proposed his original plan, many others, including Mr. Wynne, Mr. Holroyd Smith, Mr. Esmond, and Messrs. Johnson and Lundell, have suggested various new methods. Three years ago Dr. Hopkinson wrote of one of these methods that he "would not hesitate to approve its adoption in any town in which overhead conductors were inadmissible"; adding that he had "not the least doubt that it would work thoroughly, effectively, and safely." A good deal has happened since then, and much experience has been gained. But there remains not only in London, but in many provincial cities, crowded thoroughfares where overhead construction is absolutely out of the question, and where a slot-conduit would be almost equally objectionable. It is some years since Mr. J. Love equipped slot-conduit lines in Washington and Chicago. It is now most significant that in three great capitals—New York, Berlin, and Paris—the electric

tramways are being largely extended without overhead wires. New York and Berlin are putting down slot conduits; New York, most expensively, as if the object were to put as much cast iron as possible into the roads; and the conduit at every 15 ft. is furnished with pairs of hand holes, the covers of which interfere with the surface quite as much as any surface contact system, to say nothing of the interference of the central slot or of trouble about drainage. In Paris, on the other hand, where a tentative surface contact system has for about a couple of years been tried with moderate success, no fewer than 63 kilometers—about 48 miles—are now being equipped by Mr. Diatto on his surface contact plan which has been in successful operation on a small scale at Tours. Surely, then, if a method of surface contact can be shown which is at once simple, safe, and not too expensive, there is every reason to urge its adoption on engineers and municipal authorities. Thanks to the criticisms—some of them passed in this place—with respect to possible difficulties likely to arise from the use of underground coils, from mercury switches, and from surface leakage around the contact studs, improvements have been worked out which largely, if not wholly, remove the fears that have been expressed on these grounds. As contrasted with the conduit, a surface contact system has the advantages of much lower prime cost, of less interference with the roadway, and of not requiring any drainage arrangements. On long lines that run out into the country it can be operated with the same cars that carry trolley poles for use in the suburban part of the track. Those cities and towns which, like London, Birmingham, and Cambridge, have waited before erecting overhead lines, will have justified their waiting attitude when they can point to examples of the successful surface contact roads at Monaco, at Tours, and, lastly, at Paris.

DETROIT ARBITRATION CASES.

The Detroit Citizens' Street Railway Co. has recently found it necessary to discharge a number of its conductors for carelessness in handling fares. Such cases are tried before a board of arbitrators. December 18th the cases of 13 conductors were investigated by the board and the findings were all against the men.

Mr. Dohany, representing the union on the board, said concerning the verdict:

"This result must teach the public one lesson at least, and that is when they escape from paying their fares they are not only beating a 'corporation' but they are robbing innocent conductors of the opportunity of earning for themselves and families a livelihood. Let those passengers feel that they are largely the ones who have brought this pitiable condition upon these unfortunate men tonight."

HAULING STONE ON THE CLEVELAND & CHAGRIN FALLS.

As noted in the "Review" for December 15th, page 825, the Cleveland & Chagrin Falls Electric R. R., has succeeded in proving in court its full right to carry heavy freight. We are in receipt of a letter from Mr. R. L. Palmer, general manager of the road, stating that his company is now hauling stone regularly from quarries about eight miles from the city, using for this service special 10-ton flat cars, 16 ft. in length and having about one-half the capacity of an ordinary steam freight car. This freight service is carried on at night between the closing of the passenger traffic and the starting up of the same in the morning, although it is believed it could be sandwiched in between the regular cars if necessary. The company has been getting \$5 per car for hauling stone.

\$25,000 REWARD.

Under date of Dec. 22, 1899, the Brooklyn Rapid Transit Co. published an advertisement offering \$25,000 reward for information furnished to the company's counsel, Sheehan & Collin, 32 Nassau St., New York, which will lead to the discovery and conviction of any of the persons who have circulated false statements or rumors concerning the company, with intent to affect the stock market.

The Brooklyn Rapid Transit stock suffered severely in the slump of last month, and the company's officers believe it was largely due to libelous statements and rumors.

BUILDING THE NIAGARA GORGE ROAD.

In June last Mr. George A. Ricker, chief engineer of the Niagara Gorge Railroad Co. (formerly the Niagara Falls & Lewiston Railroad Co.) read a paper before the Engineers Club, of Philadelphia, on the building of this road, in which are presented interesting facts connected with the enterprise not heretofore generally known.

Benjamin Fenton and Ensign Bennett first proposed to build a steam railroad, with a gage of 39 in., from Prospect Park to the Whirlpool, and the Niagara Falls & Whirlpool Co. was organized. The company failed in its efforts to purchase a right of way and on instituting condemnation proceedings the courts held that it did not meet the requirements of the railroad law so as to entitle it to exercise the right of eminent domain.

In 1880, Capt. J. M. Brinker, of Buffalo, organized the Niagara Falls & Lewiston Railroad Co., which purchased the stock of the old company. It decided to build a double track standard gage road to connect with the electric and steam railroads entering Niagara Falls and with the ferry at Lewiston. A survey was completed in September, 1890, and the right of way bought, the company securing the fee of the land.

Mr. Schoellkopf, of the Niagara Falls Hydraulic Power & Manufacturing Co., opposed the plan to carry the road along the bank in front of his mills, but was defeated in the courts. He then suggested carrying the line up the high bank into the town, which plan was adopted and the location in front of the mills abandoned.

The right of way was very expensive; the total cost is not given, but \$110,000 was paid for Buttery Elevator and \$60,000 for the Van Horn and Grand View Elevators.

Mr. Ricker describes the construction of the road as follows:

"In order that we may better understand the actual operation of building, I will refer briefly to the geology of the Gorge. For our purpose the Gorge may be best considered as made up of three distinct sections; the upper or newly made channel excavated by the constantly receding falls; the middle or original channel, which is of preglacial origin, and the lower or postglacial channel. The characteristics of the typical cross sections of these three channels are widely different. The preglacial section is of least width, and has nearly vertical walls extending almost to the water on the American side. The postglacial section is wider and has vertical walls to about one-third the depth of the Gorge, and steps down to the water which are covered with debris that has accumulated by regular contribution from the exposed walls above. The new system, which extends southerly from the railroad bridges, is much wider than the preglacial channel and has slopes or talis reaching nearly to the tops of the cliffs. This debris is much deeper than that resting on the steps of the lower channel, and no excavation has as yet been made of sufficient depth to disclose the steps.

"The river is now flowing through the Medina sandstone, which underlies all western New York. The railroad at frequent intervals passes through sections of sandstone, and practically all the rock excavation was made in the quartzose belt of this stratum. Above the sandstone lies the Clinton limestone, over the Niagara shale, and at the top of the cliff, the Niagara limestone. While the railroad follows the irregular line of the foot of the talus from the whirlpool to Lewiston, the directions of the entire channel form, roughly speaking, four tangents. The new channel is about two miles long and extends, approximately, northeasterly from the present fall to the railroad bridges. The preglacial channel is about one mile in length from the bridges northwesterly to the Whirlpool. The waters leave the Whirlpool in a direction nearly at right angles to that at which they enter, and continue northeasterly to the Devil's Hole, a distance of about two miles, and from Devil's Hole to Lewiston, about two miles more, running almost due north. The continuation of the preglacial channel, known as St. David's, lies directly to the northward in the extension of the line of the Whirlpool Rapids, and is plainly marked, but is nearly filled with glacial drift.

"About the 1st of April, 1895, an agreement was entered into with Messrs. Cragg & Tench, contractors of Buffalo, to build the Gorge railroad, in which the contractors were to secure the men, furnish all necessary tools, and their services for 10 per cent of the force account. After five tedious years of waiting the company suddenly decided to proceed with construction, and I received a

telephone message from President Brinker to the effect that "the graders would be at Lewiston to start work tomorrow morning," and asking me to be on hand to give necessary directions. Construction was begun at Lewiston on April 11th, and a few weeks later at several points along the line between Lewiston and the Buttery Elevator. Beyond a profile, which it was afterward found impracticable to follow, no plans were made as the result of the original survey.

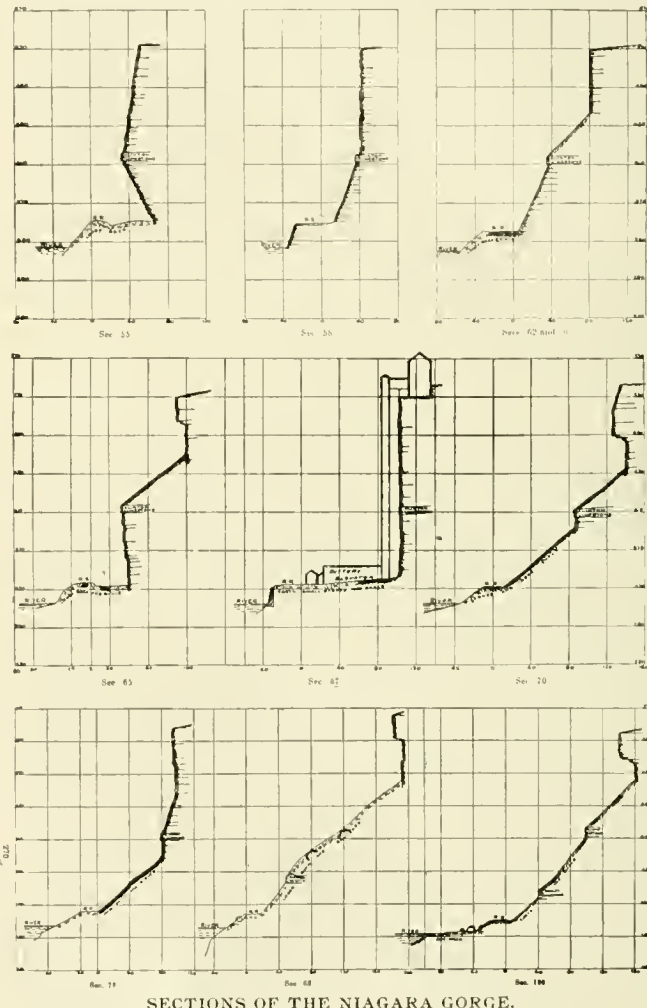
"I am now confronted with a task more difficult than that of building the railroad—how to tell you in engineering terms of the construction of this road that was built in a most unscientific manner. My orders were to put a railroad in this unpromising place, and I proceeded forthwith to obey. Before stakes were set a path was graded, following, as nearly as possible, a few feet above the proposed grade-line, and gangs of laborers were placed at frequent intervals. No reliance could be put upon any slope made outside of the natural slope. Had classification been attempted, but two kinds of material would have been named: loose and solid rock, as the talus is made up of large and small stones with not sufficient earth to fill the interstices, and with no cementing material, although the roots of dense vegetation tend to hold it in place and maintain a much stronger slope than would otherwise be possible. The deep channel of the river afforded the very best place for wasting the material excavated and work proceeded rapidly. From 600 to 1,000 men were employed, and the first five miles to Buttery Elevator roughly completed, and one track laid, and the first train entered this temporary southern terminus August 25th. On the inner side of the road-bed such a slope was formed as would stand for the time being, which, of course, meant that the heavy rains and the frost in the coming spring would bring down large quantities of material left on the steps above. Cross-overs were placed at such points as seemed to threaten most, and from time to time, as slide occurred, the road was operated with single track in that section, and large numbers of men quickly removed the encroaching talus. Several slides took place in the early spring of 1896 and again in the spring of 1897. The quantities decreased each year. A view of the slide of this spring, at the same point where occurred the greatest encroachment in '96 and '97, shows how surely the slopes are being reduced to an angle of repose and are taking on the appearance of stability. New vegetation adds greatly to their permanence and more agreeable appearance.

"Coming out of Lewiston at the south line of the village is a timber trestle 104 ft. in length and 42 ft. high, crossing a small stream flowing into the river from the foot of the Lewiston escarpment. A little further up the line is a timber trestle carrying the tracks over a deep gully formed by another lateral stream, into which for many years the New York Central R. R. has wasted its surplus earth and rock. It was my intention to use 80-ft. girders at this point, but owing to the crowded condition of the bridge shops, delivery could not be secured in several months, and as the company was extremely anxious to open the road to catch the summer traffic, installation of the permanent structure was deferred. In the expectation that a large amount of water would filter through the talus, a great many open culverts were put in, but four years' experience has proved that the danger from this cause was overestimated. These culverts, to be effective, should be movable, as a boulder or other obstacle falling in the path of a stream high up on the talus will often divert the stream many feet from its former bed, and leave the culvert high and dry. The track is ballasted with rock borrowed from the talus over most of the line. The ties are of cedar, except on steep grades, where oak was used, and the rails, rolled by the Carnegie Steel Co., weigh 60 lb. to the yard. No attempt was made at mathematical alinement, as the roadbed followed the irregular outline of the natural slope.

"Construction from the Buttery Elevator to the city of Niagara Falls was much more difficult than upon the lower five miles of the road. South of the elevator began almost vertical cliffs, extending from the top of the escarpment to the rapids below and continuing for a distance of about one-half of a mile to the Railroad Suspension Bridge. Drills and men were lowered over the cliff to the first ledge, about 100 feet above the grade line, and blasting operations carried on mostly by hand, as it was difficult to get steam drills into position. The blasts were fired usually at noon, and huge quantities of rock were thrown into the river, disappearing beneath the tumbling waters of the rapids below, without appearing in any way to obstruct the stream or to change in the

slightest degree the form of the waves. The vertical cuttings averaged nearly 100 ft., and, estimated roughly, fully 100,000 cu. yd. of rock were thrown into the river from this section.

"At the site of the Van Horn Elevator a deep recess in the cliff formed a bay across which an attempt was made to construct a roadbed in the swift current of the rapids. This experiment I believed would be futile, as a powerful stream of water was constantly discharged upon the embankment, diverted from the main current by a high boulder of Niagara limestone resting in the channel about 50 ft. from the cliff. It was evident that this bay had been excavated by the same powerful hydraulic agency, and it was useless to attempt to place in its way any structure less substantial than the cliff which it had cut out. During a period of extreme high water in the spring of 1897, when the river rose 19 ft. above its ordinary level, most of this embankment was



SECTIONS OF THE NIAGARA GORGE.

washed away. In its place rough, but heavy, longitudinal walls were built to resist the encroachment of the current; spaces between the walls were refilled with stone and a stout timber trestle built to carry the tracks. In the spring of 1898 this structure was swept away, after which the company determined to do what it might have profitably done at first, and the old elevator-shaft was removed, the cliff blasted away, and a shelf made of sufficient width for a single track. Three timber cribs, each about 60 ft. in length, protect the roadbed at critical points above this bay.

"Beneath the railroad bridges a combination of difficulties was met. A small water-wheel under the Suspension Bridge, which furnished power for a flour-mill at the top of the bank, was rearranged to permit building the roadbed, the transmitting cable raised, and a portion of the tailrace changed and a retaining wall built to hold the embankment. Near this point is an inclined railway, the floor of which, resting directly over the center line, was raised vertically about 15 ft. Between the incline and the cantilever bridge heavy walls were put in to hold back the loose rock on the inner side of the track, and retaining walls built on the outer side to prevent encroachment upon the head race.

"Permission was obtained from the Michigan Central Railroad to build abutments on both sides of the cantilever bridge piers and a central pier in front of and between their piers. The underlying material at this point is composed of very large boulders, upon which rest the foundations of the cantilever bridge, between which and the deep waters of the river there were but 13 ft. in which to pass. To prevent possible danger to the bridge foundations, blasting was prohibited within 100 ft. on the south side and 50 ft. on the north. No soundings could be obtained on account of the swiftness and great depth of the current. Within this limited area, hedged about by restrictions, construction was made doubly inconvenient.

"From the bridges to the top of the high cliff, a distance of nearly a mile, the tracks are laid on a slowly ascending grade up the talus for about 3,500 ft.; thence entering the cliff and passing through a thorough cut 60 ft. deep at the lower section, rising continually until the top of the bank is reached. The average gradient is 4.7, the maximum 6.4 per cent, and the total elevation overcome, from the bridges to the top, is just 200 ft. Passing beneath the New York Central tracks, the line swings sharply to the right and, paralleling the Central for a few hundred feet, reaches Second St. in Niagara Falls. At the southern end of Second St. connection is made with the Niagara Falls Street Ry. and thence over the tracks of the latter company to Prospect Park. The under-crossing of the Central is made at an angle of 55°; the bridge is of trough-girder type and carries at present five tracks.

"I think you will grant that it was not practicable to make detailed plans for construction of this peculiar road. It was not possible to determine, with even approximate accuracy, how the unseen conditions might alter proposed methods. I cannot say that any very serious engineering difficulties were met with, and I think there are no problems to be solved that will not be successfully met. The same vigor and energy which characterized the attack upon the ground were exhibited later in the effort to put the road in operation, and as gangs of men and construction tools would have been unsightly, work was suspended as suddenly as it was begun. You will recall the fact that wooden trestles and bridges had been put in place because the company was not willing to wait for permanent structures. The work was, therefore, left unfinished, but I was sustained by the vain hope that in the coming spring I should be permitted to scale down the slopes and replace the temporary structures.

"When 1896 arrived all our efforts were concentrated upon construction above the Buttery Elevator, and this section, too, when nearly completed, was given over to operation in much the same incomplete form as was the lower. It was expected that immediate earnings would be so great that a goodly portion of them could be applied to completion of the work, but receipts proved disappointing, and all further work was suspended, excepting such as was necessary to clear the track of slides and to provide for maintenance. As the outcome of business complications the owners of the road were obliged to relinquish it a few months ago, and it passed into the hands of a receiver. Reorganization of the company is now being undertaken, and I am engaged in making the necessary repairs, which amount to a reconstruction of the road, as considerable damage had been sustained by the track from slides and by the roadbed from the action of the river.

"A fall of rock that occurred some weeks ago (March)—accounts of which have appeared in the technical journals and in the daily papers, and called an avalanche—was greatly exaggerated. Before the road passed into the hands of the receiver I had recommended that some of the overhanging Niagara limestone just above the Buttery Elevator be removed by blasting, as it seemed to be insecure. The railroad was shut down; all people were warned not to walk upon the tracks, as it was intended before beginning operations to remove all overhanging rock which appeared to be dangerous. By reason of some blasting that was going on near by, within 100 ft. of the point in question, where the city was excavating for a sewer, two large pieces of limestone were dislodged, falling between the tracks and the cliff without doing damage. A few days later our superintendent blasted and threw off into the river the large boulders, which now rest in the margin of the rapids just outside of the tracks. A considerable amount of loose material, of course, fell with the boulders and covered the road for a distance of about two hundred feet, a depth of from three to five feet. This was easily removed, and when taken away it was found that the rails were cut in several places, but that no great damage had

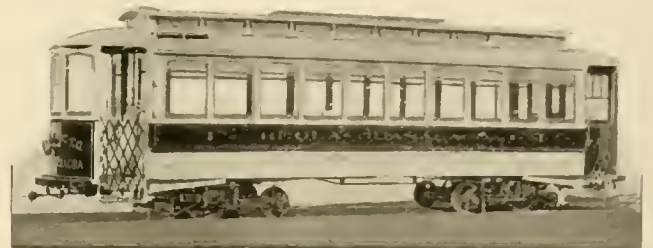
been done, except to the lower portion of the shaft of the elevator, the casting of which had been carried away. Where these large rocks now stand in the river some difficulty had previously been found in maintaining the embankment, owing to the heavy current thrown against it, and a retaining wall about 400 ft. long had been resorted to for protection. With great good fortune these large rocks now stand directly in the way of the heaviest attack of this current, and the retaining wall is no longer necessary. In general it may be said in regard to falling rock that it comes down only in the early spring months, when, under the new management, it is not intended to operate the railroad.

"Since the opening of the road in 1895 to the present time no passenger or employee has ever received injury from falling rock. I was daily over the road during the construction, and have since been frequently from the Falls to Lewiston and return, both on cars and on foot, and have never seen a rock fall. It is my opinion that, with due care, the maintenance of this railroad need not be excessively expensive, and that the same safety of operation can be obtained as is secured on any mountain road."

The "Review" has at different times published illustrations showing scenes of this road and particular reference may be made to the issues of August, 1896, page 478, and October, 1897, page 651.

ELECTRIC CARS FOR CUBA.

The first electric railway in Cuba is now building from Regla, on the bay opposite Havana, to Guanabacoa, a distance of five miles, and the first shipment of cars for it was made a few weeks ago by the J. G. Brill Co. The cars are of the type shown in the illustration. The body is a slight modification of one of the standard American types that has been successfully used between Buffalo and Niagara Falls. The body is 28 ft. long with two 4-ft. platforms, making the length over the vestibules 36 ft.; the width at the sills is 7 ft. 5 in., and at the belt rails 8 ft. The inside finish is ash and cherry with three-ply brick veneer ceiling. The seating capacity is 40, 20 double cane seats being placed on either side of a center aisle.



BRILL CAR FOR CUBA.

The car is mounted on "Eureka" maximum traction trucks, with 33-in wheels; the wheels have 2 1/4 in. treads and 7 3/8-in. flanges. The gage is 4 ft. 8 1/2 in. Among the details may be noted Brill folding gates, Brill patent angle iron bumpers, Hovey-Brill radial draw bars, a pair of Brill sand boxes, two Dedenda gongs, one on each platform, and inside each car at diagonally opposite corners, under the corner seats, are good sized tool boxes. These cars are built complete as shown in the engraving, and then knocked down so as to pack in the smallest possible space. The motors for these cars are two Westinghouse No. 38 B. This equipment, mounted upon the maximum-traction trucks, will enable the cars to be run at a very high rate of speed with safety. At the same time the platforms are carried so low as to make access to them quite easy.

The suit of the Birmingham Traction Co., of Pittsburg, against H. Sellers McKee and others, for an accounting, which came to trial last month, was discontinued. No details of the compromise are made public.

The Woman's Club, of Chicago, recommended that persons using the street cars on December 23d remember the season and give the conductor 6 cents instead of the regular fare, but this plan for Christmas gifts was not a success.

SAVING AT THE CONTROLLER.

BY J. R. CRAVATH.

In view of all that has been written in the past few years about the saving possible by proper handling of the controller and the way for motormen to operate cars with the maximum economy, this article may seem out of place. It is nevertheless true that many of the articles written have not come under the notice of practical railway operators, while some were too technical in their nature to be in most helpful form for the busy street railway man. It has come to my notice that many popular misconceptions exist as to how current is usually wasted in operating cars and it is the purpose of this article to correct some of these if possible, and also to make some practical suggestions as to the instructions that should be given motormen where the management of a road has a desire to effect a "saving at the controller."

Saving at the controller, to accomplish any extensive result, involves a saving by the majority of motormen on the road. For this reason many managers have been inclined to make all their attempts at economy in other directions, and let the motormen go on operating cars in the old way, rather than try to effect any economy by a reform in method of handling cars, because the latter attempt involves the reforming of a number of men, and hence involves questions of discipline and management of men. Many superintendents are loath to undertake this, even with the demonstrated fact before them that 20 to 40 per cent saving in power may result from properly directed efforts to make men save power at the front platform. When more economical power house machinery is put in or money is invested in copper to reduce line losses the management feels that it has a "lead pipe cinch" on the saving that results, while if the saving depends on a lot of motormen the management naturally has a feeling that its executive labor will be somewhat increased by the constant watchfulness necessary to produce economies where the results are dependent on the actions of so many men. The writer has always felt that questions of this kind, like most others around a street railway system, should be looked at purely from a dollars and cents point of view. The clerk hire necessary with any system of motormen's records so far put in operation effecting a saving of power by motormen is so very small that it is hardly to be considered at the side of the saving made. The main question, then, remaining is as to whether the time of the manager or of some competent member of his staff is so immensely valuable as to make the few minutes spent daily on this matter more than offset a saving of 20 to 40 per cent in power. However, a discussion of whether it is advisable or feasible to try to make motormen economize in power is somewhat aside from the main purpose of this article. The main questions to be taken up are the technical ones as to how power can be saved or wasted at the controller. The business question as to whether attempts to save power in this way pay (provided such attempts are properly directed) has been already settled by practical demonstrations, which amount to more than anyone's theory to the contrary.

In the first place it must be kept closely in mind that any real saving in power by proper controller handling must be made without interfering with the schedule. The faster the schedule the more power required to maintain it per car-

mile. It is not, therefore, fair to consider the question of controller economy, except with the assumption that the schedule is the same "before and after taking." In city street railway practice the greater part of the energy required by a car is used in getting the car up to speed or accelerating after each stop. At least 75 per cent of the energy used per car-mile is so consumed, the remainder being used to keep the car in motion after it has been brought up to speed. The greater part of the energy is, therefore, stored up in the car, getting it up to speed. Part of this energy must be destroyed or wasted by the brakes as soon as the car has to slow down. Part of it may be utilized to propel the car by motormen by drifting with the current off. The proportion that is used or wasted rests with the motorman. The economy with which a man handles a car depends mainly on two things, namely, on the way he gets his car up to speed and on the way he utilizes the momentum of the car to propel it after it is up to speed. In order to make this plain in a practical way, suppose we take an imaginary trip over the road with two motormen, one of whom is making an effort to operate his car as economically as possible as regards power and repairs consistently with maintaining schedule time, and the other of whom, being an average man, aims simply to get over the road on time, without regard to power or repairs. The difference between these men in the way they handle their cars is so marked to an experienced man that there is no wonder to him that there is a difference of 20 to 40 per cent between them in power used, to say nothing of repairs. The difference begins to show itself even before they are fairly away from the barn. The uneconomical man (we will call him A for convenience) after leaving the barn has a switch a few feet ahead before running onto the main line. Although he has such a short distance to run and is not behind or greatly pressed for time he throws the controller around to the top notch and almost before he has time to get it there has to jam the brakes on hard, to avoid taking the switch too fast. The economical man (we will call him B) would have not run his car up to more than quarter the speed that A did, and would have been therefore able to drift easily over the switch without using the brakes at all, so saving all the energy that A had to waste at the brake shoes. When A reaches the switch the probability is that he has applied the brakes so hard and carelessly that he has to use current again to get over the switch instead of drifting over as B would, so some more wasted energy is to be charged up against A. Once out on the street and under full speed A sees a team ahead on the track, which he knows very well he will overtake before it gets off the track. Nevertheless he keeps current full on until the last minute, and then turns off power and jams on brakes as hard as he can. Now this may furnish some excitement and amusement for the motorman and those on the front platform, but it increases the liability to accident and wastes a lot of energy which our friend B would have saved by shutting off the current some distance back from the wagon and letting the momentum carry him along until the wagon is reached. By that time perhaps the wagon will have had time to clear the track and in any case B has made as good time as A, and has not wasted nearly as much of his own or the company's energy in the brakes. Then, too, it may often happen that by giving the team a little more time it will get out of the way before the car reaches it, so that instead of having to start the car up from almost a standstill, as A does, B only has to reduce his

speed to five or six miles an hour, so that B gains both in power and in time in getting the car under way after passing the wagon.

Going on a little farther A begins to pick up passengers. He invariably keeps the power on until the last minute before applying the brakes, and then applies them hard, but usually makes up for the small time he gains in this way by making a long drawn out stop after he has first checked the speed of the car. B, on the other hand, hardly ever keeps the current on after the car is brought up to speed, but unless there is a considerable distance to be run without a stop, shuts off power and drifts with current off. He has cultivated good judgment of stopping distances and makes "prompt" stops. That is he lets the car drift until a comparatively short distance from a stopping place, and then applies the brakes moderately hard. He does not apply them very hard and then be obliged to release and drift along at slow speed for a considerable distance before making the final stop, as A would do. B realizes that the less he has to use the brakes the easier time he will have physically, and the easier he will be on the company's coal pile, while A gives it no thought.

And now a few notes as to the way these two men start their cars; a subject upon which there is perhaps more misunderstanding than any other connected with electric car operation. A good many who read this article may think that B, being an economical man, starts his car with a slow "tar in January" advancement of the controller handle from point to point, waiting several seconds on each notch. Such is far from the case. Such a method is wasteful in time, for obvious reasons, and wasteful in current because with such slow starts drifting can not be practiced and maintain schedule time, and higher momentum speeds are necessary to maintain the schedule. The start should be a "prompt" one, that no time may be wasted, just as the stop should be prompt for the same reason. With prompt stops and starts more drifting with current off after speed is attained can be indulged in and moreover the motors are worked by this method for short periods at heavy load and consequently high efficiency, instead of being worked a greater percentage of the time at lighter loads and a poorer efficiency, as is the case when the starts are slow and the current has to be kept on much of the time after maximum speed is attained, at which time they work very inefficiently, as they are working on the very light load of overcoming car friction only. However, when we look at A when he starts his car we find that the word "prompt" is entirely too slow to define the way he moves his controller handle ahead. He is around to the top notch in an incredibly short space of time. The wheels slip and power which should go into acceleration heats the car wheels instead. The economy of series-parallel control becomes a myth, because he does not stop long enough on the series points to get any benefit from them. The field shunts are cut in so soon that the motors have to do much of their acceleration on a weak, inefficient field, and the motors are unduly heated and strained. Prompt acceleration is a good thing, but when it is run into the ground, as it commonly is on large city systems, it is quite another matter. It would be a good thing if the rate of acceleration could be regulated automatically and taken out of the motorman's hands entirely, for there is a happy medium which is neither too fast nor too slow, which might better be left to an automatic device than to the caprice of a motorman, no matter how conscientious that motorman may be.

To sum up the economical motorman differs from the wasteful one in the following respects:

He utilizes the momentum of his car to get him over the road as far as practicable by drifting with current off.

He never wastes energy by running his car up to a high speed when a slower one would do just as well.

He uses the brakes as little as possible, but when he does use them he does not do it in a dilatory way or make long drawn out, time consuming stops (I do not refer to the time the car is at a standstill), but brings the car speed down promptly.

He is neither dilatory or too rapid in advancing the controller, but turns from notch to notch promptly, which in the case of most light cars in crowded city service means about one second to each notch.

He always remembers that having once made a proper start the greater per cent of the time he can keep current out of the motors and still maintain schedule time the better.

FOUND FOR THE COMPANY.

By the courtesy of Mr. C. L. Harry, general manager of the Kokomo (Ind.) Railway & Light Co., we have been advised of the result of a suit for damages recently decided in favor of the company. The facts are as follows:

Mrs. Jessie K. Jackson, of Kokomo, claimed to have been injured Mar. 29, 1898, and sued for \$10,000 damages. She alleged that because of the shock received when the front wheels left the track she was permanently injured internally so that a delicate surgical operation was necessary. The case was hotly contested and the verdict was for the defendant company, which established at the trial that the plaintiff had prior to the injury suffered from the same disease, which was claimed was produced by the injury, and also that while the track of the railway company was in bad condition at certain other points, and certain cars not in first class order, that the track at the point of the accident was in good condition, and that the injury was not caused by reason of the bad condition of the track or the car; and further, that the company had exercised the highest degree of practical care in maintaining and operating its railway system. The case was one of great importance, as the husband of the plaintiff also had a \$5,000 suit pending against the company for medical services and the loss of service of his wife. The verdict is one of great value to the company, as it tends to discourage litigation against the company on account of alleged personal injuries.

PITTSBURG EMPLOYES' ASSOCIATION.

At the annual meeting, held in December, of the Consolidated Traction Relief Association, the employees' association of the Consolidated Traction Co., of Pittsburg, the treasurer's report showed the following details:

Balance in bank, Dec. 14, 1898, \$1,438.84; receipts from all sources for year ending Dec. 12, 1899, \$10,083.31; total funds, \$11,523.15; paid out in death benefits, \$1,200; on sick benefits, \$7,404; other expenses, \$471.30; balance in bank Dec. 12, 1899, \$2,447.85. Secretary William G. Gish reported 122 members admitted during the year; total, 635. Four members died; 120 resigned after leaving the service of the company. The present membership is 511. Forty-one applicants were rejected.

C. L. Magee was elected president.

The Columbus (O.) Street Railway Co., in accordance with its custom, last month issued new uniforms to 63 employes who have been in the service more than five years. All the men received Christmas turkeys with the compliments of the company.

A temporary injunction has been issued to restrain the United Railways & Electric Co., of Baltimore, from discontinuing an old line between Mt. Washington and Pikesville. The suit was brought by an owner of abutting property.

BENEFITS OF WIDENED STREET.

An interesting legal point is involved in a suit now pending between the city of Hartford, Conn., and the Hartford Street Railway Co. One of the streets occupied by the company's tracks was widened and the company was assessed for benefits to the amount of \$3,100. The assessment was based on the alleged fact that the ties and rails of the company would be much benefited by such action. Also that the liability for accident would be much decreased; that if the railroad should put in double tracks, as it would be then able to, it would be a great convenience; it would be able to carry more passengers and its tracks would be much less liable to obstruction than formerly.

An appeal was taken and the matter was left to a committee consisting of Judge Loomis, of Hartford. After a hearing the assess-

TRACK CONSTRUCTION IN BUFFALO.

The International Traction Co., of Buffalo, has adopted as its standards for track construction with 9-in. rails the two types shown in the accompanying illustrations. That shown in Figs. 1 and 2 is called the "trench" construction, and is used in all streets having common stone paving between the tracks, and either asphalt or common stone on the sides. The second type, Figs. 3 and 4, is called the smooth excavation construction, and is used where first-class block paving is between the rails and in the devil strip. The rails are 94-lb. 9-in. semi-grooved girders.

TRENCH CONSTRUCTION.

For this type two longitudinal trenches 17 in. deep and the width of a shovel at the bottom were dug out at a distance of 4 ft.

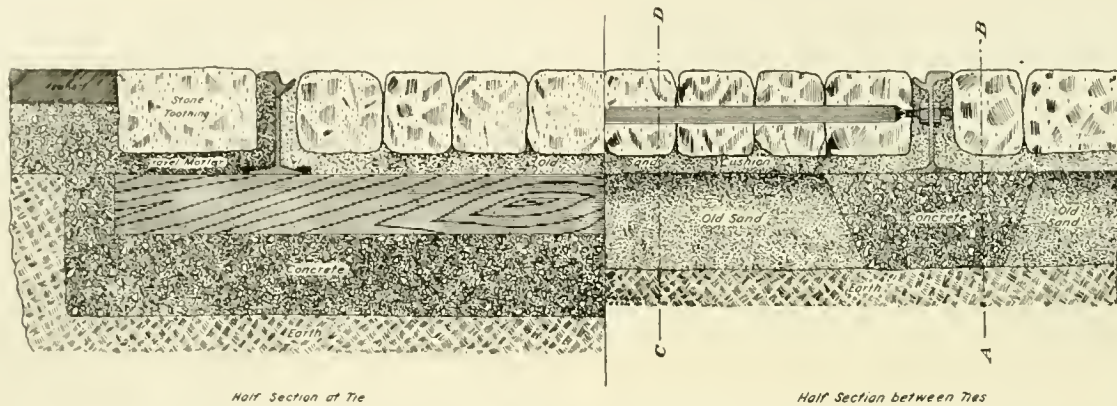


FIG. 1. CROSS SECTION OF 9-IN. TRACK BEAM CONSTRUCTION—COMMON STONE PAVING.

ment was cut to \$1,550 on the physical property of the company in the street, and a pecuniary benefit was found, but the question of whether the latter is a special benefit on which the company can be assessed, was reserved.

This decision of Judge Loomis, acting as a committee, was reversed by Judge Case, in the Court of Common Pleas, the court holding that the benefit because the widened street would lessen the company's liabilities to accident is purely speculative and its cash value cannot be assessed. Without considering the other elements of benefit the assessment was set aside and judgment for the company to recover its costs was entered.

The company would willingly pay the assessment as a donation, but objects to making a precedent.

9 in. between centers. Afterwards, cross trenches 5 ft. c. to c. were cut out; half of these were 20 in. deep below grade, and the alternate ones 17 in. below grade. The ties, of hard oak 5 x 7 in. x 7 ft., were then put in the cross trenches and the rails laid upon them, spiked and gaged, and held together by the regular 9-in. plates secured by only two bolts. The track was then surfaced, and the ties in the shallow cross trenches tamped up with dry stone, each joint tie being blocked up; after this the track was alined.

The concrete gang, comprising 25 men to a board, then filled in the trenches under the rail and ties as shown in Figs. 1 and 2, and the concrete was allowed to set for 72 hours, after which the plates were taken off and the joints welded. The old sand between the ties which had been disturbed in ripping up the old track was

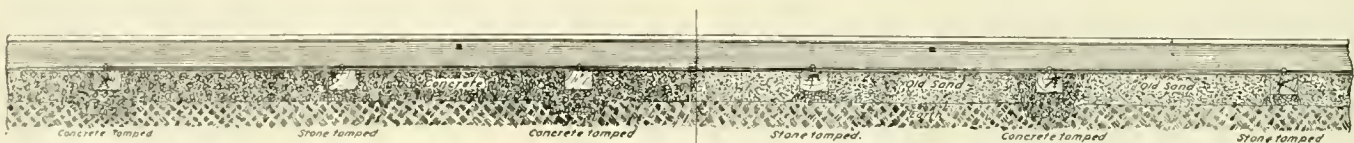


FIG. 2.—LONGITUDINAL SECTION AB (FIG. 1).

LONGITUDINAL SECTION CD (FIG. 1).

WAR ON OHIO INTERURBANS.

A number of suits have recently been instituted by the attorney general of Ohio against interurban electric lines in that state. The attorney general brings the suits because the state is nominally the plaintiff, but the parties really interested are the steam railroads.

December 12th, the first of these suits was decided in favor of the electric interurban; it was sought to enjoin the commissioners of Sandusky County from giving the Toledo, Fremont & Norwalk Electric Ry. a right of way over one of the state roads, but the supreme court dismissed the petition.

On the same day a suit was begun against the Dayton & Xenia Traction Co., alleging that the company has no charter rights to carry freight and baggage through city streets.

Other cases pending are against the Dayton Traction Co. and the Cincinnati & Miami Valley Traction Co.

The extensions to the Escanaba (Mich.) Electric Street Ry. were completed in December, and a four-train service to the "Soo" put on.

next dug out and pounded with heavy sand pounders, as a paving base for the common stone.

If the paving on the outside of the track was asphalt, tootinging stones were set next the rails, long and short stones being placed alternately, in a gravel mortar, which was made of one part common cement and two parts gravel. The space between the tootinging and the old concrete was then filled in with concrete for paving base and then sheeted.

SMOOTH EXCAVATION CONSTRUCTION.

In first-class block construction, a trench was dug 7 ft. 8 in. wide and 15 in. deep, then cross trenches spaced at 10 ft. c. to c. were dug 5 in. deeper for the concreted ties, and the rails were spiked, gaged, surfaced and alined as before. The trench was then filled in solid with concrete, not only affording support to the track, but acting as a paving base. A cushion of about four inches of gravel was then laid on a concrete base, and a first-class paving was laid. This was grouted with a mixture of one part Lehigh cement and two parts sand. A special device was designed for handling this part of the work in the shape of a small grouting box on wheels,

and it was found that it decreased the cost of grouting at least one-half. This is shown in Figs. 3 and 4.

ORGANIZATION.

The organization of the construction force was as follows: There were five distinct departments or divisions, namely, track gang, concrete gang, paving gang, welding gang, cleaning up gang, each of them under the direct charge of a boss foreman who reported directly to the engineer in charge.

The boss trackman had charge of tearing up the old track and paving, excavating, laying the ties and rails, spiking, gaging, bolting, surfacing, alining and cleaning out the trenches for the concrete gang. He had under his charge about 50 men and about 10 foremen.

The concrete gang consisted of six boards, and was under the charge of a boss concrete foreman and six sub-foremen. It was found that a great saving in mixing the concrete was accomplished by using hoes only and no shovels, the concrete being turned three

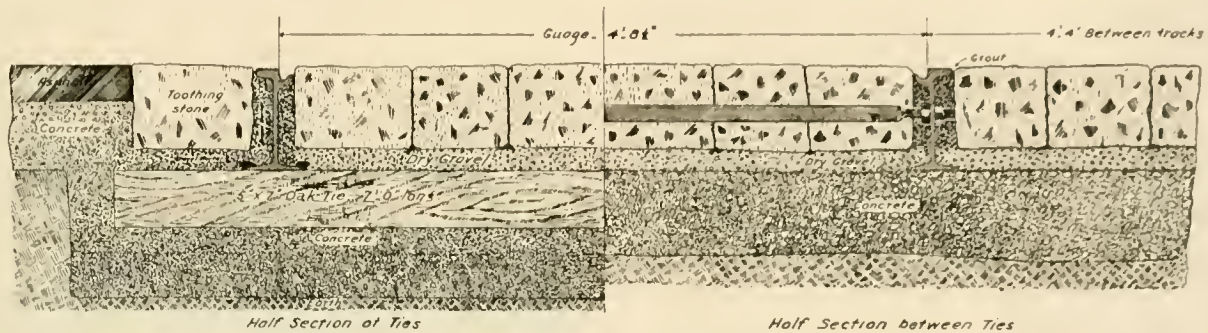


FIG. 3.—CROSS SECTION OF 9-IN. TRACK IN ASPHALT STREET—FIRST-CLASS BLOCK PAVING BETWEEN RAILS.

times, and then into the trenches by these hoes. The boss concrete man had under his charge about 150 men.

The concrete gang was followed by the paving gang, a boss paver with 6 foremen under him, 60 pavers and about 150 laborers.

The welding was under the direct supervision of a welder foreman, who took off the joint plates and excavated around the joints to a space of 40 in. square. The latter part of the season, two welders were employed.

Finally, the cleaning up division followed the welders under the charge of a boss cleaner, who had two large motor flat cars and six trail dump cars under his control. Cleaning up was carried on night and day, entirely by cars.

The company has various other types of track construction which were put in by the old companies before the consolidation, but those illustrated here are much preferred for the advantage of quick construction.

The largest number of feet of track laid by this department, through the summer just passed, was 2,760 ft. in a day of 10 hours, except in Utica St. This record was made on North Main St., an asphalt street. During the entire season, the rate of track laying

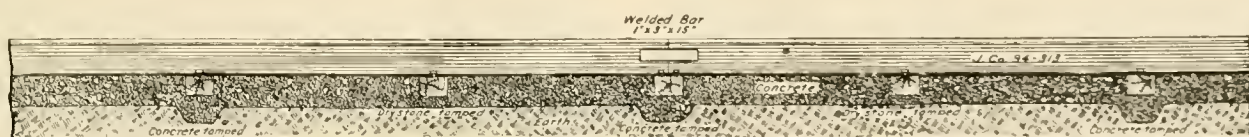


FIG. 4.—LONGITUDINAL SECTION OF FIG. 3, BEFORE PAVING.

per day averaged 1,100 ft., without taking out Sundays and rainy days. In the Utica St. job mentioned above 7,000 ft. were laid in 10 hours.

In our article on the International Traction Co. in the "Review" for December last the names of two of the officers were inadvertently omitted. The complete list of the managing officers of the allied companies controlled by the International Traction Co. are: President, W. Caryl Ely; vice-president, Daniel S. Lamont; chairman executive committee, Charles H. Coster; treasurer, R. F. Rankine; general manager, Burt Van Horn; superintendent Buffalo Ry., R. E. Danforth; passenger agent, J. E. Stephenson; electrical engineer, C. K. Marshall; engineer of way, C. C. Lewis; master mechanic, Robert Dunning.

The main office of the company is 178 Main St., Buffalo.

On page 819 of the December issue, the maximum pressure used in electrical welding is given as 35 tons; this should read 35,000 lb.

LAKE MANAWA & MANHATTAN BEACH R. R.

The Lake Manawa & Manhattan Beach Railway Co. is a new corporation which is to be operated in connection with the Omaha & Council Bluffs Railway & Bridge Co., between Omaha and Lake Manawa, Iowa. The directors are N. W. Wells, J. J. Brown, J. H. Millard and Guy C. Barton, of Omaha, and C. T. Stewart, Geo. F. Wright and W. S. Dimmock, of Council Bluffs. The officers are: N. W. Wells, president; J. J. Brown, vice-president; Charles T. Stewart, secretary; J. H. Millard, treasurer, and W. S. Dimmock, general manager. These gentlemen are connected with the Omaha & Council Bluffs Railway & Bridge Co. in similar capacities.

This new road will start from the foot of Main St. in Council Bluffs, which is the terminus of the present Pearl and Main Sts. line, of the Omaha & Council Bluffs Co., and run south to Lake Manawa, a distance of some four miles. It will then run around the lake to Manhattan Beach, another mile, making the line about five miles long.

The company expects to spend \$200,000 on this line and lake improvements. The company controls the entire south shore of the lake and 400 acres of land, which will be put in the best shape possible to attract the public as an amusement resort. A line of small steamers will be placed on the lake as well as electric launches and numerous row boats. The lake will be dredged and a summer theater will be erected. A beautiful club house will be set out in the lake, having dancing floors and the finest of restaurants. New bath houses will be built, and in fact everything done that pertains to a first-class summer resort. It will be similar in scope to Sans Souci Park, of Chicago, though the main attraction will be the bathing facilities, and the company controls the only real bathing beach upon the shores of the lake.

Some 15 new car bodies, 50 ft. long, with double trucks and high

speed motors will be purchased to operate the road and a new 800-kw. direct connected generator as well as additional boilers will be placed in the power house of the Omaha & Council Bluffs Railway & Bridge Co. to furnish power. The tracks will be laid with 65-lb. steel rails, 60 ft. long and will be well ballasted. The company owns its private right of way from Council Bluffs to Manhattan Beach, on the south shore of the lake, and is not compelled to ask for anything in the way of franchises, except permission from the city council to cross some six or seven avenues in the lower part of the city of Council Bluffs, which will undoubtedly be granted by the time it is ready to lay the steel at this point, as the public is very much in favor of the road being extended to the lake.

With Omaha, South Omaha and Council Bluffs, and the sur-

rounding suburban towns, the enterprise will have 200,000 or more people to support it; and, as it is the only lake of any prominence within 200 miles, and there are no other resorts in the cities mentioned, the road will undoubtedly be a success as well as the concessions that will be granted at the lake. The finest music available will be engaged for the grounds, and everything possible will be done to make the resort worthy of public patronage.

CORRESPONDENCE.

Editor "Review": We have noted in your issue of December 15th last, page 848, the valuable comment on training for the electrical engineering profession as embodying a number of suggestions that the foundation should be thoroughly laid in mechanical engineering. Permit us to bring to your attention the course in electrical engineering which we have recently organized here and which has been in operation since the opening of this college year.

The distinctive feature of this course is the recognition of the growing specialization in electrical engineering as in other branches of work; and the University of Illinois therefore offers three groups of elective studies, after the satisfactory completion of the first two and one-half years of work, in electrical engineering courses. These groups of electives are: 1. Regular electrical course; 2. Electro-physical course; 3. Electro-chemical course; and comprise the remaining one and one-half years of work of the four years' undergraduate course leading to the degree of B. S. in electrical engineering.

For the full professional degree of E. E., a further year of advanced graduate study and work is required, with still further provision for specialization, according to the direction of the student's activities and work in his undergraduate course.

The University of Illinois is, in its Group 1, the regular electrical engineering course, offering a very large amount of mechanical engineering that, of course, is not taken in the other two groups to such an extent. We might add that all of the courses in electrical and mechanical engineering have the same schedule of studies and work for the first two years of the four years' undergraduate course, so that the prospective mechanical and electrical engineering students all work together in all branches during their early formative period. Very truly yours,

WM. I. ALDRICH,
Professor of Electrical Engineering.

Urbana, Dec. 19, 1899.

PAYING CROSSING PATROLMEN.

The ordinance of the Consolidated Street Railway Co., of Grand Rapids, Mich., provides that the company shall pay the cost of maintaining patrolmen at such crossings as the common council shall designate, and of late the council seems disposed to designate too many crossings. The company claims that the clause is intended merely to indemnify the city against the cost of maintaining those patrolmen who are rendered necessary by reason of the street railway company being in the streets, and that in nearly all cases the patrolmen would be needed just as much if there were no street cars. As a compromise the company proposes to pay a portion, not exceeding one-fourth, of the cost of patrolling four street crossings.

TROLLEY FUNERALS IN MILWAUKEE.

The experiment of trolley funeral trains is reported to be contemplated by the Milwaukee Electric Railway & Light Co. Perhaps it is scarcely proper to say experiment in referring to such a service, but as conditions vary so much in different cities, each road must make the trial for itself.

As our readers know, the funeral service provided on the street railways in San Francisco, Denver, Chicago and elsewhere is greatly appreciated.

The Benton Power & Traction Co., of St. Cloud, Minn., was unable to complete its power plant by December 15th as planned and was obliged to shut down its street railway service because the company from which it had formerly rented power could no longer supply current.

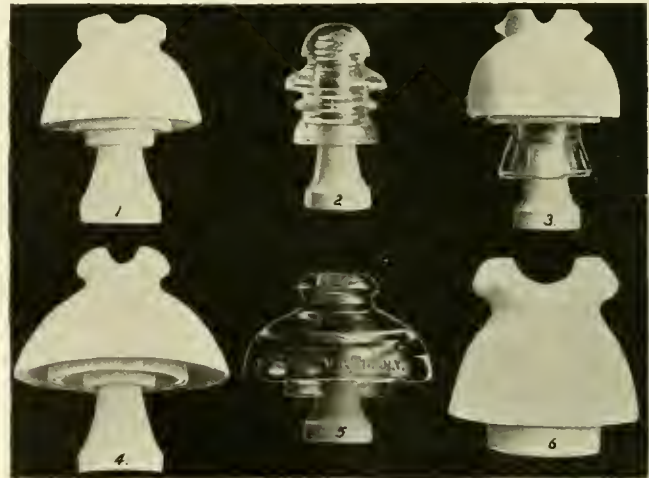
ONE WAY OF DOING IT.

The street railway company which is seeking to build through the town of Lemont, Ill., desired a right of way over a street which had two names; it had more frontage consents than were necessary on one end, and the combined totals exceeded the majority, but by reason of the two names could not get the right of way on one end of the street. The difficulty was surmounted by securing an ordinance giving the street the same name throughout its entire length.

INSULATORS FOR ORDINARY AND HIGH TENSION CURRENTS.

The group of porcelain and glass insulators shown in the accompanying illustration exhibits a few of the most important types of these goods as made at the establishment of Fred. M. Locke, at Victor, N. Y. The capacity for resisting high pressures is stated in connection with the different types. This petticoat type of insulator was designed and patented by Mr. Locke, and is in use on many high tension lines in this country, including the 11,000-volt transmission line between Niagara Falls and Buffalo.

Mr. Locke claims to produce only high class goods, and from observations made on several different occasions, it would seem difficult to suggest any additional precautions, facilities or methods



LOCKE INSULATORS.

1. For 25,000 Volts.
2. Transposition.
3. For 25,000 Volts.
4. For 40,000 Volts.
5. Glass, for 50,000 Volts.
6. Street Railway Cable.

that would be necessary to sustain this claim. Mr. Locke being an expert chemist, makes a chemical test of every batch of clay bought, so that he is sure of his mixtures, and sure that the goods when they leave the kiln are of a uniform and safe grade. For the purpose of making these tests he has fitted up a large room in his dwelling house with an elaborate chemical outfit, and here samples of all clays and kaolins required, both native and foreign, are brought, so that no clay dealer is able to palm off upon this establishment an inferior material. Mr. Locke's new catalog, No. 4, describes in detail his high insulation line material.

TICKETS INSTEAD OF ANNUALS.

The Metropolitan Street Railway Co., of Kansas City, Mo., has decided to abolish annual passes and issue instead books of coupons. There are two reasons for the change, to prevent people who have no passes from getting on the cars and calling some number to the conductor with the expectation that he will not ask to see the pass, and also to protect the conductors, who have the habit of merely nodding to passengers who they know have annuals, from being reported for missing fares.

December 15th, a trolley car in Cincinnati was struck by a Pennsylvania train; the car was demolished and a number of passengers stunned, though none was seriously injured.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO

AFFIRMS SUPERIOR RIGHT BETWEEN CROSSINGS AND EXCLUDES MOTORMAN'S NARRATIVE.

Citizens' Street Railroad Co. v. Howard (Tenn.), 52 S. W. Rep. 864. May 18, 1899.

With reference to the preferential right which a street railway company has between crossings, the supreme court of Tennessee says that the rule is well established that street railways have the superior, though not the exclusive, right of way between street crossings.

The court further holds that it was error to admit statements of the motorman made to a witness after probably fifteen minutes had been consumed in extricating a man from under the car, etc., as that "he saw plaintiff, but thought he would get off the track," this being deemed merely a narrative of a past occurrence.

NO PUBLIC POLICY AGAINST EXTENSION OF TER- MINI.

State v. Lindell Railway Co. (Mo.), 52 S. W. Rep. 248. June 30, 1899.

There is, and can be, the supreme court of Missouri holds, no public policy which would prohibit a street railway from extending its termini, and thereby carrying the public a greater distance for the same price it was formerly authorized to charge for carrying them a shorter distance. Neither does public policy prohibit one street railway from acquiring another street railway, and making the two one continuous route, and charging the traveler one fare, where he had formerly been obliged to pay two fares to travel the same distance.

Moreover, the court declares that it can see no reason for making "fish of one and flesh of the other," where a street railway company has been granted the right by the city to make various extensions, which it has accepted and acted upon, and the attorney general challenges, and intends to challenge only, a part of them, whereas, if his contentions are correct, the company had no more right to accept any of the other of the grants than it had to accept those challenged.

THINKS ELECTRICITY COULD NOT ENTER CAR FROM BROKEN GUY WIRE.

Huck v. Rochester Railway Co. (N. Y.), 59 N. Y. Supp. 1107. July 18, 1899.

The plaintiff alleged in her complaint that by reason of the negligence of the defendant, while the plaintiff was riding in one of its cars, the car suddenly stopped, and the wires conducting the electricity used for the propulsion of the car, and the guy wires used to keep the trolley wire in proper position, were so disturbed and broken that the plaintiff received a severe electrical shock, and her legs, feet, and back were burned, and the plaintiff was otherwise severely injured. It seems that she was at the time the only passenger, and was sitting down, nearly in the middle of the car, but nearest the conductor's door, on the side nearest the roadway, and facing the sidewalk. The car was going fast, and did not slow up as it approached a sharp curve. As it passed the curve there came a crash, the car stopped right there, and the lights went out. In other words, the car jumped off at the curve, and broke the first guy wire, carrying along with it 30 or 50 feet of the broken guy wire, 20 feet from the first. The plaintiff testified that she received the injuries alleged to have been sustained while seated, and by being thrown from side to side of the car—caused, as it seemed to her, by the electric disturbances. The only effect of the breaking of the guy wire was to cause the end of the broken wire to hang over the doorway of the car; the end hanging down part way or touching the ground. The trolley wire did not touch the car, or fall. The car, constructed in the ordinary manner of electric cars used on the street railways, was in perfect condition and order, and uninjured. No proof was offered by the plaintiff as to the way, or in what manner, an electrical current could, under such conditions,

have entered the car from the guy or trolley wire. The evidence of electrical experts called by the defendant fully explained the impossibility of such an occurrence from such a cause. Under these circumstances, the fourth appellate division of the supreme court of New York denies the plaintiff's motion for a new trial after a direction of a verdict in favor of the defendant. In doing so, it declares that the testimony of these experts just mentioned is in accordance with common experience that it is perfectly safe to ride in electric cars on the streets of our cities and towns, and that the electricity for their propulsion cannot enter into the car, to the injury of the passenger, either from the operation of the trolley or from a broken guy wire hanging over outside the end of a car.

WHEN ALIGHTING AFTER CAR HAS STARTED IS ON PASSENGER'S SOLE RESPONSIBILITY

Douyette v. Nashua Street Railway (N. H.), 44 Atl. Rep. 104. July 28, 1899.

The plaintiff was a passenger upon one of the defendant's cars, and in attempting to alight after the car had started was caught by the coat, and dragged some distance. There was evidence tending to show that his coat was caught beneath the outside door of the vestibule. There was no evidence that the car was defective. The jury was instructed that, "if he (the plaintiff) got off of a moving car, knowing or having reason to know that it was in motion, he took the chance of any injury that might result from such action, and cannot recover therefor." A verdict was returned for the defendant. In overruling the exceptions thereto, the supreme court of New Hampshire says that it only appeared that the plaintiff was injured in attempting to alight after the car had started. It might be that the evidence showed that he had arrived at the age of discretion, was of ordinary intelligence, and was not under the influence of intoxication or other infirmity, and that he voluntarily, without any request by the defendant, or special occasion for so doing, attempted to alight from the car while it was in motion. If such was the evidence, it holds, he certainly would have no reason to complain of the instruction given. The act would be wholly his, and he alone would be responsible for its consequences.

LIABILITY FOR LEAVING SNOW REMOVED FROM TRACKS IN BANKS ON THE SIDES.

Smith v. Nashua Street Railway (N. H.), 44 Atl. Rep. 133. Mar. 17, 1899.

Aside from the common law liability of any person who places an obstruction in the highway, or causes any defect in it, in consequence of which another suffers a special damage, the supreme court of New Hampshire calls attention to the fact that section 1 of chapter 59 of the laws of that state of 1893 provides that "any person or corporation except municipal corporations through whose negligence or carelessness any obstruction, defect, insufficiency, or want of repair in a highway is caused, shall be liable to any person injured by reason thereof." An "obstruction, defect, insufficiency, or want of repair," when used in this connection, it holds, is such as renders a highway unsuitable for the public travel thereon.

Although the defendant's charter does not expressly authorize it to remove the snow from its tracks, the court further holds, it has the right, by implication, to do so sufficiently to operate its road for the accommodation of the public. But, in the exercise of this right, it is bound to consider the rights of the public generally to the use of the streets, including those portions occupied by the defendants' tracks.

Travelers while driving from one side of the street to the other, the court goes on to say, are entitled to find the passage reasonably safe. If, after storms, the tracks are cleared, so that steep banks of snow are left on either side, the use of a portion of the street may be attended with great danger. Should the character of the banks be such as to make the street unsuitable for public travel, the banks would be obstructions, and the street would be defective and insufficient.

In the removal of snow, the court declares, ordinary care must be used to avoid so changing the general surface of the street as to render it unsuitable for the public to travel thereon.

This was an action brought to recover damages for injuries to the plaintiff's intestate, who, while attempting to cross the defendants' track was thrown from his sleigh and injured. The evidence tended to prove that the cause of the accident was the existence of a hard, steep bank of snow and ice in the street, on the side of the street railway track, running from the rail to the height of from 10 to 20 inches, made by the defendants in plowing out their tracks. The court holds that there was evidence proper for the jury to consider upon the question of the defendants' negligence. It says that it tended to prove that in plowing out the tracks, some 10 days before the intestate received his injuries, the company made a dangerous bank of snow and ice where the accident occurred, and that, even if this unsafe condition of the street was unavoidable when the track was cleared, a reasonable length of time had elapsed before the accident in question occurred in which its dangerous character might have been removed.

There was a verdict for the plaintiff, and the supreme court overrules the defendants' exceptions.

ACTS ON DIVIDED REPORT ABOUT USING ROADWAYS IMPROVED AT PRIVATE EXPENSE.

In re Port Chester Street Railway Co. (N. Y.), 60 N. Y. Supp. 160. Oct. 3, 1899.

The second appellate division of the supreme court of New York is of the opinion that the state constitution contemplates that the determination to be reached is that of the court as well as that of the commissioners, where the court is authorized to appoint commissioners to determine whether a street railroad ought to be constructed when the consent of the abutting owners cannot be obtained therefor. All of the purposes of the commission, it says, have been fulfilled when the commissioners, after notice to all parties, have heard the evidence and have made their report to the court, whether that report shall be unanimous, or by a majority of such commissioners. The determination of the commissioners is without force or effect until it has received the sanction of the court, and the fact that it is necessary for the court to confirm the report devolves upon it the duty of determining for itself whether the facts disclosed to the commissioners are sufficient to justify the granting of the petition. And so the court holds that it is authorized to act on a report of a majority of the commission. This report here was in favor of the construction of the proposed road. But the court, having considered the evidence before the commissioners and reached the conclusion that no considerations of a public nature demanded the construction of the road over the particular route selected by the projectors of the enterprise, it holds that the report ought therefor not to be confirmed, and denies the motion to confirm it.

The roadways over which the proposed street railroad was to pass, it says, had been improved at private expense; large sums of money had been expended by individuals to make a high-grade driveway leading out to the summer homes of a large number of people, who had made investments and fitted up handsome residences, greatly to the advantage of that particular section. And while the highways are the common property of the people, and considerations of a private nature must yield to public necessity or convenience, the court declares that there was no good reason why these particular roadways, improved at private expense, should be appropriated by a corporation, when there were other ways which would answer equally as well every purpose of a public nature.

Moreover, while the only question before the commissioners was whether the street railroad should be constructed over the particular route selected by the company, it was proper, in determining this question, the court holds, to consider whether there were other routes equally available, and which were calculated to accommodate the public in an equal degree, if there was a necessity for the construction of the street railroad at all.

Considerations of public policy, in view of the generally poor highways in rural districts, the court goes on to say, forbid that it should permit the work of individuals in improving driveways to be appropriated by corporations, when no public necessity calls for such a sacrifice of quasi private rights.

CONSIDERATION OF NAME OF EMPLOYEE, NOT HAVING CONDUCTORS, PRESENCE OF CORD AND BELL, NONOBSERVANCE OF RULE, GETTING UPON RUNNING BOARD, AND DEATH FROM BLOOD POISONING.

Armstrong v. Montgomery Street Railway Co. (Ala.) 26 So. Rep. 349. June 30, 1899.

A passenger, from his casual and temporary relations to the carrier's employes, the supreme court of Alabama says, is not in a position to be better informed than the employer as to the name of an alleged negligent employe, so that it has never been held or supposed, and is not the law, that when he is injured through the negligence of an employe, and sues to recover damages therefor, he should, under the employers' liability act, aver the name of the employe, or his ignorance of it.

The operation of the defendant's street cars without conductors, the court holds, cannot be said, as matter of law, to be negligence. Consequently, it having been averred that the failure to have a conductor on a certain car was negligence, the court holds that the averment should have been allowed to stand, so that evidence might be adduced upon it for the jury's consideration in determining—first, whether such failure was negligence; and, second, if it was, whether the negligence combined with the other alleged acts and omissions to produce the passenger's death, the plaintiff having undertaken to show that the passenger's injury resulted not from one or more of the negligent acts and omissions alleged, but from all of them operating together to the disaster complained of.

Surely, the court further holds, the passenger could not be held to have been guilty of contributory negligence upon the mere fact of the presence of a cord and bell, and that, of course, if he was not negligent in respect of these appliances, the fact that the car was equipped with them was of no pertinency in the case.

A rule of a street railway company that passengers must not leave its cars while they are in motion, the court holds, is a reasonable rule; but, it also insists, a passenger cannot be charged with negligence for its nonobservance unless he knew of it, though conduct in violation of the rule might be negligent without reference to it.

And the court holds that whether the passenger was guilty of negligence in getting upon the running board, preparatory to alighting, while the car was in motion, was a question for the jury.

Last of all, the court holds that one guilty of negligence should be held responsible for all the consequences which a prudent and experienced man, fully acquainted with all the circumstances which in fact existed, whether they could have been ascertained by reasonable diligence or not, would, at the time of the negligent act, have thought reasonably possible to follow, if they had occurred to his mind. Applying that rule to this case, the court holds that, there being a reasonable possibility of blood poisoning being developed or produced by the wounds to the fingers which the passenger received, and blood poisoning having resulted from the wounds and produced death, death was therefore within the range of responsibility for the negligent act which inflicted the wounds.

DUTY AS TO FILING MAP AND CONSENT OF LOCAL AUTHORITIES BEFORE BUILDING EXTENSION ACROSS STEAM RAILROAD IN NEW YORK.

Delaware, Lackawanna & Western Railroad Co. v. Syracuse, Lakeside & Baldwinsville Railroad Co. (N. Y.), 59 N. Y. Supp. 1035. July, 1899.

The provision of section 90 of the railroad law, as amended by laws of 1895, which says that every street surface railroad corporation before constructing any part of its road upon or through any private property described in its statement, and before instituting any proceedings for the condemnation of any real property, shall make a map and profile of the route adopted by it upon or through any private property, etc., a special term of the supreme court of New York, Onondaga County, says, was doubtless mainly intended to apply to cases in which resort might be had to condemnation proceedings to acquire right of way over ordinary private lands. But notwithstanding this, and that in some respects its requirements are not especially appropriate to a case of building an extension of a street surface railroad across a steam railroad, the court holds

that, as the statute, independent of condemnation proceedings, calls for the filing of a map, etc., before entering upon private property, the steam railroad property to be so crossed is within the meaning of this provision. The court is of the opinion, however, that the benefits of this provision are to be invoked by each owner as to his own property, and that he cannot complain because a map has not been filed of the proposed route through the lands of some other person. And certainly, it says, one property owner cannot enjoin the construction of a road because the builder thereof has not filed a map of its proposed course through private lands where a right of way has been amicably secured. Again, it says that it is to be observed that this provision does not require a map and profile of the entire route which might be of general use to all property owners, but only of the route through private property, which, naturally, will be a matter of interest in each case to the individual owner.

The court further holds that, before crossing the steam railroad, the consent of the local authorities must not only be obtained, but filed in the office of the county clerk, as required by sections 91 and 92 of the railroad law.

The contingency of the street surface railroad company being compelled by a final decision to make "compensation," the court holds, can be safely provided for by the giving of a sufficient undertaking.

Finally, the papers in the case before the court failing to establish that the company was attempting in bad faith to evade the provisions of the statute by constructing a street surface railroad under the guise of a branch or extension, the court says that it sees no adequate reason for treating the construction as other than an "extension," exempted from the requirements of a certificate of public necessity.

CAN OPERATE CARS INTENDED EXCLUSIVELY FOR CARRYING FREIGHT AND EXPRESS MATTER.

Degrauw v. Long Island Electric Railway Co. (N. Y.), 60 N. Y. Supp. 163. Oct. 3, 1899.

Street surface railway companies, authorized by the general railroad law of New York, the second appellate division of the supreme court of that state holds, can operate cars designed and intended exclusively for carrying express matter, freight, or property, and used exclusively for such purpose.

It is not doubted, says the court, but that the legislature has authority to charter a street surface railroad company, and grant the power to carry freight exclusively or passengers exclusively, or unite the authority to carry both. But the company that assumes to exercise the power in question, it also maintains, must justify the right to do so by the terms of some grant of power as broad as the acts themselves.

The statutory grant of authority in question being to convey "persons and property in cars for compensation," the court does not think it reasonably conceivable that the legislature intended that it should be cut down as though it said "passengers with property." In the ordinary carriage of passengers upon street railroads, the court goes on to say, it has never been thought that passengers carrying small articles, or such baggage as may be carried by hand, was the occasion for the use of the word "property" as used in the statute. The regulation for the carriage of such property, that which accompanies the passenger, even upon commercial roads, is usually by rule of the company, and not by statutes. It stands upon a different footing from the carriage of other property, and by common acceptance is usually denominated "baggage," or, to adopt the English expression, "luggage," meaning, in popular phrase, that which is carried by the person. No such limited meaning is to be ascribed to language deliberately used in a statute, where the interpretation placed upon it is as discriminating freight, quite independent of passage by its owner. Again, in the use of the word "compensation," the court sees an indication of an intent upon the part of the legislature to embrace the subject of the transportation of passengers and of property.

Nor is the court at all sure that the transportation in single cars of such property as must be transported throughout the city in cars or upon wagons will increase the burden of use of the street. Time, it says, will demonstrate whether the use of cars is more burdensome than that of wagons.

And the court does not apprehend that its present construction of the statute will entail all of the evils which it was argued must follow in the train thereof. While, in the struggle which is going on for the transportation of persons and property, it must be confessed that street surface railroads are not backward in the assertion of all the rights which the grant of power confers, and admitting that, in whatever right they have acquired to transport passengers or freight or property, they have a vested right, which may not be defeated or impaired by legislation, still, the court declares, the law is—and the courts may be relied upon to enforce the law—that the right of the street by the public is first and primary; and when the right of the public or an individual member of it requires the use of the street for a proper purpose, the rights of the railroad company must yield thereto, even though the effect be, for the time, to stop the operation of its cars thereon.

ASSUMPTION OF RISK IN USING VISE AND WORKING ON INSIDE OF A CURVE.

Shadford v. Ann Arbor Street Railway Co. (Mich.), 80 N. W. Rep. 30. Sept. 19, 1899.

A vise of which complaint was here made, the street railway company contended was in general use by railway companies in the same or similar lines of work, and that the proof offered by it established this contention. Now, if this contention was uncontroverted, the supreme court of Michigan says, that would be a complete defense, to this action for personal injuries. But the contention was controverted.

The plaintiff insisted that the tool was not a reasonably safe one for the kind of work in question; that, while it was in general use by electric railways, telephone and telegraph companies for many purposes which did not subject it to much strain, it was not in general use for drawing up trolley wires upon a curve, under the conditions which obtained when the accident in question happened. And there being many witnesses produced to show the truth of this contention, and the testimony for and against it being very contradictory, the supreme court holds that the question of whether the instrument was in common use in the same or similar lines of work became a controverted fact—a question not competent for the court to decide as a matter of law, but a question of fact very proper to be left to a jury under proper instructions.

The court goes on to state that the rule is too well settled to be longer open to discussion that when a servant enters upon employment which is, from its nature, dangerous, he assumes the usual risks and perils of the service, and this is equally so as to those risks which require only the exercise of ordinary observation to make them apparent. But here, again, the plaintiff maintaining that he was not acquainted with the dangers of the employment, and was not familiar with the tools used in the work of this character; that he was told that the vise was a suitable tool for this work, and that it would hold anything; that he relied upon this statement; and that the danger attending the use of this vise consisted of its treacherous nature, of which there was nothing in its construction to give indication, the court holds that, if such were the facts, the doctrine of assumption of risks did not apply, and the question of fact was a proper one for the jury.

Then, the company insisted that, as a matter of law, the plaintiff was guilty of contributory negligence when he undertook to do this work from the inside of a curve. It argued that he was bound to know the workings of natural laws, and that any person of ordinary intelligence would know there was danger in being on the wrong side of a trolley wire stretched upon a curve and held in place by the grip of an instrument; and that the trial judge should have directed a verdict upon the ground of contributory negligence. But the plaintiff replied that he was not familiar with the fact that to work on the inside of the curve was more dangerous than to work on the outside; that, if the vise held fast to the guy wire, as he was told by the foreman it would do, which statement he believed to be true, it would not be more dangerous to work on the inside of the curve than on the outside, while the necessities of the business frequently made it necessary for the men to work on the inside of the curve, etc. In this situation, the court thinks that it was proper to allow the jury to say whether the plaintiff was guilty of contributory negligence.

Judgment for the plaintiff affirmed.

LEGAL PROOF NECESSARY TO GIVE JURISDICTION TO REGULATE CROSSING OF STEAM RAILROAD.

In re Trenton Street Railway Co. (N. J.), 44 Atl. Rep. 177. Oct. 9, 1899.

In an application, under the New Jersey act of Mar. 22, 1895, to regulate the mode of crossing a steam railroad by a street railway, authority being given to the chancellor, under specified conditions, to direct the mode of crossing, the court of errors and appeals of New Jersey holds that the petitioner must show, by due proof, that his application is within the terms of the statute. More expressly does the court hold that the petition, verified by affidavit and served is not sufficient proof to establish jurisdictional facts as to which the oath of the affiant is not competent evidence, although it may be a rule of the court of chancery that "affidavits and petitions duly sworn to, on which orders to show cause may be granted, if served as affidavits, may be used on the hearing of the order to show cause." In other words, the court declares that legal proof cannot be dispensed with, under this statute, by the rule of court. Such affidavits as those mentioned cannot be accepted as competent proof of the corporate existence of the street railway, or of a grant by a turnpike company to the street railway. Those are basic facts, and until they are made to appear by legal proof the chancellor is without authority to act.

RIGHT OF THROUGH PASSENGER TO RIDE AT LOCAL RATES.

Kissane v. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 79 N. W. Rep. 1104. Sept. 12, 1899.

On Apr. 10, 1899, the plaintiff boarded one of the defendant's cars at a point in the township of Canton, with the intention of going through to Detroit. He did not communicate this intention to the conductor. The through fare was 35 cents. He offered the conductor 10 cents, as a fare to Inkster. The conductor demanded 15 cents, and the 5 cents was paid under protest. On arriving at Inkster, the plaintiff tendered the conductor a ticket, costing 13 cents, when bought in a strip of five tickets, which ticket the conductor refused, demanding a cash fare of 20 cents, which the plaintiff paid to prevent being put off the car. This suit was then brought to recover the 5 cents which the plaintiff claimed was an overcharge for his fare to Inkster, and 7 cents, the excess of his cash fare over the ticket from Inkster to Detroit.

The case was tried before the court without a jury. The court found (1) that the plaintiff was entitled to ride from the point where he boarded said car in the township of Canton to the village of Inkster for the sum of 10 cents, and that the additional sum of 5 cents was wrongfully exacted, and for which he was entitled to recover; (2) that the ticket tendered at Inkster entitled the plaintiff to ride from Inkster to the city hall in Detroit, and that, therefore, the 20 cents demanded and paid was illegally and wrongfully exacted, and the plaintiff was entitled to recover the difference between 13 cents, which he had paid for his ticket, and the 20 cents exacted, or 7 cents for that part of the route, making 12 cents in all, with his costs of suit, not exceeding \$25.

The supreme court of Michigan holds that the judgment of the circuit court must be affirmed. It holds that the Canton township franchise, which fixed the maximum fare at 5 cents, entitled the plaintiff to the right to be carried through that township for 5 cents, though he may have intended at the time of taking passage to go beyond the limits of the township, and that this limit of fare in the franchise could not be held to apply to local passengers alone, but must apply to all who desired passage, even if going beyond the limits of the township. The company had no right to make such a discrimination. So, when the other township which he must go through to reach Inkster limited the maximum fare therein to 5 cents, that made the maximum fare through the two to Inkster 10 cents. Another franchise not only limited the fare from Inkster, but the court says that the ticket produced was itself a contract binding upon the company to accept it for one fare from Inkster, as it was unrestricted and unlimited.

The statute under which the defendant company was organized provides that "any company organized under the provisions of this act may construct, use, maintain and own a street railway for the transportation of passengers in and along the streets and highways

of any township, upon such terms and conditions as may be agreed upon by the company and the township board of the township, which agreement and acceptance by the company of the terms thereof shall be recorded by the township clerk in the records of the township."

Street railways, the supreme court declares, are bound by such agreements, and the defendant could not release itself from the obligation to comply with these agreements in the townships through which it passed because the passenger intended to take passage to some other place.

Nor does the court consider that an extra 5 cents could be charged, besides what a township franchise authorized, for fare through a village, so long as the latter was wholly within the township, although a franchise obtained from the village provided that no passenger should be carried for a less fare than 5 cents for any distance. This the court construes as authorizing merely a charge of 5 cents for any short trip which would otherwise, on a prescribed mileage basis, amount to less than that sum, and not as authorizing a charge of 5 cents extra for riding through the village.

LIABILITY FOR INJURY OF NEW PASSENGER ON RUNNING BOARD OF GRIP CAR.

Bertram v. People's Railway Co. (Mo.), 52 S. W. Rep. 1119. "Memorandum decision." April Term, 1899.

The plaintiff obtained a judgment for \$3,500, upon a petition bottomed upon an averment that the train was slowed up, coming nearly to a stop, when, upon the invitation of the defendant's agents and servants in charge of said train, he stepped upon the running board of the grip car, and before he had time to take a seat the car was started with a violent lurch, so that it threw his body outward, and brought it into contact with a wagon standing near the track, and which the defendant's agents saw, or could have seen by the exercise of reasonable care, but which the plaintiff did not see because his back was turned towards it, whereby he was injured. Admitting that, measured by rules which he deduces from the adjudicated cases, the petition stated a good cause of action, nevertheless, of law and fact set forth at some length, including a belief that the evidence did not tend to support the petition in some vital points, Mr. Justice Marshall says that he thinks the judgment of the circuit court ought to be reversed; but, the court (division No. 1 of the supreme court of Missouri) not concurring, the case was transferred to the court in banc.

MUST SHOW FACTS FROM WHICH EXERCISE OF PROPER CARE MAY BE INFERRED.

Lorickio v. Brooklyn Heights Railroad Co. (N. Y.), 60 N. Y. Supp. 247. Oct. 10, 1899.

While it is not necessary to produce direct evidence of lack of contributory negligence in every instance, the second appellate division of the supreme court of New York holds, it is necessary to show facts and circumstances from which the jury might reasonably infer that the deceased was exercising proper care. There are no presumptions in favor of the plaintiff. The burden of proving the case is upon the one who seeks to recover.

Here was an action brought by the plaintiff, as administratrix, to recover damages sustained by the death of her son, due to an accident on a line of street railway, at a street crossing, where he had been seen just before the accident—according to one witness—leaving the curb not more than 20 feet in front of the car. The entire evidence in support of the plaintiff's case established no more than that her son, a bright boy, in good health, who discharged his duties as barber well, was run over and killed at the intersection of two streets, by a car which was being operated at a rate of speed which one witness testified was too high to permit him to get off, and which was sufficient to carry the car 75 feet after striking the boy before it came to a standstill. The court remarks that, so far as shown, the speed might have been two miles an hour or ten, and that there was no evidence as to the grade at the point of collision, nor as to the distance within which the car might have been stopped under the circumstances, nor of the conduct of the motorman.

Under these circumstances, it insists that no end of justice could have been promoted by submitting the case to the jury, and affirms a judgment against the plaintiff, for costs, with costs.

IS ADVERTISING AS PROFITABLE TO STREET RAILWAYS AS TO STEAM RAILROADS?

Abstract of an address before the Massachusetts Street Railway Association by Robert H. Derrah, Dec. 13, 1899.

Every president, manager, and even the employe is, or should be interested in the matter of increasing the revenue of his road, and the general talk which I shall make, may give you some suggestions as to how this may be done through the means of publicity.

Ten years ago, here in eastern Massachusetts, there were 28 street railways, operating 600 miles of tracks, in 48 cities and towns. All the roads, with the exception of the West End (now the Boston Elevated), the Lynn & Boston and the North Woburn street railways, were isolated. Ten years ago the street railways were built for the business man who wished to go to or from his work, or the woman who wished to go down town to do her shopping and return on the cars afterwards; it was purely a business man's institution. The roads were built in the thickly populated sections of the different cities and towns because there was a revenue to be derived from the traffic to be picked up along the line. There were no opportunities afforded the people who wished to take a ride in the country for an afternoon's outing. The street railways did not consider it advantageous to extend their lines into the suburbs unless there were a suburban population to be brought into town or the connecting of large centers such as Boston, Lynn and Salem.

Since that time, however, these cities and towns have been connected by electric lines, running in most cases, over the old country turnpikes, until today we have some 75 street railways in eastern, central and southern Massachusetts, directly connected with Boston, operating some 1,400 miles of tracks in 130 odd cities and towns, and forming a great network between the centers of population. There are figures to show that within 50 miles of the Boston City Hall there are 2,392,394 people, while within the same distance from Philadelphia there are 2,361,041 and within 50 miles of the Chicago City Hall 1,915,716. It is a fact that only a small proportion of these 2,300,000 people around Boston understand that there are so many places directly connected with Boston by the trolley cars, and it may be news to some of you to know that there is not a town in this state with a population of more than 3,000 that has not a street railway in operation or under construction.

Now a great many of these railroads run through country districts where there is very little traffic to be picked up on the line, and some of them connect places where there is not sufficient travel between their termini to pay operating expenses. Why have they been built? Look over the figures for their year's business and you will see that in the summer months they carry a very large volume of traffic which is able to make up any losses which they may sustain in the winter. The truth is that the extension of the street railways of eastern Massachusetts has led to the growth of a new kind of business—the pleasure travel. A business man will take a car to go to or from his work. The man who has no occasion to use the car for business will take the trolley car that passes his door for it affords him an afternoon's outing in the country at a small expense and places within easy reach hundreds of places which he has intended to visit, but which have heretofore been difficult of access.

Looking back to the time when the street railways were all located in the cities and were disconnected, you will find that the population then served was less than 1,170,000. Taking the population and the number of passengers carried, you will find that each person rode on an average of 123 times within the year. Since then, although the mileage of the electric lines has increased something like 125 per cent, and the population served has increased 50 per cent, the individual riding has more than kept pace with the growth of facilities and the advance in population, so that each person now rides on an average of 160 times within the year. Now we all know that this increase of mileage, as I have said, has largely been through the country districts, where there was not the additional population to be picked up, and all this goes to show that the increase in travel is very largely pleasure travel.

About 15 years ago the steam railroads of the country found that there were these two classes of travel to be catered to, one the regulars, and the others what they called the "floaters." The

regulars were interested in the railroad only so far as changes in the rates of fare, running time and schedule were concerned. The floaters were that class of people who had no regular route to follow, but were looking for information as to where they might spend a holiday or a vacation, the places of interest on the different steam railroad lines, the possible points they were able to reach, the cost of getting there, etc. The railroads found that a man in Colorado might wish to spend his vacation in Boston and a man in Boston might wish to go to Colorado. The receipt from this class of travel began to be such that the different lines all began to make an effort to secure it, and the man in Boston who did not know where he would go was invited by one company to go to Yellowstone Park, by another to visit California, by another to go to the White Mountains, and so on. To reach the regular patrons of the railroads a notice posted up in the stations was sufficient. To reach the floaters, it was found necessary to appeal to them in a variety of ways. The railroads advertised their varying attractions in the newspapers and the magazines, sent out letters and circulars, and within the last 10 years have generally issued booklets which they have distributed free all over the country. Some of the railroads not only distributed these booklets, but they sent out competent lecturers to different sections of the country from which they thought they might draw travel, giving illustrated lectures upon the points of interest reached by their system. The Santa Fe company issues a handsome book of 125 pages, finely illustrated, describing the scenery to California and back. Nothing in the nature of a railroad advertisement is inserted in the book, but there is a slip enclosed giving the location of the Santa Fe offices in different parts of the country. Does this pay? The answer is that the road has just issued the 124th thousand of these books, which are given away. People see the book, become interested in the reading matter and pictures, keep it because it is handsomely gotten up and is in no sense a cheap thing, and after they get interested in the West, write to the ticket agents for further information. The Boston & Maine R. R. issues many handsome books, and every year in greater quantities. They help a man in planning his vacation, and get him interested in that line, and there is no question that they pay, or the railroad company would soon stop issuing them.

To get up such booklets successfully, one must be familiar with the country through which the lines pass, the location of historic places, the picturesque scenery, and this must be put up in an attractive form, so that people will not throw the book aside as a cheap thing unworthy of their attention. The succeeding issues from year to year must have new matter and new pictures, and come to the readers as new attractions for their attention. One might think that ten years of persistent advertising of the attractions along the Boston & Maine, for instance, would have familiarized almost everybody who travels, with the places along that line, but the fact is that the amount of pleasure travel is constantly increasing and that people who have taken a single trip one year take two trips the next year. The different lines have their own individual features and advantages to offer the public and these illustrated booklets can be made so interesting and so artistic that they are not only worth reading, but worth preserving. On account of the different features and advantages of different lines, no set rules or forms can be followed, which adds to their attractiveness. Not every man will accept the first invitation to travel which comes to him in these publications, but if you keep putting the subject into his mind, he will come to travel sooner or later. It is this persistent advertising of the steam railroads which takes so many travelers in summer to all parts of the country.

I think I have said enough to show you that the steam railroad managers, who are generally pretty wide-awake business men, consider this advertising for pleasure travel as one of the best means of earning revenue for their roads. Now, I would like to ask you what the street railways of central, eastern and southern Massachusetts are doing in the way of impressing upon the minds of not only the two or three millions of people reached by their lines, but the million of people who visit these cities and towns annually, that their lines afford the best and cheapest means of visiting points of interest, seashore resorts, historic places, etc., from the city of Boston. Travelers who have come home from long journeys on the steam roads are well informed about these distant places, but there are many of them who know nothing of the historic and interesting places which may be reached by trolley from their own doors. I

think you will all agree with me when I say that there is no part of the United States richer in diversity of scenery, in historic associations and points of varied interest than this very section of eastern Massachusetts which is so well covered by electric lines. What the steam railroads of this country have done in securing additional revenue through people making long pleasure trips may be done by the street railways among the people who would take the shorter and cheaper trips which are within the reach of everybody, and many of whom cannot afford the time or money for long trips. The street railways of this section, represented in this Association have not only the material to describe and illustrate in order to attract travel, but they have the people who are ready and willing to take advantage of the opportunity if it is brought before them in the right way.

Now it seems to me that it is time for the electric railways of Massachusetts to take a leaf from the book of the steam railway passenger agents. It is more perplexing, today, to find out how to reach various points within a few miles of Boston by the electric cars than it is to find out how to go to points in any section of the country traversed by the steam railroads. If a traveler to a distant section of the country wants information about some point he goes to the agent of the local line, and not only finds out about that line, but all its connections, and often has a choice of routes on connecting lines in getting to his destination. The man who wishes to take his family for a couple of days' riding on the trolley cars must have some special means of getting information, or he is obliged to communicate with the various companies over whose lines he will pass in order to find out about running time, rates of fare and connections. A great many people, knowing of the work which the steam roads have done in issuing illustrated booklets, for free distribution, naturally imagine that the trolley lines have done something in the same direction, and I may say that you gentlemen are not in a position to know how great is the demand for such publications. The street railways in this section of the country do not advertise in the newspapers, magazines or illustrated booklets except in a limited way. One might say that they have done practically nothing in the way of building up pleasure travel. It seems to me that you should see that the present is a most opportune time to take advantage of your opportunities, and educate the people to taking these pleasure trips by trolley. It is not a matter of spending a few dollars to help somebody to get up an advertising circular which will be looked through for information and thrown away when the traveler finds that it contains plenty of advertising, but little of the information wanted. It is the time to set forth the advantages, points of interest, routes, rates of fare, parks and attractions of the street railways of eastern Massachusetts in attractive booklets which will give people a desire to travel on these street railways. Such publications would not only be in great demand by the traveling public, but I think you would soon find that they resulted in an increase of travel in pleasant weather which might be directly attributed to their influence, and which the trolley lines would not get otherwise.

About four years ago it occurred to me that the public had no idea of the magnitude of the street railway system of eastern Massachusetts, nor of the places that could be visited by trolley at a small expense. I believed that there would be a great deal more of pleasure riding on the street cars if the public knew where to go, what to see, how to get there, and what it would cost. I published a book for two years giving general information, with a map of the street railways of eastern Massachusetts. The third year I was convinced, by many requests I had received, that a great many of the people who used my book wanted more information as to the points of interest, and I added a large amount of descriptive matter, together with some half-tone illustrations, making an attractive publication which would make a favorable impression upon the constantly growing number of pleasure excursionists. This was not a book to be given away. Every purchaser—and there were no unsold copies left over from year to year—felt that he was getting something of value.

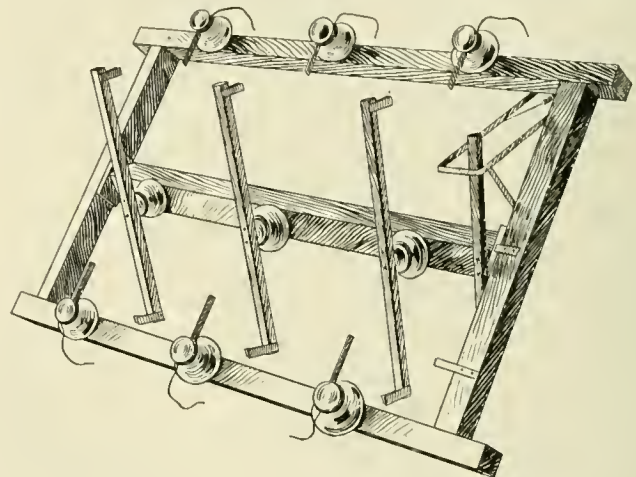
There is no street railway man in Massachusetts qualified to give the public the information they desire in reference to the network of electric lines, and it therefore seems to me that one of the best paying investments for the street railways is to have them all combine and pay their proportionate share towards maintaining an office in Boston for giving the public this information. I am sure that if a sufficient amount of money were appropriated to publish in the different papers the fact that an office of this kind has been estab-

lished for the benefit of the general public, it would be a very popular office and a great benefit to the mass of people asking for such information.

Should we go into any steam railroad office, we would find elaborate pictures illustrating some beautiful scenery through which the lines pass in the south, or west, or wherever it may be. If an office for the street railways were opened in Boston with photographs of historical places, seashore resorts, inland scenery, etc. it would be most interesting.

HIGH TENSION SWITCH.

The Power Development Co., of Bakersfield, Cal., employs an ingenious combination fuse and switch on its high voltage transmission line for cutting out sub-stations for purposes of inspection or cleaning. As will be seen from the illustration, the device consists of a frame, supporting on insulators the terminals of the line wires and the wires leading to the sub-station. Within the frame is pinioned a 4 x 4 in. timber carrying arms provided at their ends with switch clips, designed to engage the wire terminals when the switch is closed and complete the connection. On turning the



DETAILS OF WHORFF HIGH TENSION SWITCH.

central timber, which is done by means of cords attached to one arm and leading to the ground, the station is entirely isolated from the line. The switch clips form the terminals of a copper wire fuse 28 in. in length.

The switch is supported on two poles just outside the station and has handled successfully for some time a current of between 10,000 and 11,000 volts. It is the invention of Frank T. Whorff, superintendent of the Power Development Co.

TRANSFERS IN CHICAGO.

One of the discouraging things met by street railway managers who would fain have a good opinion of patrons of their roads is the dishonesty in the use of free transfers. There is a general feeling that to outwit a corporation is a praiseworthy action, and men who would scorn to steal a nickel from the company's till were they to visit the treasurer's office have no scruples in buying a transfer from a newsboy for 3 cents and by riding on it beating the railway out of a fare.

The Chicago City Ry. has for a long time suffered from the newsboy-passenger combination, its very liberal transfer system making it particularly vulnerable. The company's policy heretofore has been to issue transfers at the time the fare is paid, the ticket being good on all intersecting lines, but quite recently it was decided to issue the transfers at the transfer point, making them good at that point and for 15 minutes only.

By a vote of 51,855 to 25,331 the question of replacing the street railway tracks on Tremont and Boylston Sts. in Boston, which were removed when the subway was completed, was decided in the negative, it having been submitted to a popular vote at the last election.

KANSAS CITY-LEAVENWORTH ELECTRIC RAILWAY.

One of the latest interurban roads to go into operation is the 24-mile line from Kansas City to Leavenworth, Kan., known as the Kansas City-Leavenworth Electric Ry. The line runs parallel to the Kansas City & Northwestern R. R. from Kansas City, Kan., to Vance, a distance of eight miles. It then crosses that line and strikes across the country to a point just south of the village of Conner, whose name has been changed to Wolcott, in honor of Herbert W. Wolcott, secretary and general manager of the company, who was largely instrumental in bringing about the successful completion of the road. From Wolcott the route runs parallel to the main line of the Missouri Pacific R. R. almost to Leavenworth Junction; it then passes westward to Lansing and through that city to the Soldiers' Home, Leavenworth and Fort Leavenworth. The new line therefore comes into direct competition with two steam roads.

Kansas City has a population of 250,000 and its position as a railroad center for receiving and shipping freight will be of great value to the new company, as it is the intention to carry freight between Kansas City and Leavenworth at night, providing an outlet cheaper than over the steam lines for the Leavenworth factories, of which there are several, notably the Great Western Stove Works, the Great Western Milling Machinery Works, three large furniture factories, a shoe factory, mattress factory, etc. Beside these and some jobbing houses there are three coal mines in operation, with a prospect for a fourth, and when the freight rate is cheapened much of the coal traffic is expected. As a rich farming and fruit growing country is traversed, it is believed much patronage will come from the farmers.

Leavenworth is a growing and prosperous city of about 25,000 people, with a large military post at the north and a Soldiers' Home at the south, both beautiful suburban excursion points, made more interesting because of the fact that the federal prison containing nearly 1,000 military and other prisoners is located at the military post, and the Kansas state prison, with 900 convicts, is situated 1½ miles from the Soldiers' Home and within 100 ft. of the track of the new line. It is believed by the proper use of advertising these will attract profitable passenger traffic from among people arriving at Kansas City with a few days to spare for sightseeing.

of the trolley board 12 ft. 4½ in. The weight of the car complete is about 42,000 lb.

The inside is furnished in plain cherry rubbed to a high polish; the ceiling is of birch veneer. There are twin doors at the ends and between the two compartments; the vestibules are semicircular in form and have drop sash and folding doors. Plate glass is used throughout the car.

Electric heaters made by the Consolidated Car Heating Co. are in all compartments and in the motorman's cab. The seats are rat-



H. W. WOLCOTT.



M. C. CANFIELD.

tan covered, with corner grab handles; five reversible and two stationary seats are placed in the large compartment and two reversible and two stationary seats in the smoker; folding seats for smokers are in the baggage compartments of cars of that type.

The cars are mounted on Peckham No. 14 A double trucks and equipped with four 50-h. p. motors made by the Lorain Steel Co.

The company's principal buildings are located at Wolcott, which is 13 miles from Leavenworth, and comprise the power house and car barn, which are completed, and repair shops that are as yet unfinished. All of the structures are of brick on stone foundations. The smoke stack, which is also of brick, is 14.5 ft. high.



STANDARD CAR, KANSAS CITY LEAVENWORTH ELECTRIC RAILWAY—AMERICAN CAR CO.

The line consists of a single track, with 62-lb. steel T-rails, with rock ballast for the roadbed. The majority of the grades are less than 3 per cent, with two short stretches, one of 4 per cent and the other 5 per cent. There are two curves of 18°; all other curves are 12° or less. The track joints were made by the American Rail Joint Co. The company owns six combination coaches, with smoking compartments; 4 combination express and passenger coaches; 15 freight cars and one 35-ton locomotive. The cars were built by the American Car Co., of St. Louis, and the company will soon put on 20 more cars of the same type. The bodies are 31 ft. 8 in. long over the corner posts, the cars being 41 ft. over the bumpers. The width over the sill plates is 8 ft. 5 in., and the height to the top

In the power station is a 32 x 56 in. Hamilton-Corliss engine, belted to two 300-kw. General Electric generators. The switch-board is also of the General Electric make.

The boiler room contains two batteries of two 400-h. p. Stirling water tube boilers each.

The car barn is complete in each detail. It has a capacity of 12 coaches and has an excellent system of pits.

The overhead line is single pole and bracket construction, cedar poles 35 ft. long being used, together with the Ohio Brass Co's. line material and figure 8 trolley wire. As the double trolley system is used, no overhead switches are required. The feeders are aluminum cables of 350,000 cm. section.

The plant line and track were built by the Cleveland Construction Co. and were turned over to the Kansas City-Leavenworth Electric Railway Co. this month. The latter corporation has an authorized capital of \$1,000,000.

The officers of the company are as follows: President, David H. Kimberly; vice-president, H. C. Ellson; treasurer, Charles O.



INTERIOR OF CAR.

Evarts; secretary and general manager, Herbert W. Wolcott; superintendent and electrician, M. C. Canfield; civil engineer, Z. P. Herndon.

TILE WATER TANK.

The accompanying illustrations show a water tank lately completed by the H. B. Camp Co. for the Pittsburg & Western Railway Co., at Hazelton, O., which is quite interesting, being built of tile. The tank has not yet been tested, and will probably not be in regular service for a month or two.



FIG. 1.

The ground being soft the foundation was made of a heavy bed of concrete laid on top of piling. On this concrete bed the square portion of the structure (see Fig. 1) was built of what are known among building block makers as "corner brick," 8 x 8 x 16 in., 1/2 in. shell, placed end to end with the hollows vertical. A sample of these bricks (see Fig. 2) was tested at the Watertown Arsenal and showed an ultimate strength in compression of 241,000 lb., which was equivalent to 1,775 lb. per sq. in. of gross area, or 4,465 lb. per sq. in. of net bearing area.

The lower portion of the tank structure is 25 ft. square and 20 ft. high. It is divided into three sections by walls; the outer sections are again subdivided by cross walls, and the middle section by two

cross walls, thus providing supports for the floor of the tank proper. The compartments thus formed are utilized for various purposes, one for the pumps, one for the boiler, one for tools, one for a hand car house, and one for a telegraph operator's office (yard business).

The tank proper is 23 ft. 6 in. internal diameter, and 16 ft. deep; the vertical wall is constructed of tiles 6 x 6 x 12 in., 1/2 in. web, curved to the proper radius, assembled after a method patented by Mr. H. B. Camp, of the H. B. Camp Co., Akron, O. A section of the wall is shown in Fig. 3 from which the construction is readily

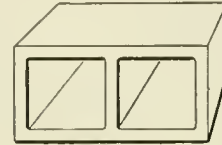


FIG. 2.

apparent. The tile has grooves on two opposite edges, the object of which is to form circumferential cavities in which bands or hoops of steel or iron are placed. All the joints are laid in cement. The hoop in this tank is 1/2 x 3 in. for the bottom course, the section being reduced for the upper courses where the bursting stress is less.

Not less interesting than the vertical wall is the bottom of the tank, which serves also as the roof for the first story, and is made

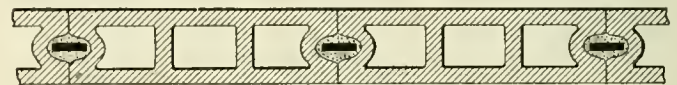


FIG. 3.

of hollow tiles 12 in. deep, 10 in. wide and 24 in. long, with two longitudinal webs; all the walls and webs are 5/8 in. thick. The construction is known as the Johnson patent floor, tile and steel fabric, the latter forming the tension member of the beam. We shall give a more complete description of this floor in another connection.

The weight to be sustained by the floor is 1,200 lb. per sq. ft. when the tank is full.



FIG. 4.

A section of this type of floor 20 ft. 4 in. between supports was recently tested (see Fig. 4) by subjecting it to the equivalent of a uniformly distributed load of 500 lb. per sq. ft. The deflection at the center was 9-16 in. and the permanent set 3-16 in.

The Lynn & Boston road has opened a new line into Boston to accommodate what is known as the County Park district of Chelsea.

A petition has been filed asking the Massachusetts Legislature to authorize the carriage of freight by street railways.

WILD ANIMALS FOR EXHIBITION PURPOSES.

A correspondent in the Scientific American gives a number of facts that will be of interest to street railway managers owning or contemplating a collection of animals for street railway parks. The writer states that the demand for wild animals for small parks in summer is rapidly increasing and owners of and dealers in wild creatures make quite a fair profit in renting them out during the warm weather. As winter approaches most of the animals are returned to the city for exhibition in their regular quarters, where the public is always willing to pay a small fee to gaze at them.

In spite of the brisk demand, however, prices instead of advancing for most of the animals have fallen; the reason for this is attributed to the fact that expeditions for capturing wild beasts in their natural homes are more numerous and are better equipped than ever before, and also that breeding in captivity is now possible with nearly all of the birds and animals.

This success of breeding in captivity is noticeable among lions in particular, and from present indications there is little danger of these felines becoming extinct. Formerly an importer of fine lions could calculate upon getting \$5,000 for a good specimen, but today young lions bred in captivity are almost a drug in the market. Tigers do not take as kindly to cage life as the lions, and they do not breed so satisfactorily in captivity, and considerable numbers are imported every year. Elephants do not breed well in captivity, not more than two or three ever having been born in this country, but the importations of these animals is so large that the prices obtained for them have dropped from \$10,000 to \$1,500 to \$2,500 each.

Monkeys do not breed well in cages. They are so easily obtained in the country south of us, however, that prices are merely nominal, and there is little danger of their immediate extinction. Among the highest priced animals of today are the rhinoceros and hippopotamus, specimens of the former, of which there is only about a half dozen in the country, having sold for \$7,000 and \$7,250.

Snakes and birds form a large part of the animal importer's business. These creatures come in great numbers from India, Africa and South America. The public is peculiarly fascinated by snakes, and they are among the most popular creatures exhibited. The best specimens of reptiles come from India, and a snake 20 ft. or more in length is worth considerable money. In a cage it is the size of the snake more than its venomous qualities that attract, and a large boa constrictor or python is worth more than a more deadly reptile of smaller size.

REDUCED FARES AT TERRE HAUTE.

The Terre Haute (Ind.) Electric Co. on December 15th commenced the sale of 25 tickets for \$1.00. These reduced rate tickets are bound in small books 2¼ x 1½ in., 24 in a book, and the cover is good for the last ride. Tickets must be detached in the presence of the conductor to be valid.

Mr. C. B. Kidder, manager of the company, writes us these books have been well received by the public and promise to become very popular.

TROLLEY MAIL COLLECTION AT HARTFORD.

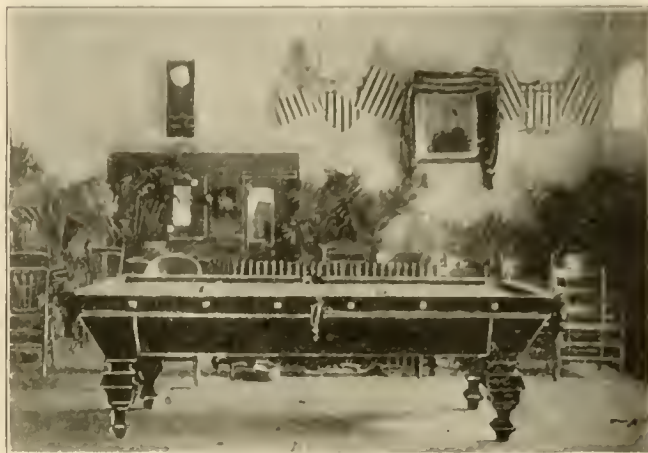
The postoffice at Hartford, Conn., where the street cars were recently provided with mail boxes, finds that while this service is very popular, it does not have the effect that was predicted for it. One of the strong arguments urged in favor of the trolley car mail boxes was that they would relieve the mail carriers from collecting a large portion of the mail and enable the trips to street boxes to be made in shorter time. At the present time, however, the carriers are collecting just as much mail from street boxes, although the cars carry thousands and thousands of letters per month. The only explanation offered is that the people are writing more letters than formerly.

An electric car at Piqua, O., was struck by a westbound passenger train on the Panhandle R. R. on December 24th and entirely demolished. The car became stalled at the crossing and all the passengers had time to jump before the collision. No one was injured.

EMPLOYES' CLUB AT DENVER.

The employes of the Denver City Tramway Co. not long since organized the Tramway Athletic and Literary Club, and on December 27th the club rooms in the Tramway Building at the North Denver loop were christened. The rooms were crowded and a good vaudeville entertainment presented; the performers were for the most members of the club or their immediate relatives.

The suite occupied by the club consists of three rooms not including the smaller dressing room auxiliary to the stage. The



EAST END OF MAIN ROOM.

main room is 40 ft. long, 22 ft. wide and 14 ft. high and has been furnished so that men with the most widely differing tastes can all find something to interest them. One of the accompanying illustrations is from a photograph taken the morning after a club smoker; it shows the west end of the room which is fitted up as a gymnasium, horizontal ladder, parallel bars, trapeze, vaulting horse, punching bag, indian clubs, wrestling mat, etc., all being in evidence.

On the north side of this room is the stage which is shown in another view; it is 16 ft. wide, 12 ft. deep and 22 ft. high, the floor

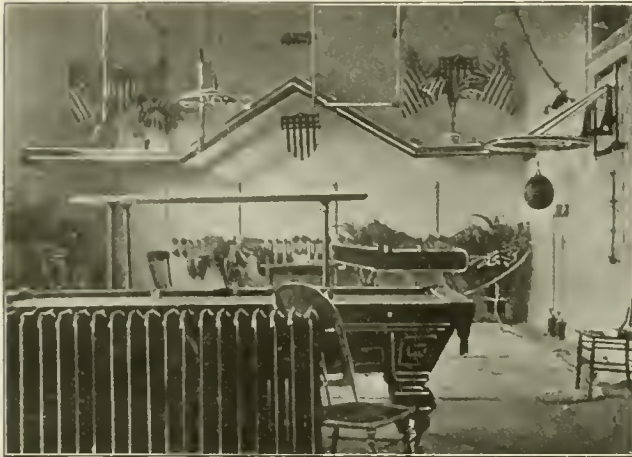


THE MUSIC CORNER.

being 2½ ft. above that of the main room. The stage is up to date in all its appointments, and is supplied with both gas and electric lights which are all manipulated from the wings.

The third view of this room is taken looking east. On this wall is a life sized portrait of Mr. C. K. Durbin, general superintendent

of the Denver City Tramway Co., to whose hearty co-operation the success of the club is very largely due. East of this room is the reading room in which is already the nucleus of a library of standard works; for those who care for cards, draughts or chess, tables are provided.



WEST END OF MAIN ROOM.

West of the main room is a bath room, 12 x 12 ft. The music corner is shown in another view.

The association, which has a membership of nearly 100, takes great pride in its handsome quarters, and the indications are all for a most successful club. Outsiders also have shown interest in the association, merchants of the city having made donations of books and chairs. But the warmest friend of the association is the Denver City Tramway Co. which provides the rooms and heat, light and janitor service free of charge and also subscribed a sum equal to that raised by the members toward furnishing the club. Nearly \$1,300 has been spent in fitting up the rooms.



C. K. DURBIN.



C. M. SEARLES.

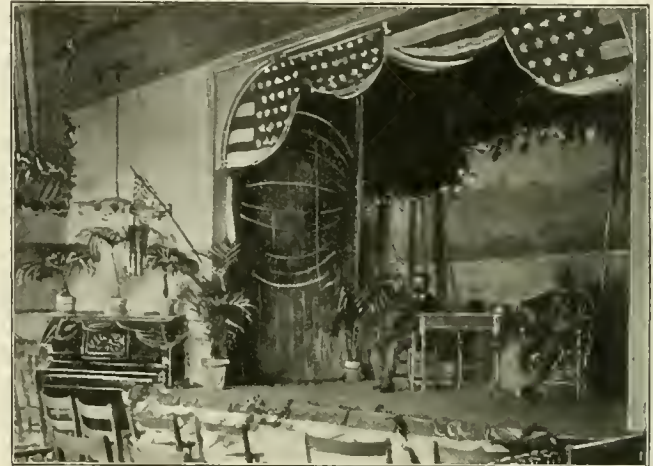
The Tramway baseball team is auxiliary to the association. Members with special talents have formed a string band of six pieces and there is also a male quartette.

The officers of the association are: C. M. Searles, president; Eli Adams, vice-president; H. M. Dikeman, secretary, and E. D. Bonham, treasurer. It costs an employe of the company 50 cents to secure a membership and the monthly charge for dues is 25 cents. Mr. Searles, who was largely instrumental in organizing the club was formerly connected with one of the Chicago roads and had experience in similar work in that city.

At the suggestion of Senator Hanna, president of the Cleveland City Railway Co., and its heaviest stockholder, the directors set apart \$5,000 to be distributed among the employes as a Christmas gift. It was given to show the company's "appreciation of the manly course taken by its employes during the late strike," on the Cleveland Electric, when the Cleveland City men refused to go out on a sympathetic strike.

FROM THE DAILY PRESS.

"This present distress" falls on small and great alike. Galesburg likewise has its street railway question. The old company is seeking an extension of its franchise from eleven to twenty years, to-



STAGE.

gether with certain new lines, and a new company is also in the field asking for a system of streets. Street railway experience in the larger towns thus far has developed two or three conclusions which ought to be of service by way of counsel to Galesburg. The first is that security through competing companies is pretty sure to prove an illusive dream, since it is bound to give place to consolidation in one form or another. The second is that a town, if it retains proper control over the business, is better off with all lines owned by one company, so that the best paying lines may help out those which pay less, and so that there may be universal transfers. The third is that it is not prudent or necessary to fix fares beyond revision for long periods in advance. And the fourth is that all blackmailing schemes against existing companies and all grants made to "unknown" parties, and merely intended for sale, are as inimical to the public interests as they are to the immediate corporations against which they are practiced. These four conclusions are not longer open to debate.—Chicago Tribune Editorial.

The use of electric traction promises to become the most important economic development of the immediate future. It is destined to effect a complete revolution in the methods of travel and freight carriage between the cities and country districts. Internal trade is generally more important though less discussed than commerce with foreign nations, and any change materially affecting local traffic must have far-reaching consequences. It would be most unfortunate if a few legislative errors should deprive this generation of the chief benefits to be derived from the coming change. It is well that the Provincial Ministry have acted promptly, and we trust they may be successful in framing legislation that will adequately protect the public interest.—Toronto Globe.

TOLEDO TRACTION BAND ENTERTAINS.

On the 21st of December the Toledo Traction Centennial Band entertained its friends. The band concert was the principal feature of the evening, but in addition there were a number of vocal and instrumental solos and recitations. The entertainment was followed by a banquet, and when the regular toast list was finished a number of short speeches were made; among those who spoke were President Lang and General Manager McLean of the Toledo Traction Co.

An English contemporary last month announced that a "wind-up order" had been made against the British Gas Traction Co., Ltd., and this fact may be taken as an indication that the gas motor at present is not a success for the purposes of street traction.

MECHANICAL DEPARTMENT

MACHINE FOR BREAKING UP TRACKS.

The accompanying illustrations show a very novel and successful machine designed for breaking up street railway tracks, which has been patented by Geo. W. Baumhoff, superintendent of the Lindell Division of the United Railways Co., of St. Louis, and Otto Schmid, of the same road. The two half-ton reproductions from photographs show the machine in operation and a view of the street after the car has passed through it on a working trip, while the line drawings will make clear the construction.

The machine, as shown in side elevation in Fig. 1, consists of a car mounted on an ordinary truck. The side sills are made up of two steel channels enclosing wooden filling pieces, and at the front end are bent down towards the track; from the toe of the



RAIL BREAKING MACHINE.

projecting sill a horizontal piece, b, is carried back towards the car. The object of the piece will be explained later. Chains running over suitable pulleys and pulled by a winding drum driven by an electric motor have tongs at the ends which grip the rails. When power is applied the rails and ties are lifted, the rail being

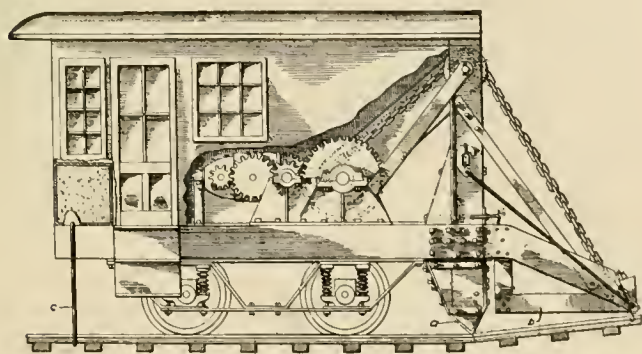


FIG. 1.

bent over the fulcrum a. As the rails are lifted the ties come, one by one, in contact with the horizontal piece b, and are forced free from the rails. The fulcrum a is a pointed block which when the machine is not in use is swung upward on a hinge at the front side and thus held out of contact with the track. When in opera-

tion of lifting the car is prevented from tilting forward, by clamps c hooked under the rails and over the side sills as shown in Fig. 1.

In some instances the rail is not broken when bent up the first



VIEW OF PIECE OF WRECKED TRACK.

time and in this case a wire cable is attached to the chain, carried around a pulley at the nose of the side sill and the rail bent down as shown in Fig. 2. When bending rails down the clamps c are placed at the fulcrum as in Fig. 2. Bending the rails is continued till they are broken.

When it is desirable to nick the rails this is done by striking with sledges on two cold chisels d d, mounted on the fulcrum blocks.

This machine is especially designed to tear up track having welded joints and for this purpose has proved to be a great labor saving device. Mr. Baumhoff reports that this machine with a crew of three men will tear up nearly two miles of track in a day, break-

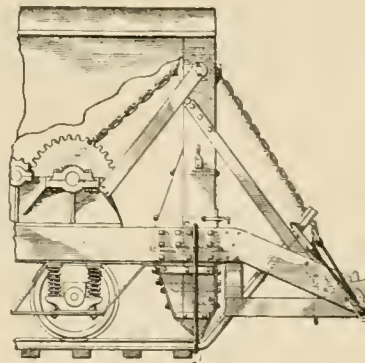


FIG. 2.

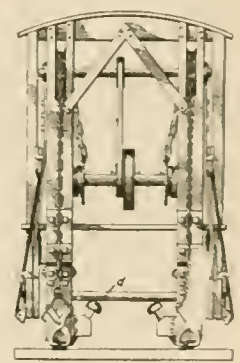


FIG. 3.

ing the rails into short lengths as desired, usually 4 or 8 ft. Old rails when so broken command about \$1 per ton more as scrap, and are cheaper to load and haul.

The United Railways Co., of St. Louis, has been using the machine in breaking up its old track preparatory to rebuilding.

The rails shown in illustration are 6-in. grooved girders weighing 78 lb.; 7-in. rails have been broken and the machine is heavy enough to break 9-in. or even larger sections.

COLORS OF HEATED STEEL CORRESPONDING TO DIFFERENT DEGREES OF TEMPERATURE.

A paper before the American Society of Mechanical Engineers by Maunsel White and F. W. Taylor, Bethlehem, Pa.

There is, perhaps, nothing more indefinite in the industrial treatment of steel, than the so-called color temperatures, and as they are daily used by thousands of steel workers, it would seem that a few notes on the subject would prove of general interest.

The temperatures corresponding to the colors commonly used to express different heats, as published in various text books, hand books, etc., are so widely different as given by different authorities, it is impossible to draw any definite or reliable conclusion. The main trouble seems to have been in the defective apparatus used for determining the higher temperatures. The introduction of the Le Chatelier pyrometer within the last few years, has placed in the hands of the scientific investigator, an instrument of extreme delicacy and accuracy, which has enabled him to determine the temperatures through the whole practical range of influence, and led to the establishment of new melting and freezing points of various metals and salts, which are now accepted as the standard in all scientific investigation. There has not, however, been published any results with the Le Chatelier pyrometer seeking to establish a correspondence of temperatures with color heats.

The first work done in this line, of which we are aware, is that of Dr. H. M. Howe, some eight or nine years ago. His results, however, have not been published, and with his kind permission we are enabled to give them here:

Dull red	625 to 550 C.	1,022 to 1,157 F.
Full cherry	700	1,292
Light red	850	1,562
Full yellow	950 to 1,000	1,742 to 1,832
Light yellow	1,050	1,922
Very light yellow	1,100	2,012
White	1,150	2,102

The nomenclature used for color heats differs with different operators, but in our investigation we have adopted that which seems more nearly to represent the actual color corresponding to the heat sought to be represented. We have found that different observers have quite a different eye for color, which leads to quite a range of temperatures covering the same color. Further, we have found that the quality or intensity of light in which color heats are observed—that is, a bright sunny day, or cloudy day, or the time of day, such as morning, afternoon, or evening, with their varying light—influence to a greater or less degree the determination of temperatures by eye.

After many tests with the Le Chatelier pyrometer, and different skilled observers working in all kinds of intensity of light, we have adopted the following nomenclature of color scale with the corresponding determined values in degrees Fahr. as best suited to the ordinary conditions met with in the majority of smith shops:

Dark blood red, black red	990
Dark red, blood red, low red	1,050
Dark cherry red	1,175
Medium cherry red	1,250
Cherry, full red	1,375
Light cherry, bright cherry, scaling heat, light red ..	1,550
Salmon, orange, free scaling heat	1,650
Light salmon, light orange	1,725
Yellow	1,825
Light yellow	1,975
White	2,200

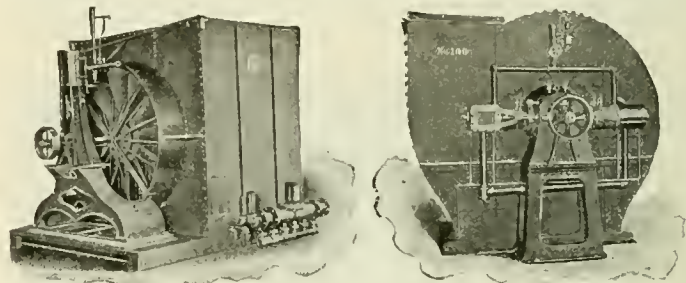
With the advancing knowledge of, and interest in, the heat treatment of steel, the foregoing notes, it is hoped, may prove of some value to those engaged in the handling of steel at various temperatures, and lead to further and wider discussion of the subject, with a view to the better understanding and more accurate knowledge of the correct temperatures. The importance of knowing with

close approximation the temperatures used in the treatment of steel, cannot be over-estimated, as it holds out the surest promise of success in obtaining desired results.

This demand for more accurate temperatures must eventually lead to the use of accurate pyrometric instruments; but at present the only available instruments do not lend themselves readily to ordinary uses, and the eye of the operator must be largely depended upon; therefore, the training of the eye, by observing accurately determined temperatures, will prove of much material assistance in the regulation of temperatures which cannot be otherwise controlled.

THE BLOWER SYSTEM FOR HEATING AND VENTILATION.

The fan system of heating and ventilation has grown rapidly into favor in the last few years. As is generally known, the apparatus used in connection with this system consists of a fan which draws or forces air over a bank of steam coils, the air then being blown through conduits to the various apartments. To none of the many and varied classes of buildings to which it is applied is it better adapted than to the shops and car houses connected with street railway systems.



AMERICAN BLOWERS.

One of the features which makes the system valuable for such application is the possibility of forcing a current of heated air into the car pits, rendering it easy to thaw out cars that are frozen up, and to dry out "grounded" cars in wet weather. While furnishing a uniform degree of heat, the system also provides perfect ventilation. This is an important feature in shops where a large number of men are employed, as comfortable surroundings and pure air are conducive to the best work.

The American Blower Co., of Detroit, Mich., with offices in New York and Chicago and London, England, makes a complete line of apparatus for use in connection with heating and ventilating plants, and has had large experience in designing the system for use in street railway plants.

What is recommended as a very convenient method for testing whether an armature is in balance and correcting defects is as follows: Mount the armature in bearings which are free to move horizontally and then, as the armature will tend to rotate on its center of gravity, if the center of gravity does not lie in the axis of the shaft, the lateral motion of the bearings will indicate the fact. The heavy side can be marked on the shaft with a piece of chalk and counterweights added until the balance is perfect, as shown by the end bearings not moving.

ELECTRICAL MACHINERY IN SWEDEN.

Robert S. S. Bergh, U. S. consul at Gothenburg, Sweden, writes the State Department as follows:

"Another thing of importance in this country is electrical machinery in general, which will be in great demand as soon as the people have fully learned the value of their numerous waterfalls. A large electric power plant will soon be built at Trollhattan; electric railways and tramways are being planned for Gothenburg, Lund Bjerrod and Jonkoping. In this line, as in everything else, the Germans are always watchful; they pay close attention to details, and if necessary send experts here to study plans, etc., whereby they greatly increase their chances to introduce machinery. If it is not practical for Americans to do likewise they could possibly employ active agents to represent them here."

W. F. FURBECK & CO.

A new banking and brokerage house was formed under this name on Nov. 1, 1899, and has opened extensive offices at Nos. 149 to 153 Washington St., Chicago, for the purpose of carrying on a general business of this kind. The senior partner of the firm is Mr. W. F. Furbeck who was formerly connected with the north and west sides street railway systems of Chicago.

Mr. Furbeck was born in 1848 in Schenectady County, N. Y. He came to Chicago in 1861 and entered the employ of the First National Bank of Chicago, in 1863, at the age of 15 years. He remained in this bank for 19 years and in 1882 accepted the position of cashier in the brokerage firm of Chas. T. Yerkes, jr. & Co. In 1887 he became private secretary to Mr. Yerkes who was then president of the street railway lines. In 1892 Mr. Furbeck was elected vice-president of the North Chicago Street Railroad Co., and continued in this office until the sale of that road to the Chicago Union Traction Co.



W. F. FURBECK.



J. CHARLES MOORE.

The stock department of W. F. Furbeck & Co., is under the management of Mr. J. Charles Moore who has also been identified with the work of Mr. Yerkes for 21 years, first in the banking and brokerage business for eight years and later with the Yerkes' street railway lines of Chicago for 13 years. Mr. Moore's last position was that of secretary of the Chicago Union Traction Co. The extensive experience of both Mr. Furbeck and Mr. Moore and their wide acquaintance insures a large and select clientele for the new concern.

The junior member of the firm, Mr. R. J. Furbeck, represents the house in New York and is a member of the New York stock exchange. He was formerly associated with the brokerage firm of A. L. Dewar & Co.

DEATH OF S. DANA GREENE.

Lieutenant S. Dana Greene, general sales manager of the General Electric Co., and his wife were drowned on January 8th while skating on the Mowhawk River at Schenectady, N. Y. About 5:45 p. m. men working at an ice house some distance below the town heard screams proceeding from a point where a cut in the ice some 300 ft. wide had been made clear across the river; putting off in a small boat they picked up Mrs. Greene, who was in an unconscious condition and died shortly after. Not until some time later was it learned that Mr. Greene had been with his wife; then a search was made and after several hours his body was also recovered.

S. Dana Greene was 35 years old, and was a son of Samuel Dana Greene, who was first lieutenant and executive officer of the Monitor in the fight with the Merrimac, and a grandson of General George S. Greene, who died about a year ago at an advanced age. He was a graduate of the naval academy at Annapolis and stood at the head of his class. About eight years ago he resigned from the navy to go into the electrical business, and was one of the managers of the General Electric Co. at Schenectady.

Four years ago he married Miss Cornelia Chandler, daughter of Admiral Chandler of the navy. Mr. Greene was a member of the Century and University clubs, was in the naval reserve and was naval aid on Governor Roosevelt's staff.

REPORT OF THE NEW YORK RAILROAD COMMISSIONERS.

The Board of Railroad Commissioners of the State of New York, consisting of Ashley W. Cole, Frank M. Baker and George W. Dunn, under date of Jan. 8, 1900, presented its 17th annual report to the Legislature. From this report we extract the following:

ELEVATED RAILROADS.

The most notable circumstance, from the point of view of the public, during the past year, in connection with elevated railroads of the state (which are all in New York City), is that to a considerable extent the motive power of those in the borough of Brooklyn has been changed from steam to the third rail system. The work of equipping the remainder of the lines in Brooklyn is progressing, and it is expected that in the coming summer all of the elevated lines there will be operated by electricity.

Several of the railroads in Brooklyn which in past years have been operated by steam have been converted to the overhead electrical trolley system, and three of them have been operated in connection with the elevated railroads through the construction of inclined planes at the points of junction. The result has been that a passenger could enter an elevated railroad car at the entrance to the Brooklyn bridge, at New York City, and ride to Coney Island, without change of cars, for a single fare of 5 cents.

The Manhattan Ry. in New York, is preparing to change its motive power from steam to electricity, third rail system.

It is likely that operation by electricity will benefit the companies through economies which such operation will render possible; people living along the routes of these railroads will be benefited by the removal of the annoyances caused by the operation of locomotive steam engines; and it is probable that the traveling public will be better satisfied with the accommodations enabled to be offered through such operation.

Several accidents, causing a stoppage of cars on that part of the Brooklyn system operated by electricity, have occurred. In one case on the Brooklyn Union Co's. line, passengers started to walk from the cars to a station, along a foot path which was not protected by a handrail. The cars started in the meantime, and a person who had tried to board the last car and was clinging to the gate, brushed against several of those on the footway, hurling them to the street, resulting in the death of two and the injury of several others. As the result of an investigation of this occurrence by its electrical expert, the Board recommended that the entire line of the Brooklyn Union Elevated R. R. be equipped with handrails on the sides of the structure. The company notified the Board that it would comply with this recommendation.

At the time of writing this report, the matter of the complaint of residents of the borough of the Bronx, New York City, against the Manhattan Railway Co., as to its failure to construct its railroad from the present terminus at 177th St. and Tremont Ave. northward to Bedford Park and vicinity, is pending before the Board.

The total number of passengers carried by the elevated railroads during the year ending June 30, 1899, was 213,248,419, a decrease of 14,528,133, as compared with 1898. This decrease is in large part accounted for by the fact that the returns of the Brooklyn Elevated Railroad Co. and its successor the Brooklyn Union Elevated Railroad Co. cover a period of but nine months, the other three months' statistics being included in the report of the Brooklyn Heights Surface R. R. The number carried by the Manhattan Ry. was 174,324,575, a decrease of 9,036,271, as compared with 1898.

The following accidents occurred on elevated railroads during the year ending June 30, 1899; Total killed, 19, of whom 5 were passengers and 8 were employes; total injured, 20, of whom 8 were passengers and 12 were employes.

STREET SURFACE RAILROADS.

The percentage of dividends to capital stock of street surface-railroad companies for the year ending June 30, 1899, was 4.67. The number of passengers carried on all the street surface railroads of the state, including the few remaining horse railroads, during the year ending June 30, 1899, including "transfers," was 920,365,560, an increase over 1898 of 71,054,890. The number carried in the boroughs of the Bronx and Manhattan, New York City, including "transfers," was 509,314,816, an increase over 1898 of 52,351,063. The number carried in the borough of Brooklyn (including some carried in the borough of Queens) including

"transfers," and including those carried during the last three months of the year by the Brooklyn Union Elevated R. R., was 238,721,051. The table gives statistics relative to the operation of some of the more important street surface railroads during the year ending June 30, 1899.

The following is a comparative statement of totals compiled from the reports of the street surface railroads for the years ending June 30, 1898, and June 30, 1899:

	For year ending June 30, 1898.	For year ending June 30, 1899.
Capital stock.....	\$132,844,303 33	\$151,427,128 33
Funded debt.....	130,179,166 90	129,524,373 63
Unfunded debt.....	31,806,542 42	87,089,302 02
Cost of road and equipment.....	233,635,396 51	267,388,036 95
Gross earnings from operation.....	31,884,384 20	35,460,822 71
Operating expenses.....	19,153,716 55	21,142,563 63
Net earnings from operation.....	12,730,667 65	14,318,259 08
Income from other sources.....	1,451,501 55	1,636,006 43
Gross income from all sources.....	14,182,169 20	15,954,265 51
Taxes and miscellaneous.....	1,459,498 56	1,779,127 78
* Interest paid and accrued.....	6,924,276 79	6,711,108 76
* Dividends.....	5,799,359 32	7,070,219 50
Surplus or deficit for the year.....	a 631,007 34	a 14,083 30

* Includes respectively interest and dividends paid by lessors from rentals received from lessees as follows.

	1898	1899
Interest.....	\$1,666,068 34	\$2,375,500 45
Dividends.....	2,720,894 32	2,828,892 50

a. Surplus d. Deficit

The total number of passengers killed during the year ending June 30, 1899, on the street railways using other than animal tractive power was 23, not including the 15 persons killed in the grade crossing accident at Troy; employes, 12; other persons, 88; total, 123. The injured were: Passengers, 287 (not including 17 at Troy); employes, 62; other persons, 215; total, 564. On the animal power roads 14 passengers were injured, 3 other persons killed and 11 injured.

During the past year, in other states as well as in this state, many kinds of accidents which have until lately been considered incidents alone of the operation of steam railroads, have occurred on street railroads. Head-on collisions of motor cars have not been infrequent. Cars have left track. Rear-end collisions have occurred. Motor cars have struck wagons as well as other motor cars at crossings. Cars have been struck at crossings of steam railroads. Nearly all of these accidents have resulted in loss of life or injury. Many of them in this state, would have been avoided, if the companies had complied with the recommendations of this Board, repeatedly made, which are again repeated here at the end of this title. The Board has endeavored to see that its recom-

mendations are compiled with, but co-operation of managers is necessary. That some managers are not awakened to the dangers incident to the operation by the new systems of power, seems to the Board to be proved by the accidents which have occurred.

The electrical expert of the Board has made inspections of many crossings of electrical and steam railroads. His recommendations as to switch and signal devices to be installed at these crossings have been made the requirements of this Board, under section 36 of the Railroad Law. The inspection of these crossings is proceeding, and it is the intention of the Board that each such crossing in the state shall have been inspected and recommendations in regard thereto, where necessary, made before its next annual report.

In several instances in Brooklyn during the past year electric cars have been operated on the tracks of steam railroads. This method of operation has been investigated by the Board, and a report by the electrical expert on the subject will be found in the report. It is the intention in these instances that, ultimately, the railroads involved will be entirely operated by electricity.

During the year the Board conducted a test of improved brakes for street surface cars. These tests covered a considerable period of time. At the time of writing this report the necessary compilations have not been made and the report as to the result is not completed.

Inspections and reports are constantly made by the electrical expert and members of the Board as to the accommodations, in general, furnished the public by street surface railroad companies.

The Appellate Division of the Supreme Court, Second Department, has decided that freight may be carried on street surface railroads. This is being done in several instances in the state at present, especially express business, the number of tons of freight carried during the year being 129,040.

The average number of persons, including officials, employed during the year ending June 30, 1899, on all the street surface railroads of the state was 25,729. The aggregate amount of salaries and wages paid them was \$14,447,573.82. The companies owned or operated on June 30, 1899, 4,743 electric and cable box cars, 3,681 electric and cable open cars, 139 electric mail cars, 631 electric and cable freight, express and service cars. Of these 8,302 were reported as equipped with fenders. There were 1,406 horse cars in operation.

The Board renews its former recommendations as to the operation of street surface railroads, especially in the following particulars:

First.—Every street car which crosses a steam railroad at grade

Street Surface Railway (Principal Companies) Receipts and Expenditures per Passenger and Cost of Operation per Car Mile for Year Ending June 30, 1899.

OPERATED WHOLLY OR IN PART BY MECHANICAL TRACTION.

NAME OF ROAD.	Number of passengers carried, including transfers.	Total car mileage.	BASED UPON GROSS EARNINGS FROM OPERATION AND OPERATING EXPENSES.		BASED UPON RECEIPTS FROM ALL SOURCES AND TOTAL EXPENDITURES, INCLUDING FIXED CHARGES.		Cost of operation per car mile.	Total expenses per car mile, including fixed charges.
			Average earnings per passenger.	Average cost of operation per passenger.	Average receipts per passenger.	Average expenses per passenger.		
			Cents.	Cents.	Cents.	Cents.		
Albany.....	12,137,017	3,518,738	5.55	3.70	5.61	4.53	12.78	15.63
Auburn.....	1,778,869	422,711	3.96	2.21	3.98	3.60	9.31	15.15
Blghamton.....	3,301,530	924,500	4.10	2.32	4.16	3.68	9.83	16.02
Brooklyn Heights (c).....	158,290,848	34,115,391	4.57	2.79	4.68	4.39	12.94	20.40
Buffalo and Lockport.....	595,727	458,993	12.65	9.46	12.72	16.72	12.28	21.57
Buffalo Railway.....	37,917,236	6,327,366	3.45	1.70	3.52	2.82	10.20	16.91
Buffalo and Niagara Falls.....	1,194,109	950,807	12.52	7.25	12.70	12.14	9.10	15.25
Coney Island and Brooklyn.....	28,056,411	5,675,770	4.04	2.47	4.84	3.58	12.23	17.70
Crosstown Street (Buffalo).....	15,670,922	3,220,127	3.25	2.15	3.27	3.25	10.47	15.84
Geneva, Waterloo, Seneca Falls and Cayuga Lake.....	1,309,217	421,945	4.57	2.50	4.72	5.01	7.76	15.54
Glens Falls, Sandy Hill and Fort Edward.....	1,169,354	395,200	5.34	3.06	5.33	4.04	9.07	11.97
Ithaca Street.....	1,482,117	298,663	4.13	3.24	5.10	4.83	16.09	24.01
Jamestown.....	2,482,388	584,548	3.65	2.31	3.74	3.52	9.84	14.98
Kingston.....	1,350,806	225,125	5.00	3.14	5.00	4.30	18.88	25.95
Metropolitan, New York (b).....	392,570,654	40,076,413	3.21	1.58	3.39	2.70	15.09	25.86
Nassau (Brooklyn) (c).....	39,930,208	8,895,483	3.90	5.28	4.18	5.47	14.75	23.24
Newburgh.....	1,357,240	373,583	6.36	3.64	6.40	6.34	13.23	23.03
Niagara Falls and Suspension Bridge.....	1,584,080	392,220	4.00	2.30	5.73	4.96	9.32	20.04
New York and Queens County.....	9,872,850	2,277,658	4.28	2.46	4.31	3.80	10.66	16.47
Rochester.....	22,366,823	4,904,480	3.78	2.22	3.87	3.59	10.12	16.38
Syracuse and Suburban.....	1,119,530	308,550	4.78	2.16	4.83	4.16	7.84	15.10
Syracuse Rapid Transit.....	12,202,511	2,756,023	3.94	2.35	3.97	3.91	10.41	17.34
Third Avenue, New York.....	48,473,376	11,685,140	4.41	2.56	5.09	3.32	10.74	13.88
Troy City.....	12,442,149	2,717,992	4.50	2.59	4.56	3.76	11.88	17.22
Union, New York.....	20,720,768	3,660,346	3.22	2.15	3.24	2.92	12.20	16.55
Utica Belt Line.....	4,563,823	1,089,634	4.49	3.15	4.53	4.39	13.20	18.40
Yonkers.....	3,069,239	737,485	5.00	3.57	5.03	5.43	14.87	22.63

OPERATED WHOLLY BY ANIMAL POWER.

Central Crosstown, New York.....	13,611,376	1,601,670	3.24	2.27	3.26	2.88	26.46	33.56
Dry Dock, East Broadway and Battery.....	16,995,700	2,297,014	3.63	2.73	3.71	3.51	20.21	25.81
Forty-second Street, Manhattanville and St. Nicholas Avenue.....	15,206,447	2,317,344	3.81	3.77	3.96	4.58	20.39	24.59

(a) Includes all lines controlled by Brooklyn Heights not making separate reports. (b) Includes all lines controlled by Metropolitan not making separate reports. (c) For nine months only.

shall be equipped with a red flag for use during the day and a red lantern for use at night. When approaching such crossings the car shall come to a full stop at least 30 ft. from crossing, and shall not proceed until the conductor has gone upon the steam railroad, carrying the flag or lantern, and after ascertaining that the way is clear, given the proper signal for the car to proceed. At crossings protected by a system of derailing switches interlocked with signals on the steam railroad, and operated by a man stationed at the crossing, this recommendation does not apply. The Board also recommends that at all grade crossings, on overhead trolley railroads, a V-shaped trough (preferably of metal) be constructed over the trolley wire or wires to insure the motor retaining the current, while the crossing is being made.

Second.—That where two or more street car lines cross, or where they merge, an agreement shall be made as to which line shall have the right of way. The car that has not the right of way shall come to a full stop before crossing over the tracks of the other line, or entering on the joint track.

Third.—That cars passing in opposite directions shall not meet on street crossings.

Fourth.—That the speed of the cars be reduced to a minimum on all curves where the view is obstructed.

Fifth.—That passengers be prohibited from riding on the running boards or side steps of open cars.

Sixth.—That the passengers be not permitted to stand on the front platforms of open cars, and that only as many passengers be permitted on such platforms as can be conveniently seated. In the case of open cars that have no seats on the front platform, passengers shall not be permitted to ride on the platform, and the side gates shall at all times be kept closed. Under no circumstances should passengers be permitted to ride on the front platforms of closed cars.

CONCLUSION.

The period covered by this report has been an exceedingly busy and prosperous one for the railroads of the state, and it may reasonably be expected that such conditions will continue to exist for some time to come. Experience teaches, however, that times of depression occur. Prudence requires that the directors and managers of railroad companies shall, during the prosperous period, endeavor to place the properties in their charge in such physical condition that they may, on the score of safety and convenience of the public, view with little alarm, if not with equanimity, the approach of less prosperous times.

The Legislature at its last session passed the bill recommended by the Board providing that mortgages made by the railroad companies must be approved by this Board before issue, and bills amending the Grade Crossing Law in certain particulars.

LARGE CARS FOR THIRD AVENUE RAILROAD.

The new electric cars adopted as standard by the Third Avenue Railroad Co., of New York, are among the longest in use on any street railway in the United States. They were built after designs by John H. Robertson, superintendent of the company, are 41 ft. long over all and the bodies are 32 ft. in length. The platforms are large and with the extra wide doors make ingress and egress unusually easy, even when the car is crowded to its full capacity. There are 12 cross seats on each side, giving a seating capacity of 48 passengers. The seats are provided with grab handles at the corners nearest the aisle for the convenience of passengers forced to stand.

The car can be converted into practically an open car by dropping the windows into the sides.

Each car is fitted with Standard air brakes. Four sets of cylinders and brake mechanism, one for each pair of wheels, are furnished, so that the breaking down of one would not impair the efficiency of the system. The cars weigh 40,000 lb., are mounted on Peckham trucks and are driven by four 30-h. p. motors.

James McGrath, a juror in a personal injury case against the Chicago City Ry., who was accused of soliciting a bribe from the company, was fined \$50 for contempt of court.

There is now pending in the Detroit Common Council a general ordinance providing for the carrying of freight by the suburban and interurban electric lines entering that city.

THE MILWAUKEE SITUATION.

The controversy over street railway franchises in Milwaukee still goes merrily on, though now the company and the council are in accord.

While the ordinance was before the council both parties were active in debating the question. On December 18th the council, by a vote of 25 to 17, ordered the ordinance to a third reading, after amending it so as to provide for tickets at the rate of 6 for 25 cents, 25 for \$1, good between 5:30 and 8 a. m. and 5 and 7 p. m., and for carrying firemen in uniform free. Otherwise the provisions were as given on page 866 of the "Review" for December last. The low-fare hours as amended are 30 minutes longer than in the original draft, which also provided for the free transportation of policemen and detectives only.

On December 21st an injunction was issued on the petition of Mr. H. A. Schwartzburg, restraining the mayor, the 25 aldermen, the city clerk, the street railway company, and others from taking any further steps looking to the passage, publication or acceptance of the ordinance; in this petition conspiracy was alleged.

The answers denied any conspiracy and alleged that a legislative body cannot be enjoined, whereupon the petitioner was directed to show cause why the injunction should not be dissolved. The case was continued until January 2d.

December 30th a second injunction was secured by Cassius M. Paine on behalf of the state, the allegation of the petition being that the council had no power to grant franchises to a company organized to carry freight, mail and express.

January 2d, the mayor and council decided to ignore the injunctions, and the ordinance was passed by a vote of 23 to 1 and signed by the mayor. Mayor Rose, in answer to an inquiry, made the following statement:

"We became satisfied that the opponents of the ordinance intended to resort to every expedient to prevent the passage of the ordinance. The opposition from the beginning was unfair, and even dishonest. There seemed to be a deliberate attempt to mislead the people and to misrepresent the ordinance.

"If the second injunction had not been served, the council would have waited for the decision upon the first injunction, but when the second was served and we received information that applications for more were in process of preparation, we knew that it would avail nothing to wait for a final determination in the courts.

"We were firmly convinced that the opposition was not prosecuted in good faith, but solely for the purpose of delaying action upon the ordinance with the hope of defeating its passage by postponing action upon it until after the next election. Its opponents calculated, beyond question, that if they could go to the people before they became familiar with the provisions of the ordinance by a practical demonstration that it would be defeated.

"I am perfectly confident that the injunctions served are void: that they were secured merely for the purpose of delay and were not expected to be ultimately upheld by the courts, and when we became convinced of these facts and became satisfied that new injunctions would be secured as fast as others were dissolved, we determined to exercise the power that is vested in legislative bodies and their executive under the organic law and constitution of the state and insist upon our right to proceed in the execution of powers which we claim the courts have no right to interfere with.

"The ordinance is now in force and our people will speedily become familiar with the benefits it secures to them."

January 3d the company began the sale of tickets according to the terms of the new franchise, and it is stated nearly every passenger bought tickets, so that the conductors' supplies were quickly exhausted. The company has not yet filed its acceptance of the ordinance and so is not in contempt.

The court whose orders were ignored by the council has not yet taken action to punish the council for contempt, the hearing of the case on its merits not having been concluded.

The Tiffin, Fostoria & Eastern Electric Ry. has a boycott on its hands because fares were increased 50 per cent.

The employes of the Springfield (Mass.) Street Ry. are devoted to the game of whist and at stated intervals tournaments are held at the club rooms in the car barns, the conductors being pitted against the motormen.

FOREIGN FACTS.

The Leeds (Eng.) Tramways are being extended.

The Idawara (Japan) Tramway Co. began running electric cars last November.

It is stated Serpollet steam motors may be introduced on tramways at Tokyo, Japan.

The City of Birmingham (Eng.) Tramways Co. has reduced fares on its cable lines from 3d. to 1d.

The street railway at Morelia, Mexico, is being extended two miles to the penitentiary at San Pedro.

As soon as Government permission is given an electric line will be built between Yumoto and Kojiri, Japan.

It has been decided by the city council of Worcester, Eng., to lease the municipal tramways to a private company.

It is proposed to build an electric tramway from Dundee to Carnoustie. Mr. Hopkins is electrical engineer for the former town.

Dresden, Germany is to have a new electric line, which will be built by the A. G. Elektrizitätswerke, formerly O. L. Kummer & Co.

The United Kingdom has exported coal during the past year at the rate of 1,000,000 tons per week according to a late compilation.

The British Government is purchasing hundreds of horses from various tramway companies for use in the Transvaal during the war.

Mr. Alfred Dickinson of Birmingham, Eng., is said to have been granted important tramway concessions in Cape Town, South Africa.

A Paris company is arranging to construct an electric road at Calais, France. United States Consul Milner, of Calais, can give further information.

An electric railway will be built between Shiogama and Sendai, Japan, by the Rikuu Electric Railway Co. Eizo Konishi of Sendai, Japan, is said to be interested.

The sanitary committee of the Thornaby (Eng.) Town Council has served notice on the tramway company that it must abate the nuisance caused by watering its lines.

It is stated the St. Etienne (France) R. R. will be equipped electrically by the Societe Hydro-Electrique Roussillonnaise, 7 Rue Lafayette, Paris, which was recently formed for the purpose.

In Dublin (Ireland) the Palmerston Park tramways are now running by electricity. The Dublin Tramway Co. has secured permission to build a number of new electric lines in Cork County.

A company has been formed at Paris, known as La Compagnie des Tramways Electriques de Vanves a Paris et Extensions to construct and operate an electric tramway from Paris to Vanves on the Diatto system.

In response to petitions from the workmen of the city, the Dover (Eng.) Tramways Co. will run special cars at certain hours for working people at a fare of 1/2d. for the distance of three miles, instead of 1d.—the regular rate.

The City & South London Ry., one of the underground roads of London, has escaped paying city taxes this year by reason of a decision to the effect that as the line does not pass under any site previously occupied by a building, no assessment can be made.

The parliamentary committee of the Hull (Eng.) Town Council has decided to recommend the council to apply for a provisional order to construct a double line of tramways in Great Union St. and on the Hedon Road, and to extend a number of existing tramway lines.

A bureau of information has been established by the Italian government at Rome for the use of importers and exporters. All questions dealing with trade with Italy will be answered. Address "Ufficio d' Informazioni Commerciali, Ministero di Agricoltura, Industria e Commercio, Rome, Italia."

The Huddersfield Corporation Tramways Co. reports total traffic receipts for last year of £32,372, an increase of £1,775 over the previous year; number of passengers carried 5,077,936, equal to the entire population of the city carried 50 times. Number of letters posted in the tramcar letter boxes 456,002.

There is so great a scarcity of tramway cars in Great Britain that a number of town corporations are seriously considering the advisability of erecting car building plants of their own. All of the regular car building works have orders enough on hand to keep them busy for from one to two years to come.

One little incident of the present war in South Africa is reflected in the following cablegram from the Johannesburg City & Suburban Tramway Co. to the London office of the company. It reads: "All horses commandeered; hold Government receipts. Works entirely suspended; depot occupied as police barracks."

Serious mob demonstrations occurred at Limerick, Ireland, recently in connection with the granting of a tramway franchise for the town. The citizens opposed the scheme and went to the council hall in a body hooting and jeering and threatening the members of the council with personal injury. Policemen succeeded in dispersing the crowd.

A disputed halfpenny has cost the South London Tramways' Co. £150 in damages. A lady traveled on one of the company's trains from Chelsea Bridge to Clapham Junction and refused to pay more than 1/2d., the authorized fare for the journey, although the conductor demanded 2d. The court has granted the lady £150 damages for her injured feelings.

A large portion of the tramway lines in Liverpool has been equipped with the overhead electric system, but about 40 miles of track are still worked by horse haulage. A bill has been introduced in the city council providing for the reconstruction of all of these lines for electric traction, as well as for the construction of a number of new lines at a cost of over £270,000.

Electric tramways are made responsible for a curious phenomenon at Brussels, states a contemporary. It has been noticed that since the running of electric cars in that city the trees along the route begin to turn brown and drop their leaves early in August and bud and even blossom again in October, while trees in other parts of the city retain their regular custom of dropping their foliage late in the fall and do not put forth fresh blossoms until spring. It is believed the extraordinary state of affairs is due to the effects of leakage currents acting on the roots of the trees. Next!

All the street railway interests in the city of Havana have been consolidated. These include the franchises owned by the Harvey syndicate, comprising the International Bank of Paris, Hanson Brothers of Montreal, G. B. M. Harvey, F. S. Pearson and others of New York City, and the concession known as the Torre Pla concession, covering 12 miles of streets and owned by the American Indies Co., composed of Thomas F. Ryan, P. A. B. Widener, R. A. C. Smith, Sir William C. Van Horne, William McKenzie and others. Construction work has been commenced, and it is expected a complete system of electric traction will be in operation by June 1st.

PAN-AMERICAN EXPOSITION BUILDINGS.

Very satisfactory progress has been made in preparing for the Pan-American Exposition to be held in Buffalo during the summer months of 1901 and the plans for the buildings are practically completed. The accompanying illustration shows the Machinery and Transportation Building, in which our readers will be most interested, which is 500 x 350 ft. It is designed in a type of Spanish Renaissance, the best examples of which on this continent are found in the old mission buildings in California and Mexico. The Machinery and Transportation building forms a hollow square



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MACHINERY AND TRANSPORTATION BUILDING.

with arcades on all sides, the interior court being 100 x 200 ft. The court is adorned with a fountain surrounded by flowers and shrubs. The facades present an arcaded effect corresponding in appearance to mission cloisters; the eaves with great overhangs add to the picturesque. Each facade is broken by an important architectural feature, and each corner flanked with low pavilions, the design giving large plain surfaces for color, while the eaves give deep shadows. The color scheme is made up in reds and yellows, light in tint.

MORE THEFTS OF WIRE.

The night of December 23d over 2,000 lb. of trolley wire was taken from the lines of the Chicago Union Traction Co. in Ridgeland Ave., south of 22d St.

The night of December 10th, 1,300 ft. of trolley wire was taken from the lines of the Detroit & Northwestern road near Farmington, Mich.

On December 14th two attempts were made to wreck a car on Hackensack and Ft. Lee line of the Bergen County (N. J.) Traction Co.; it is believed that the motive was revenge for the arrest of a trolley wire thief some weeks since.

On December 20th, 2,100 ft. of bond wire was taken from the tracks of the electric line between Burlington and Mt. Holly, N. J.

On December 13th, the Delaware & Atlantic Telephone Co. suffered the loss of eight copper wires from its lines in Delaware County, Pa. The wires were cut down for a distance of two miles. This is the fifth theft of wire in this county within three months.

RE-SALE OF GALVESTON ROAD.

The property of the Galveston (Tex.) City Railway Co. will again be sold on February 6th, the terms of the sale made last September not having been complied with. The road was first placed in the hands of a receiver on Oct. 13, 1897, when R. B. Baer was appointed receiver by the federal court. On Sept. 5th, 1899, the property was sold to Julius Runge for \$905,000, who was formerly president of the company. On November 10th the sale was confirmed and the purchaser was given until December 20th to pay the balance of the purchase price. As this requirement has not been fulfilled the sale is declared void and a new one ordered.

A peculiar accident occurred on one of the cable lines of the Chicago Union Traction Co. on December 20th, a grip car being pulled in two; no one was injured.

STREET RAILWAY MAIL BOXES IN GRAND RAPIDS.

Last month the Consolidated Street Railway Co., of Grand Rapids, Mich., through the effort of G. S. Johnson, president and general manager, inaugurated a mail collecting system that will nearly double the efficiency of the postal department in the city and suburbs. Two mail boxes of medium size and of the standard type such as are now used on street corners, are placed on each car, one at each end. The box is placed inside the vestibule by the controller stand; an opening is made in the front of the car large enough to slip letters through. The side of the box from which the carriers remove mail is next the vestibule door, enabling collections to be made without entering the car.

The instructions issued by the company to its employes for the care of the mail, explains fully the details of the system. These instructions, for a copy of which we are indebted to Mr. Johnson, are as follows:

"You are expected to exercise proper care and diligence regarding the mail boxes, giving them as much attention as you would any other attachment to the cars, and at all times being careful to prevent breakages of the boxes.

"Conductors will please see that all boxes are open for the reception of mail matter when they take their cars out in the morning. At night, the boxes will be closed by an employe of the postal department, and the employes of this company will be careful to see that they are kept closed until the cars are again ready for use.

"There is likely to be confusion and misunderstanding for some time regarding the boxes. For that reason, I ask you to be especially careful in your replies to questions regarding the mail service, being at all times courteous and gentlemanly, giving as much information as possible.

"You are not required to stop at a crossing or anywhere else for the purpose of allowing mail to be deposited only, except for mail carriers. It is expected that people who wish to deposit mail will be at the proper street crossings, and will take their chances as to whether or not cars will stop. If you have no passengers to get off and there are no persons to get on the car at any landing, you are not obliged to stop for mail matter. At the same time, you are expected to exercise judgment regarding it. If you find you have time to stop for the purpose of picking up mail, you must do



MAIL BOXES ON GRAND RAPIDS CARS.

so, but your first duty and obligation is to keep on your schedule time and to carry out the instructions and desire of the company. It will be agreeable to the company to extend to the public every courtesy possible which will not impair the regular service, and it is expected by a combination of judgment and a desire to accommodate that the public can be very thoroughly served in the matter of these mail boxes.

"You will stop at any regular stopping place, at any time, when signaled by a mail carrier, and give him ample opportunity to deposit what mail he desires.

"Employes of the postoffice will be stationed in or about Campau Place and on Lyon St., opposite the postoffice, and possibly at other locations, for the collecting of mail from the boxes. You will please give them time and opportunity to do this, assisting them if need be, so as to save as much time as possible.

"If any trouble arises of any kind or character, regarding this service, if any breakages occur, or if anything happens out of the ordinary, you will please report them immediately by telephone or messenger to the superintendent.

"If a car is disabled, its number, the point where it is, and the place (shop or car house) to which it is being taken, must be immediately reported to the superintendent. This is of the utmost importance, because there may be mail in the boxes which must be taken out by the postal authorities, and not permitted to remain in the boxes while the car is in a car house or shop."

President Johnson, writing on December 22d, says: "The system has been in operation since December 18th, and it is wonderful to see what use has already been made of the boxes. The number of letters coming in in this way is very large, and is constantly growing, and the public seems to appreciate the convenience greatly. Mail formerly deposited in street boxes at the outskirts of the city and which had to await the rounds of the carriers to be brought down to the main post office, now gets to the office from two to five hours sooner than before the new plan was adopted. So far, we have not experienced any inconvenience to speak of in stopping for mail or for the collectors."

CAR LIGHTING.

The accompanying illustration shows a scene with which most travelers are familiar for much to the general public's delight, the Pintsch gas lamps can now be seen on almost every railroad car in the country, and also on the majority of the cable surface roads of the various American cities, and on some electrically propelled cars also.

The rapid progress of this car-lighting system tells better than anything else could of the merits which the Pintsch light possesses. There are now in this country nearly 14,000 cars equipped with this system of illumination, which means a total of 70,000 Pintsch gas lamps in service. These 14,000 cars that are distributed over 115 railroads that have adopted this as the standard method of car lighting; the gas is made at 50 Pintsch gas works, located at various cities throughout this country. Pintsch supply stations are now established at necessary points all the way from Portland, Ore., and Montreal, Can., in the north, to Jacksonville, Fla., and Houston, Tex., in the south, and there is now no trip in which a passenger car might be employed, where Pintsch gas cannot be supplied.

The Safety Car Heating & Lighting Co. that controls the Pintsch patents in the United States, is also the owner of patents covering six standard heating systems that are employed by most of the principal railroads of this country. Some of these systems simply employ straight steam taken directly from the locomotive; others are hot water circulating systems, operated either by steam from the locomotive or in conjunction with the Baker heater. The latter system is the standard that has been adopted by the Pullman and Wagner Palace Car companies. There are about 80 railroads that are now using the steam system of the Safety Car Heating & Lighting Co. This company also controls a hot water circulating system for street railways, as well as electric heaters for surface cars.

The general offices of the company are at 160 Broadway, New York, with a branch office in the Monadnock building, Chicago, and another in the Union Trust building, St. Louis.

The Homer, Mich., street railway was opened January 1st.

"NOARK" FUSES.

A fuse that will not arc or flash under any circumstances is sold by the Manville Covering Co., western representative for the H. W. Johns Manufacturing Co. The device consists of a fusible conductor enclosed in a tube with a peculiarly arranged filling entirely surrounding the conductor. The blowing of the "Noark" fuse under overload is a definite action occurring in a certain time interval for each definite increment of excess current, as determined by the character of the service for which it is intended. Owing to the arrangement of the surrounding material, the blowing time interval at any period during the life of the fuse remains practically constant, and simply varies in an inverse ratio to the amount of excess current above its rated capacity.

The condition of the fuse is shown at all times by means of a fine wire extending along the outside of the case, and which breaks the instant the fuse blows.

ART CALENDAR.

One of the handsomest calendars that has appeared for the new year represents children playing on the broad beach of one of our Atlantic coast resorts. The youngest, a little tot, is defying the approaching tide of the ocean, and in a spirit of bravado calls out to his companions who are eagerly watching him. "Who's Afraid?"

Copy of this calendar carefully mailed in strawboard to protect in transmitting, will be mailed on receipt of 10 cents in postage stamps by W. B. Kniskern, G. P. & T. A., Chicago & North-Western Ry., Chicago, Ill.

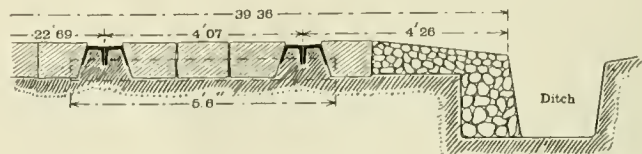
Early application should be made as the edition is limited.

NIAGARA, ST. CATHERINES & TORONTO.

The Niagara, St. Catharines & Toronto Railway Co., of St. Catharines, Ont., is rebuilding its steam road and equipping it with electricity. This company is a reorganization of the St. Catharines & Niagara Central Railway Co. The officers are: President, J. A. Powers; secretary and treasurer, A. B. Colvin; general manager, F. A. Cheney.

STEEL TRACK FOR COMMON ROADWAY.

Mr. Horace L. Washington, U. S. consul at Valencia, Spain, in a recent report described a steel track laid for a distance of two miles on the road between Valencia and Groo and which has been in use for seven years. The road is nearly 40 ft. wide, with double tracks



SECTION OF ROADWAY.

26.76 ft., center to center. The tracks are a trifle over 4 ft. gage. The rails consist of two flaring channels fastened together by bolts spaced 4 in. apart. The rails are held to gage by flat tie bars 9-16 x 5 in x 5 1/2 ft., with slots cut into the upper edge, into which the flanges of rails fit, and the outer ones held by keys.

ELECTRIC TRACTION ON THE NEW YORK, NEW HAVEN & HARTFORD.

There are six of the branch lines of the New York, New Haven & Hartford R. R. which are now operated by electric power. These are the Nantasket Beach branch, 8 miles in length and which is operated by the third rail system; the Nantasket Junction to Pemberton branch, 7 miles, which is operated by the overhead trolley; the Nantasket to Cohasset, 3 1/2 miles, operated by the third rail system; Berlin to New Britain, 3 miles, by third rail; Hartford to Bristol, 9 miles, third rail; New Britain to Bristol, 9 miles, third rail; Stamford to New Canaan, 8 miles, by the overhead trolley.

AT THE M'GUIRE WORKS.

The McGuire Manufacturing company reports the year 1899 as one of the best it has ever had, and notwithstanding the enormous rise in the cost of material the year has been a very profitable one. Two orders of the same amounts, placed just one year apart, explains the advance in iron clearly. In December, 1898, the company bought 1,000 tons of bar iron at \$20 per ton. Exactly the same date in 1899 the company ordered 1,000 tons of bar iron at \$48 per ton. It is therefore enabled to make a good showing for 1899 because of purchases made in 1898 and early in 1899, that participated in the advance in the first half of the year 1899, and, while the business of the last half of the year was very much in excess of the first half, the prices of material had advanced so that everything equalized. The firm was therefore entirely satisfied with the year's business and anticipates for 1900 one of the best years it has ever known.

While this company has always been busy in the truck department for the home market, during the year 1899 it sent its product to foreign markets which nearly encircle the globe. It has just completed a large order for San Francisco, and other large orders for Havana, Cuba, Brooklyn Elevated, New South Wales, Australia, and has shipped to Germany, England and France during the year.

The new truck which has been placed on the greatest number of lines is the No. 39. The general result of the use of this truck is best explained by one of the users. Mr. Cummings, of the Indiana Railway Co., South Bend, Ind., which is using these trucks on large interurban cars and where the schedule time is 40 miles an hour, writes as follows: "These trucks for our high speed inter-urban service are highly satisfactory. They ride like a sleeping car. It is the simplest in its construction, and we do not hesitate to say that it is the best truck we ever saw. It has so many good points that it must be seen and used to be appreciated. Come down and see us and bring your friends and we will show you the very best equipped high speed service in the country."



McGUIRE HANGER.

After the closest competition of all the truck makers of the country, this truck has been accepted by the Brooklyn Elevated R. R. Certainly a simpler construction can hardly be imagined. It is not of more than ordinary weight, but the distribution of metal is such that it has been demonstrated to have the maximum of strength and durability, while its riding qualities are all Mr. Cummings says.

A very important feature of the McGuire company's business has developed strongly within the last year; that is, the elastic brake hanger. It has been behind in filling these orders, a whole year, and it has been discovered that the different railway lines are putting them on all makes of trucks as well as those made by the McGuire company. The accompanying cut shows the elastic hanger as used. A feature that recommends this hanger is the fact that it automatically takes up its own wear and absolutely prevents kicking, and contains its own release spring.

In the year 1899 the company did the heaviest snow sweeper business in all its history, bringing the total number of these machines in use throughout the country to about 500. The stove business has also been quite large and the company is so satisfied with the year's work in the stove line that it is preparing for an immense business in 1900. It claims that the public preference for cars heated by stoves is being felt; that the electric heaters arranged as they have been—concentrating the heat at six different points under the seats—are very offensive to passengers as well as being decidedly dangerous to the health of passengers who use the seats over these heaters. In cold weather there is call for such a strong heat at these points that the persons sitting over them are overheated, and then leaving the car when it is possibly below zero, endanger health and life. The company calls attention to the common scene of passengers looking under the seat to locate the heater so as to avoid the heat, while in the car heated by a stove, with the glowing coals seen through the isinglass, the passenger is comfortable and satisfied, and runs no risk of catching cold therefrom. Besides this feature, the company claims that it is very much

cheaper for railway companies to heat their cars by coal stoves than by current. For this reason it will not be caught another year as it was this—unable to supply the demand.

AIR CARS IN NEW YORK.

Mr. Joseph Hoadley, of the American Air Power Co., advises us that the statement printed in the December "Review" that the compressed air cars had been withdrawn from the 28th and 29th St. crosstown lines of the Metropolitan Street Ry. in New York is in error. It appears that these cars have not been withdrawn yet.

NOTES FROM INDIA.

Kashmir, a state of India, is to have an electric railway 180 miles long, so it is said. The line will connect Tumu and Srinagar, and will be operated by water power obtained from the Chenab River.

The Bombay Tramway Co. is urging as one reason why it should be given permission to equip its road for electric traction, the fact that it is constantly having its horses drop dead in the street from heat.

Mr. F. J. E. Spring, consulting engineer to the Government of India, for railways, has prepared a note on the subject of tramways in the province of Assam, India, in which he points out the necessity for such lines.

Madras is said to be the only city in India having electric tramways. The lines in this city are owned by the New Madras Electric Tramways Co., which is a reorganization of the Madras Electric Tramways Co., whose property was foreclosed by the bondholders. It is stated a proposition has been made to the Madras municipality to operate the road as a municipal concern.

The annual report of the Calcutta Tramway Co. for 1899 states that negotiations for the introduction of electric traction on its lines have been satisfactorily settled. The principal condition of the new agreement is, the company shall remain in possession of the lines for 30 years from Jan. 1, 1901, in consideration of its converting the system from horse to electric traction within three years. Preliminary surveys are in progress and within a short time the directors will be in a position to let contracts for the construction of the power station, etc.

TESTS ON CEMENT.

In a paper on "Cement" read before the Franklin Institute by A. S. Cooper, the author gave the results of various tests on portland cement mortar to determine the effect of time on that material. It is the opinion of many engineers that a portland cement mortar which has stood an hour or two has lost some of its strength, but this was proved to be erroneous.

Four large batches of mortar were mixed and briquettes were made by hand from each pile at intervals ranging up to eight and one-half hours after mixing. These were all carefully marked, stored away, and broken after one year. The results showed that the loss of strength after the eight and one-half hours' standing is practically nothing. In practical working with most portland cement, if it becomes necessary for the mortar to stand for half a day even, no injury will result, according to Mr. Cooper, provided the precaution is taken to keep the mortar wet.

In a recent decision Judge John Goodland, of Appleton, Wis., holds that a street railway company or any company that has a franchise for the erection of poles on the highway, is not responsible for accidents occurring in consequence of the poles being in the streets. He decides the city granting the franchise for the placing of the poles is the responsible party in all accidents arising therefrom.

The borough of West Pittston, Pa., has imposed license fees of \$15 per car on the Wilkes-Barre & Wyoming Valley Traction Co.

SNOW FENCES ON ELECTRIC RAILWAYS.

In the "Review" for December last, page 821, was illustrated a type of temporary snow fence of which the International Traction Co., of Buffalo, has some 16 miles in use. This fence is made up in 16-ft. panels 5½ to 8 ft. high, and is set as shown in the engraving which we reproduce here. The fence is put out in the fall and removed in the spring.

In order to get the experience of other roads with snow fences a number of letters of inquiry were addressed to interurban companies, but by far the greater number of answers stated that such fences were not used.

Last winter the Boston Elevated Railway Co. for the first time in its history made use of snow fences, placing them on private lands adjoining the highway at exposed points. The results were



BUFFALO SNOW FENCES.

fairly satisfactory but the mistake had been made of setting the snow fences too near the tracks. This winter the company placed out considerably more snow fence than last year and set it about 100 ft. from the tracks. The fence is portable and abutting owners give their consent to its use for a small or nominal consideration; it is indeed a benefit to the property owner as it assists in keeping drifts from the sidewalks.

The details of construction of the Boston Elevated's snow fence and the manner of assembling the panels are shown in the accompanying illustration, Fig. 1. The sections are 16 ft. long, each made of three 1 x 6-in. boards nailed to 4 x 4-in. pieces at the ends and stiffened at the center by a 1 x 6-in. piece. The bottom board is placed 6 in. from the ground.

The Lynn & Boston R. R. has less than 1-3 mile of snow fence on its system. Mr. E. C. Foster, general manager of the company, states that the fence has thus far proved of but little advantage, though the benefits of such a device where the surroundings favor the formation of drifts is recognized.

The Dunkirk & Fredonia (N. Y.) R. R., the electric line connecting these towns, has ½ mile of snow fence protecting a stretch of the interurban track. This fence is made by nailing three 1 x 6-in. hemlock planks, 16 ft. long to V-shaped supports made of pieces



FIG. 1.—FENCE USED BY BOSTON ELEVATED.

2 x 4 in. and 6 ft. long and spaced 8 ft. apart. When in place the legs of the V are nailed to stakes 2 ft. long driven in the ground. In placing this fence the company's practice differs from that of the Buffalo and Boston roads in that the longitudinal planks are all on the leeward side of the fence instead of the sections alternating as shown in the illustrations. The inclination is such that the top of the fence is from 4 to 4½ ft. high. It is placed 110 ft. from the track.

Concerning the benefits of this fence Mr. M. M. Fenner, manager of the Dunkirk & Fredonia, writes as follows:

"We have had the worst snows this year that we ever knew, and have opened our road with the least trouble, on account of having extended the snow fences. Where we had heretofore been compelled to keep 100 men shoveling for a week, we can now open the road with half the number of men in a day, which feat we accomplished January 3d. and have done the same thing twice before during the present season. This season has been a record breaker in this particular locality along the lake shore in the state of New York, taking in Dunkirk and Fredonia as a center, the snow being about 3 ft. deep on the level. It has been so cold the snow has been very light and it has also been windy so that the drifts have been immense.

"We still need about a quarter of mile of fence, having about ½ mile at this time, and will be able to get most of it as residents, as a general thing, do not refuse permission to have the fence put up late in the season and removed in March, after the period of heavy snows. We have used the fences about five years and at an early period had much trouble in getting a fence that would do the work, but after much experience in the use of it we have now what we think gives the best possible results."

The Duluth (Minn.) Street Railway Co. has 1¼ miles of the portable snow fence shown in Fig. 2, which, during the winter months, is placed from 60 to 80 ft. from the exposed tracks, depending on the location. The company finds little difficulty in securing permission from abutting owners to erect the fence on their land. The fence is made up in 12-ft. panels, with the supporting legs and braces designed to be folded up for handling; it will be noted that the longitudinal planks on this fence are more numerous and spaced closer than in the fences previously mentioned. When built in 1894 the following was the itemized cost per mile:

51,000 ft. lumber @ \$7.50 per M.....	\$382.50
2,640 machine bolts, ½-in., @ 85 cents per 100.....	22.44
70 lb. ½-in. cut washers @ 3 cents.....	2.10
300 lb. wire nails @ 1½ cents.....	4.50
51 days labor @ \$2.00.....	102.00

Total\$513.54

Mr. Herbert Warren, general manager of the company, in sending us the figures adds that at the present time the same quality of lumber would cost \$13 per M and labor would cost \$2.25 per day.

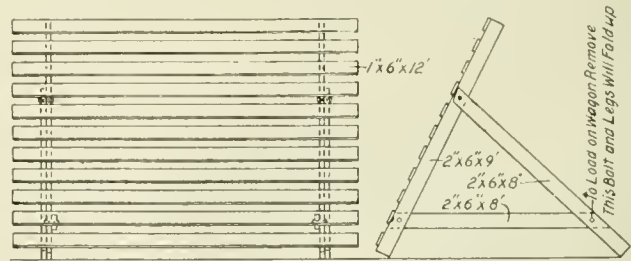


FIG. 2.—FENCE USED BY DULUTH STREET RAILWAY.

The company also has about ¾ mile of fence of a similar pattern, but not so high, and some brush fence upon the lines of the Lake-side Ry., which it operates.

The Eastern Maintenance of Way Association at its meeting in September last received a report on the subject of wire and snow fences and for the latter it was recommended that when the right of way is sufficiently wide to permit, close board fences of sufficient height should be built. Where such is not practicable portable fences in 12-ft. lengths to be fastened together with bolts were recommended. When permission can be secured from abutting property owners, these fences should be placed parallel to and about 100 ft. from the track.

If the prevailing winds are approximately parallel to the track it is seldom that cuts will be filled with drifts. In some instances, however, it is well to build so-called wing fences; these are placed along the sides of the cuts, at about right angles with the track and at such distances apart as experience shows to be necessary.

FUNERAL CARS FOR ST. LOUIS.

It is announced that contracts have been made between the St. Louis Funeral Car Association and the St. Louis Transit Co. and United Railways Co. for the operation of funeral cars over the street railway lines of the city. The tracks at present pass within a block of nearly all the churches and hospitals in St. Louis and temporary switches are to be provided for the cars so that regular traffic will not be delayed by reason of the funeral service.

Switches are to be laid into all the cemeteries and chapels for use in inclement weather built. A novel feature contemplated is the building of four chapels in different parts of the city at which the funeral services can be held instead of at the late residence of the deceased, as is customary.

REPORTS OF CHICAGO ELEVATED ROADS.

The traffic report of the South Side Elevated shows a daily average of 61,994 passengers in 1899 as against 51,777 in 1898, an increase of 19.7 per cent. The average daily traffic by months is as follows:

	1899.	1898.	Inc.
January	58,762	52,117	6,615
February	60,292	52,682	7,610
March	63,909	54,827	9,082
April	63,878	54,148	9,730
May	59,588	49,459	10,128
June	56,117	45,427	10,690
July	52,644	44,148	8,496
August	52,599	41,770	10,829
September	52,599	41,770	10,829
October	73,793	58,198	15,595
November	69,972	59,257	10,715
December	72,683	62,735	9,948

The report presented at the annual meeting of the Metropolitan Elevated, January 4th, covered the period from July 1st to December 30th. The traffic shows an increase of 22.37 per cent in the daily average as compared with the returns for 1898. The daily averages by months are:

	1899.	1898.	Inc.
July	67,498	53,878	13,620
August	68,070	55,925	12,145
September	76,184	60,702	15,482
October	94,430	74,490	19,940
November	88,820	74,745	14,075
December	90,682	77,168	13,514
Average six months	80,930	66,134	14,796

The figures on operation from July 1st to November 30th are: Gross earnings, \$624,158.10; gross operating expenses, \$270,717.64; surplus applicable to stock, \$99,078.33.

This company has 13.11 miles of double track, 1.67 miles of four track road and leases 4.38 miles of track from the Union Consolidated and loop companies.

The Lake Street Elevated had a daily passenger average of 37,266 in 1899 as against 33,948 for 1898. The gross earnings were \$697,513.27; operating expenses, \$331,552.87; interest, taxes and rentals of surface lines and loop, \$372,318.82; surplus for the year, \$3,639.58. It was announced that the company would complete two miles of three-track line this year, from 52d Ave. to Rockwell St., whereby express service would be provided for the western traffic of the road. This, with the natural expansion of business from the Oak Park extension, would greatly increase the income of the road. From the three-track system the company expects an increase of about 5,000 passengers a day.

PRIZES FOR EMPLOYEES.

The annual distribution of cash prizes to motormen and conductors was made by the Cincinnati, Newport & Covington Street Railway Co. early in January. The awards are made for clean cars, freedom from accident and attention to duty. Seventeen motormen received \$25 each, one motorman received \$10, one conductor received \$25, five conductors received \$10 each and 11 conductors received \$5 each.

ANNUAL REPORT OF BOSTON ELEVATED.

The second annual report of the Boston Elevated Railway Co., for an advance copy of which we are indebted to Mr. H. L. Wilson, auditor, gives the following summary of the company's business for the year ending Sept. 30, 1899:

Gross earnings from operation	\$9,671,441
Operating expenses	6,827,150
Earnings from operation	\$2,844,291
Payments under lease of West End St. Ry.	2,357,968
	\$ 486,323
Add interest on special deposits	84,696
	\$ 571,019
Taxes, Boston Elevated	257,420

Balance	\$ 313,599
Interest paid to holders of B. E. receipts	262,500
Surplus for the year	\$ 51,099
Operating Expenses	
General expenses	\$ 835,000
Maintenance of roadway and buildings	1,309,198
Maintenance of equipment	602,521
Transportation expenses	4,080,431
Total	\$6,827,150

Revenue Miles.	
Run by electric passenger cars	34,542,520
Run by horse passenger cars	51,704
Run by electric U. S. mail cars	174,294
Total	34,768,518
Passengers Carried.	
Revenue passengers on electric cars	199,898,995
Revenue passengers on horse cars	124,229

Total revenue passengers	191,023,224
Free transfer passengers on electric cars	42,113,715

Total passengers carried	233,136,939
Plant and Equipment.	

Miles of track completely equipped with electric overhead system, 327; partially equipped, 3.9; miles of overhead electric feeder lines, 468. Number of horse cars, 248; of electric cars, 2,710; of mail cars, 11; of snow plows, 244; of snow sleds, 391; of miscellaneous vehicles, 515.

COLLECTION OF RAIL SECTIONS.

The catalog of the Chisholm & Moore Manufacturing Co. for 1900 contains a collection of drawings to scale, showing every section of rail rolled by the six leading rolling mills in this country, with the American standard rail joint as applied to each pattern. It will be remembered this company published a similar collection of drawings last year and these have been in such demand that it was decided to republish them this year with numerous additions. Copies of the catalog may be had on application to Chisholm & Moore Manufacturing Co., Cleveland, O., and no railway official's reference library will be complete without one.

FREIGHT SERVICE FOR BROOKLYN.

It is understood that the National Express Co. is interested in a plan to operate a night freight and express service on the lines of the Brooklyn Rapid Transit Co. A year ago a similar scheme was discussed, but nothing came of it. The present plan is for a regular freight service to and from all parts of the city, with large receiving and distributing depots. A ferry service connecting with Manhattan and Jersey City railroad stations is included in the scheme.

The Toledo Traction Co. has made a donation of \$250 to the Toledo Public Library.

CAPITAL TRACTION ANNUAL MEETING.

On January 10th the annual meeting of the stockholders of the Capital Traction Co., of Washington, D. C., was held at the offices of the company, 91,705 shares being represented out of the total of 120,000.

The following were unanimously chosen directors: George T. Dunlop, Charles C. Glover, Henry Hurt, John G. Parke, Edward J. Stellwagen, Wm. Manice, Maurice J. Adler.

It was voted to authorize \$1,500,000 of bonds dated Apr. 2, 1900, payable in 20 years and bearing interest at the rate of 4 per cent, payable semi-annually; the company retains the option to redeem the whole or a part after three years at 5 per cent premium. Of the total, \$1,080,000 will be offered to stockholders at par and \$420,000 held in the treasury.

The proceeds will be used to retire an issue of 5 per cent bonds authorized Jan. 12, 1898, amounting to \$1,000,000; to funding the present floating indebtedness of about \$80,000, and to providing a fund from which there can be restored to the earnings account the sum of \$150,670 used for improvements, and further sums used for extensions and additions to the equipment. The cost of installing the underground system was in excess of \$1,500,000.

The directors met on the same day, January 10th, and re-elected the officers, who are as follows:

Geo. T. Dunlop, president; C. C. Glover, vice-president; C. M. Koones, secretary and treasurer; David S. Carll, chief engineer and superintendent.

CONSOLIDATION OF UNION AND CONSOLIDATED, CHICAGO.

On December 21st Secretary Marlowe sent the following circular to stockholders of the Chicago Consolidated Traction Co. explaining the plan for amalgamating that company with the Chicago Union Traction Co.: "Arrangements have been made so that the holders of the stock of the Chicago Consolidated Traction Co. will receive for each share of stock the sum of \$45, payable in 4½ per cent 40-year gold bonds of a kind to be decided by the counsel for the company, and which bonds are to be guaranteed, principal and interest, by the Chicago Union Traction Co. The stock shall be held in such manner as to be additional security. The bonds will be of the denomination of \$1,000. Any of the holders of the stock of the Chicago Consolidated Traction Co. who may desire to accept this offer will please notify me on or before Dec. 31, 1899, and deposit their stock with the undersigned."

CAR BARNs BURNED.

The barns of the South Chicago City Ry. at Hammond, Ind., were destroyed by fire early on the morning of January 9th. The barn was a brick building 72 x 225 ft.; the rolling stock destroyed included 32 cars, sweepers and sprinklers. No serious delay in traffic was occasioned as by the time cars were scheduled to leave temporary repairs had been made of the line connections destroyed.

WHAT SANTA CLAUS BROUGHT.

The Cleveland City Railway Co. distributed \$5,000 to its employes on Christmas.

The London (Ont.) Street Ry. distributed \$500 among its employes on Christmas.

The Consolidated Street Ry., of Seattle, Wash., announced a 10 per cent advance in wages on Christmas.

The Savannah (Ga.) Thunderbolt & Isle of Hope Ry. presented each of its employes with a turkey or its cash equivalent.

Each employe of the Union Elevated Railroad Co., of Chicago, received a gift of \$10 on reporting for duty Christmas day.

The Galveston (Tex.) City Railroad Co., by its receiver, Major Baer, made all of its employes the present of an extra day's pay.

The Columbus (O.) Street Ry. presented 400 turkeys to the married men and 97 silver dollars to the single men in its employ on Christmas.

The Nashville (Tenn.) Street Ry. served coffee and hot rolls at the transfer stations from 5 to 8 a. m. and a Christmas dinner was provided at restaurants for all employes.

The Chicago Consolidated Traction Co. served Christmas dinners from 10 a. m. to midnight at its car barns and all the employes who had to work that day had from one to three meals as the company's guests.

For some time past the Cincinnati Street Ry. has been fitting up a portion of its old cable power station for the use of its employes as club rooms, and they were opened to the men on Christmas day. President Kilgour and other officials of the company were present at the opening. Rooms are to be fitted up at the other power houses and stations.

In some cities Santa Claus by reason of press of other business was unable to get around until a week later.

The Topeka (Kan.) Ry. increased wages 20 per cent dating from January 1st.

The Lexington (Ky.) Street Ry. announced on New Years that wages would be increased 25 per cent.

The Franklin (Pa.) Electric Street Ry. suspended traffic from 12 to 1:30 on New Years day and entertained its employes at dinner.

The Zanesville (O.) Electric Ry. announced that beginning January 1st wages would be increased 10 per cent. The company also offers premiums of \$10 to the motormen and \$5 to the conductors operating cars for six months without accident.

The Cleveland Electric Ry. gave a dinner to its employes and their wives on the night of January 1st; the dinner was served in the club rooms at one of the barns. President Everett and Superintendent Douglass were present and made short speeches.

The New Orleans & Carrollton Railroad Co. added extra time to the pay roll of its men as follows: Those continuously in the service of the company from Jan. 1, 1899, to Dec. 20, 1899, three days' extra pay; from July 1, 1899, to Dec. 20, 1899, two days' extra pay; all other employes, one day's extra pay. President Newman in announcing the order added: "The efficient and satisfactory services rendered and the marked interest displayed at all times by its employes is a guarantee of its success, and its success is that of those employed by the company."

TOLEDO OUT OF THE GAS BUSINESS.

The city of Toledo, O., has sold its gas plant to private parties for \$228,000. This is the plant which cost the city \$1,500,000 (paid by a bond issue) and from which it has received a gross total revenue of \$100,000. Those interested in further details should refer to our issue of December last, page 845.

A MODEL ACCIDENT REPORT.

One of our readers sends in the following, a copy of a report turned in recently by one of his men. For brevity it rivals Dewey.

"Car going south at Third St., bicycle coming north, boy kicking at dog. When most to car turned in front car. Boy not hurt, bicycle damaged."

GRADE CROSSING ACCIDENTS.

December 30th a Panhandle train struck a Chicago City Ry. car, injuring three persons.

On December 23d a St. Louis trolley car was struck by a freight train, the motorman being killed and three of the six passengers injured.

December 20th an Illinois Central engine moving at slow speed struck a car of the Urbana & Champaign Railway, Gas & Electric Co. at a grade crossing and seven persons on board the trolley car were slightly injured.

An express train on the Pennsylvania R. R. ran into an electric car at Delta Ave., Cincinnati, on December 15th, demolishing the car and damaging the locomotive. The car was filled with passengers, but none were badly hurt.

December 28th a car on the Cleveland (O.) Electric Ry. ran into a freight train at a grade crossing; there were 15 passengers on board, but only two or three were injured slightly. The collision was due to the rails being wet and it is alleged a defective brake on the trolley car.

HALF FARES.

The Dayton & Xenia Electric Ry. is in operation.

The Peoria & Pekin Terminal Co., of Peoria, Ill., has been formally opened.

The government pays 12 cents a mile for all mails carried by the Brooklyn Rapid Transit Co.

The Greenwood Electric Ry., connecting Greenwood and Indianapolis, Ind., is open for traffic.

The Reading (Pa.) Traction Co. declared a dividend of 50 cents per share payable January 1st.

A mail service has been established between Goshen and Elkhart, Ind., over the Indiana Electric Ry.

The Metropolitan Street Ry., of New York, has declared its regular quarterly dividend of $1\frac{3}{4}$ per cent.

All the conductors and motormen of the Toledo Traction Co. will hereafter wear a regulation uniform.

The Metropolitan Street Railway Co., of Kansas City, Mo., spent nearly \$2,000,000 in improvements last year.

The Chattanooga Rapid Transit Co. has completed a 9-mile extension from Chattanooga to Chickamauga Park.

The recently completed Carnegie (Pa.) Heidelberg & Bridgeville Electric Ry. was placed in operation January 6th.

The College Hills & Park Line Ry., of Sherman, Tex., was sold last month to satisfy a deed of trust, to J. P. Harrison.

The city of Chicago has sued the Union Loop Co., alleging that the latter sweeps dirt from the structure into the streets.

Ray C. Logan, who is held responsible for several hold-ups on street cars in Chicago, has been sentenced to the penitentiary.

An injunction restraining the city of Dallas from selling the property of the Dallas Consolidated Electric Street Ry. has been secured.

Power from the Mechanicville (N. Y.) water power plant is used on the Albany and Troy branches of the United Traction Co., of Albany.

The North Milwaukee line of the Milwaukee Electric Railway & Light Co. was formally opened on the evening of Saturday, December 16th.

A steam heating system for supplying heat to the residences and business houses in the city is contemplated by the Findlay (O.) Street Ry.

A new company will be formed to operate the new Paltz (N. Y.) & Walkill Valley Electric R. R., which has been sold at receiver's sale.

Over 1,600,000 passengers were carried last year by the Leavenworth (Kan.) Electric Ry., an increase of 550,000 as compared with the previous year.

A car on the Detroit (Mich.) Rapid Ry. was derailed on January 7th by a misplaced switch, evidently the work of some one with malicious intent.

Combination opened and closed cars will be operated all winter by the Metropolitan Street Railway Co. of New York City, no matter how cold the weather. It is stated smokers demand the open cars.

The Haverford St. repair shop of the Union Traction Co. of Philadelphia, were partially destroyed by fire on January 2d. The loss is placed at \$15,000.

Four non-union men accused of taking part in a riot the outgrowth of the recent street railway strike at Buffalo, N. Y., were fined from \$25 to \$50 each.

A quarterly dividend of 60 cents per share on its capital stock was declared by the Market Street Railway Co. of San Francisco, payable after January 16th.

The British Institute of Electrical Engineers and the American Institute of Electrical Engineers will probably hold a joint meeting during the Paris Exposition.

The Evansville (Ind.) Street Railroad Co. has paid into the city treasury the sum of \$2,040, representing 2 per cent of the road's earnings for the past year.

The Delaware, Lackawanna & Western R. R. has decided to reduce passenger rates between Syracuse and Baldwinville, N. Y., to compete with the electric line.

The offices of the New York & Queens County Electric Railroad Co. have been moved into a new building at Nos. 5 and 7 Borden Ave., Long Island City.

A breakdown in the power house of the Santa Barbara (Cal.) Consolidated Electric Co. recently necessitated the running of an old mule car on State St. for several days.

The Circuit Court of Cook County has ruled that the repeal of the Allen law at the last session of the Illinois Legislature did not abolish the necessity for frontage consents.

It has been decided to consolidate the Gardner (Mass.) Street Railway Co. and the Gardner, Westminster & Fitchburg Street Railway Co., under the name of the latter.

The Muskegon (Mich.) Street Railway Co. has placed on sale working people's tickets at the rate of six for a quarter. The tickets are good until 8 a. m., and from 5 to 7 p. m.

The council of Kirkwood, a suburb of St. Louis, has passed an ordinance prohibiting any street railways operating within its limits from carrying any mail, baggage or express matter.

The residents of South Omaha, Neb., have petitioned the mayor and city council of Omaha to ask the Omaha Street Railway Co. to extend its lines and improve its service to that suburb.

The Haverhill (Mass.) Georgetown & Danvers Street Railway reports gross earnings for the year ending Sept. 30, 1899, of \$23,209. Under the excise tax law the company pays the city \$66.30.

The Denver City Tramway Co. is to be prosecuted for not complying with the car heating ordinance. It is believed that the company has not been given a reasonable time in which to comply.

Boston experienced the first heavy snow storm of the season on January 1st, and all of the snow fighting facilities of the Boston Elevated R. R. had to be called into use to keep the cars moving.

The Dotz Third-Rail Electrical Co. was incorporated in Delaware last month, with an authorized capital of \$2,500,000. W. W. Dotz and William Reinhart, of New York, are among the incorporators.

A consolidation of the Virginia Electric Co., Norfolk Street Ry. and the Norfolk & Ocean View Railway Co., of Norfolk, Va., has been completed, under the name of the Norfolk Railway & Light Co.

The property of the Phoenix City (Arizona) Railway Co. was sold on December 28th by the receiver for \$33,342. The purchaser is the Phoenix Railway Co., a California corporation, and it is believed that Gen. M. H. Sherman who was at the head of the old

company is interested in the new one. The sale was ordered on account of a judgment for \$354,000 secured by the Valley Bank of Phoenix as trustee for the bondholders.

An application of the Atlanta (Ga.) Railway & Power Co. for the privilege of laying underground pipes for the purpose of supplying steam heat to the public has been held up by the Board of Aldermen.

By the deposit on December 27th of \$4,500,000 with the Continental National Bank, of St. Louis, the final step in the transfer of all the consolidating lines in St. Louis to the United Railways Co. is completed.

A gang of pickpockets is successfully working the street cars in Baltimore, as shown by the large number of losses reported by passengers. The holiday season, with its crowded cars, offered great opportunities.

The Chicago City Council has passed an ordinance requiring all street railway companies in the city to replace all flanged rails with grooved rails within five years. From this time on new track must be laid with grooved rails.

Among recent petitions to the Massachusetts Legislature was one from the Boston & Suburban Express Co. for authority to permit street railway companies to furnish it facilities for transporting mails, parcels and express matter.

The Newark (N. J.) Tax Board has announced that it intends to tax as real estate, the franchises of street railway, electric light and other companies enjoying public grants of this nature. The matter will be taken into the courts.

The Union Traction Co., of Anderson, Ind., will probably make arrangements for entering Indianapolis over the tracks of the Indianapolis Street Railway Co. It is stated very friendly relations exist between the two corporations.

Owl cars on the Broadway cable road in St. Louis are now operated by electricity instead of mules as heretofore. It is announced within a few months the Broadway line will have been entirely converted to electric traction.

The Berlin power station that supplies current for the third rail section of the New York, New Haven & Hartford R. R. was forced to shut down recently for several hours owing to the failure of the water supply due to the severe drought.

It is stated in Spokane (Wash.) papers that President Hill, of the Great Northern R. R., ex-Senator Warner Miller, of New York, and others are to build an electric road to connect the Republic mining camp with the Spokane & Northern road.

The statement is made that the company owning the union loop in Chicago is about to make application for permission to build elevated railways in Adams and Monroe Sts., from Fifth Ave. to Wahash Ave., thus changing the present loop into two smaller ones.

The Monongahela Traction Co., of Pittsburg, is about to lay out a new ball park at Kennywood. The athletic grounds will be a level field 450 ft. long and 350 ft. wide, with a grand stand having a capacity of 2,200, and two extensive bleachers at the side of the infield.

The litigation in the supreme court over the consolidation of the Cincinnati & Hamilton Electric Street Ry. and the Cincinnati & Miami Valley Traction lines into a through line from Cincinnati to Dayton has been compromised and through cars will soon be in operation.

The Bay Cities Consolidated Ry. has effected a settlement with the bridge commissioners of Bay County which puts an end to a controversy which has been pending for some time, and gives it the right to use the bridge and approaches on the payment of \$500 per annum.

The Brooklyn Rapid Transit Co. on January 1st made a 5 per cent advance in the wages of employes who had been continuously in the service for two years, 10 per cent for those in the service for three years, and 15 per cent for those who have been with the company five years or longer.

Abutting property owners have brought a number of suits against the Union Elevated R. R., Chicago, alleging damages by reason of the shutting out of light and by the vibrations. Similar suits filed some time ago have been decided in favor of the company and are now pending in the upper courts.

The gross receipts of the Milwaukee Electric Railway & Light Co., for the year ending Dec. 31, 1899, were \$1,977,193, on which the company will pay taxes of \$79,088 to the city. The gross earnings of the Milwaukee Light, Heat & Traction Co., were \$232,500 on which city taxes of \$4,650 will be paid.

The attorneys of the city of Columbus, O., have advised the council that the resolutions passed recently declaring sundry street railway franchises forfeited and directing the clerk to advertise them for sale, are void, as the council had no authority to take such action; it must originate with the board of public works.

As the result of the Brooklyn Rapid Transit Co.'s new transfer system whereby all the through travel from the suburbs is carried on the elevated roads, the traffic over the Bridge has increased to 190,000 passengers a day. The greatest number of passengers carried when this railroad was controlled by the municipality was from 145,000 to 150,000 a day.

The Tri-City Railway Co., of Davenport, Ia., has opened its new line to the Arsenal at Rock Island for the accommodation of the Government employes at that place. Special Arsenal cars will be run for this purpose morning and evening, and special employes' tickets entitling the holder to one round trip ride each working day in the month will be sold at \$2 per month.

An attempt to hold up a street car in Seattle, Wash., on December 28th, resulted in the death of one of the would-be robbers and the wounding of several of the passengers. Two masked men entered the car, which carried eight people, at 11 o'clock p. m., and ordered the occupants to throw up their hands. Instead of doing so several of the passengers opened fire on the highwaymen with the above results.

A deliberate attempt to wreck an electric car belonging to the United Railways & Electric Co., of Baltimore, was made last month on the elevated trestle over North St. An unknown person placed a large paving stone on the track between the rail and the wooden guard, but fortunately the first car that struck the stone was moving slowly and no damage aside from derailing the car was done.

Acting on the report of the fire chief of New York City that an unusual number of collisions between cars and fire apparatus had occurred recently, both the Metropolitan Street Railway Co. and the Third Avenue Railroad Co. have issued instruction to all the motormen and gripmen to stop their cars before crossing streets in which fire companies are stationed, to see if a fire engine or truck is approaching.

An authority states that the first-class passenger fares on the steam roads of the United States last year averaged 2.14 cents per mile. In England the first-class fare is 4 cents per mile; the third-class fare is 2 cents per mile; in Prussia the fare is 2.99 cents per mile; in Austria 3.05 cents per mile, and in France 3.36 cents per mile. These figures were compiled by George H. Daniels, of the New York Central R. R.

A new price list of leather belting has been adopted by the Leather Belting Manufacturers' Association. The following prices from this list will give an idea of the revised schedule: Single belting, 1/2 in. wide, 8 cents a ft.; 1 in. wide, 14 cents a ft.; 2 in., 34 cents; 4 in., 72 cents; 6 in., \$1.11; 8 in., \$1.48; 1 ft. wide, \$2.22; 2 ft., \$4.44; 3 ft., \$6.66; 4 ft., \$8.88; 5 ft., \$11.10; 6 ft., \$13.32. Double belting is twice the price of single belts.

A suit for foreclosure of mortgage has been filed against the Astoria (Ore.) Street Railway Co., and Judge McBride has been appointed receiver of the property. The mortgage is a first lien and there is now due the principal of \$25,000 and \$4,500 accrued interest. The company owns three miles of electric road, five motor cars and two trail cars, and one 80-kw. generator, one 125-h. p. engine and one 200-h. p. boiler.

The Keokuk & Hamilton Water Power Co. has been incorporated in Iowa by capitalists of Keokuk, Ia., and Hamilton, Ill., to develop the water power of the Des Moines rapids of the Mississippi River, and transmit it electrically to various cities and towns of the two states. The officers of the company are: Charles P. Birge, Keokuk, president; R. R. Wallace, Hamilton, vice-president; Edward Jarger, Keokuk, secretary and treasurer.

President W. Caryl Ely of the International Traction Co., of Buffalo, in a recent interview regarding the street railway transportation facilities at the coming Pan-American Exposition said in part: "We will have five lines of street cars running to and from the exposition grounds and will be in a position to care for from 75,000 to 100,000 persons an hour. North of the grounds we will have terminal tracks with room for between 400 and 500 cars."

The city council of Buffalo, N. Y., has passed a resolution requiring the Buffalo Traction Co. to begin the building of a few new lines next spring, allowing an extension of time on several other lines, releasing the company from its obligation to build a number of lines that were originally intended to parallel the routes of the Buffalo Railway Co., and removing the legal obstacles in the way of an actual consolidation of the Buffalo Traction Co. and the Buffalo Railway Co.

At the recent meeting of the Fairmount Park Transportation Co., of Philadelphia, the president stated that Woodside Park, in which the company had invested \$300,000, was in fine condition. The Transportation Co., during the year ending October 1st last, advanced the Woodside Park Co. \$45,000, and in addition expended \$20,000 in improvements. The number of passengers carried for the year was 2,552,562, an increase of 309,408 over the previous year. Net receipts were \$70,952.

The bitter feeling in consequence of the recent strike in Cleveland has not entirely disappeared, as is evidenced by the number of arrests that have been made of persons willfully annoying the new conductors and injuring the company's property. The chief amusement of the rowdies who caused the trouble was the ringing up of fares, for which the conductors would have to account. Another pastime was the cutting of the trolley rope and annoying peaceably disposed passengers.

The report of the Board of Railroad Commissioners of Maine for the year ending June 30, 1899, states there are 240 miles of street railways in the state, three of which are horse and the rest electric. The total gross earnings for all the roads is given at \$1,090,418; operating expenses, \$686,420; net earnings, \$403,998. There were two passengers killed and seven injured. Total number of passengers carried was 18,496,374. Motormen and conductors on street railways of Maine are paid from \$1.43 to \$1.60 per day.

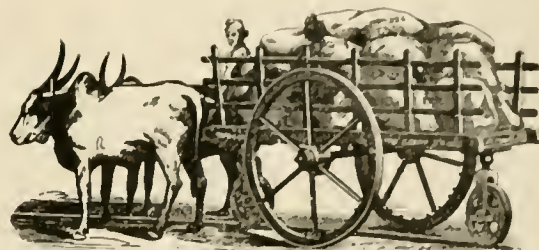
The State Board of Equalization of Connecticut has completed the work of auditing the returns of the steam and street railway companies of the state for calculating the taxes. The largest amount of tax paid by any electric road is by the Fair Haven & Westville Ry., which pays \$36,728.73, the stock being valued by the board of equalization at \$25 per share. The next highest trolley taxpayer is the Hartford Street Railway Co., \$30,296.47, the stock being valued at \$125 per share. The smallest amount of tax is paid by the Newington Tramway Co., which has an existence practically in name only. The amount is 8 cents.

The superior court at New Haven, Conn., has awarded judgment for \$3,000 damages to the parents of a child killed by a car of the Derby (Conn.) Street Ry. The defendant at the trial made the fol-

lowing argument, that "as the statute authorizes the Railroad Commissioners to require street railways to place fenders on their cars whenever public safety requires it, this authority invested in the commissioners is exclusive and deprives the court of the power to find negligence from their absence in cases where the commissioners have failed to order their use." It is held, however, by the Hartford court that this is not good law.

ADDIS' SINGLE RAIL TRAMWAY.

The accompanying illustration is from Indian Engineering, in a recent issue of which is reprinted a letter, dated Nov. 2, 1891, from the inventor, W. J. Addis. The tramway consists of a single rail; the vehicles are any of those in ordinary use with the addition of



SINGLE RAIL TRAMWAY.

one or more centrally located wheels to bear on the rail. Mr. Addis states that the road has been worked in Europe, India and Burma, and recommends it for feeder lines and famine roads.

A CASE OF WORM EATEN PILES.

Mr. Onward Bates, engineer and superintendent of bridges and buildings of the Chicago, Milwaukee & St. Paul, recently presented before the Western Society of Engineers, of which he is president, an account of the experience of his road with worm eaten piles. The company uses Wisconsin oak for piling when this timber can be secured, but on one occasion was obliged to get a lot of Arkansas oak piles. These were driven in various bridges on the company's lines; two years later it was discovered that worms were eating the Arkansas piles in one of the bridges and 60 of them had to be replaced. Within four years after being driven all of this lot of piles were found alive with worms. The worms attacked the pile near the surface of the ground and worked downward, being most destructive in sandy soils and during dry seasons; they confined themselves to the Arkansas timber and did not molest northern oak piles driven in the same bent.

In answer to an inquiry, the Forestry Division of the Department of Agriculture gave the following information concerning these piles:

"If an oak is felled in Arkansas in May and left only a week on the ground and unbarked, the boring insects, like green flies on a dead animal, will have deposited their eggs by the thousands. Even if peeled and taken away, young larvae will continue their mischief. If the bark is pushed off, the logs at first do not show any conspicuous signs of the presence of these borers and thus may easily pass muster. From the fact that the piles decayed so readily it seems plausible that:

- "1. They were left in the bark for some time before peeling.
- "2. That they became infested by fungi (causing decay) as well as the borers.
- "3. That they remained in the wood for sometime and thus facilitated the progress of both.

"Any after-treatment except impregnation or subjection to dry kiln seasoning could not benefit these timbers.

"Had they been cut in winter (any time after September 15th), peeled and at once taken out of the woods to some dry yarding ground, they would have lasted as well as Wisconsin oak. Oak sapwood is generally not durable and it might be well to cut it away whenever the exposure requires great durability."

Mr. Bates stated the life of Wisconsin oak piles was from 12 to 18 years.

PATROLMEN AND FIREMEN USUALLY RIDE FREE.

There is one valuable service rendered by street railway companies to the municipalities in which they are located that is seldom taken into consideration when the questions of remuneration for franchisees, rates of fares, etc., are up for discussion. This is the carrying of city employes, as policemen and firemen, without charge, and in a number of cities this free transportation, if paid for at regular cash fare rates would amount in the aggregate to several thousand dollars per year. The greater portion of this sum is virtually a gift to the community, as it costs the company as much to carry a policeman or fireman as any other passenger. Most of the roads have of their own accord offered free transportation to these public servants although they were under no more obligation to do so than they were to carry without charge, doctors, school teachers or in fact any other class of citizens.

To ascertain what the custom is in this regard and to determine something of the cash value of this free riding the "Review" recently sent out a list of questions to a few prominent roads picked at random from different sections of the country. Of the 29 companies addressed only 2 do not carry either policemen or firemen without charge; 6 carry policemen but not firemen; and 21 carry both policemen and firemen. In nearly all cases the stipulation is made that these officers must be in uniform or a fare will be collected.

Twenty of the companies reporting do not keep records of free riders and 9 do.

The Albany Ry., and the Milwaukee Electric Ry. & Light Co. carry neither policemen nor firemen free.

The following companies carry policemen only and not firemen: Portland (Me.) R. R., Cleveland Electric Ry., Cincinnati Street Ry., Binghamton R. R., Ithaca (N. Y.) Street Ry., and Duluth (Minn.) Street Ry.

The following companies carry both policemen and firemen but are not able to estimate the total number that ride per annum: St. Louis & Suburban Ry.; Twin City Rapid Transit Co., of Minneapolis, Minn.; Omaha Street Ry.; Metropolitan Street Ry., of New York City; Union Traction Co., of Philadelphia; Wilmington (Del.) City Ry.; United Railways & Electric Co., of Baltimore, Washington (D. C.) Traction & Electric Co., and Louisville (Ky.) Ry.

T. M. Jenkins, general manager of the St. Louis & Suburban Ry., writes as follows: "We carry both policemen and firemen free of charge—that is the policemen when they may desire to ride, and firemen going to or coming from their meals. (Of course this clause is merely one of form, as we have no means of telling when any particular firemen is going to or coming from his meals.) Both policemen and firemen are required to be in uniform to entitle them to free transportation."

The Cincinnati Street Ry. has a rule that not more than two officers are to ride on a car at any one time.

Willard J. Hield, general manager of the Twin City Rapid Transit Co., of Minneapolis, writes: "We permit police and firemen when in full uniform, to ride free on all our cars. We receive compensation from the government for the transportation of mail carriers and postoffice special delivery boys, but this is paid in a lump sum, and they are allowed to ride on their uniforms and are consequently regarded by the conductor as free riders. The conductors report all free riders, but do not separate the different classes."

The following companies report the estimated number of police and firemen carried free each year and the value of this service if it were paid for at regular cash fare rates as follows:

Boston Elevated Ry., number carried, 3,285,000; value, \$164,250.

Denver (Col.) City Tramway Co., number carried, 81,000; value, \$4,050.

Columbus (O.) Ry., number carried, 264,000; value, \$13,200.

Buffalo Ry., number carried, 1,280,936; value, \$64,046.

Chicago Union Traction Co. number carried, 1,600,000; value, \$80,000.

Birmingham (Ala.) Ry. & Electric Co., number carried, 50,000; value, \$2,500.

Detroit Citizens' Street Ry., number carried, 800,000; value, \$40,000.

New Orleans City R. R., number carried, 530,000; value \$26,500.

Market Street Ry., of San Francisco, number carried, 360,000; value, \$18,000.

Consolidated Traction Co., of Pittsburg, number carried, 365,000; value, \$18,250.

Indianapolis Street Ry., number carried, 521,950; value, \$26,097.50.

Rochester Ry., number carried, 150,000; value \$7,500.

The Ithaca Street Ry. does not carry firemen free but estimates the number of police at from 5,000 to 6,000 per year, and the value of the service at \$250 to \$300.

The Duluth Street Ry. carries 73,000 policemen per annum; value of service, \$3,650.

MERRY-GO ROUNDS OR CAROUSELS; HOW THEY ARE MADE.

One of the most interesting manufacturing establishments that one can visit is found at 3635 Germantown Ave., Philadelphia, where the proprietor, Mr. G. E. Dantzel will explain to the visitor the method of constructing the mechanical details of one of these child fascinating amusement appliances, and what is still more interesting will describe the method of constructing the various wooden animals, and chariots on which the children are mounted for a ride. The animals provided with the carousels, which are turned out from this establishment are not mere graven images, stiff and ugly, but animals designed true to life, and graceful in form and poise, and in fact highly artistic as to form and coloring. In the process of manufacture, seasoned planks 3 in. thick, of poplar or other white woods are cut into peculiar shapes by a band saw, and then glued firmly together making a hollow box with various irregular attachments. These then go to the carving room and are carved by hand by skilled artists into the desired forms. The horses have glass eyes, genuine horse tails, and the saddles and saddle-cloths are carved in the wood. For models the designers go to the illustrated animal books or zoological gardens where they study animal life and draw and design in the most natural manner possible. If it be a horse that is being constructed, the head and mane are carefully formed and carved as if for a bronze statue, and the pose of the limbs and that of the whole body is oftentimes that of an animal running or galloping, and the detail designs are so accurate that even the shoes on the feet are carved and colored so as to imitate a real iron shoe. The favorite animals imitated include horses, donkeys, camels, oxens, deers, giraffes, buffaloes, ostriches, lions, dogs and almost all the animals familiar to child life, both domestic and wild. Not only is the carving carefully and artistically done, but the painting and decorating is in pleasing and durable colors. Two or four rows of animals are usually mounted on the large machines, and in some cases, the individual animals of the inside rows are mounted on ingeniously arranged movable pedestals which give to the animals an automatic rocking or galloping motion independent of the whirling motion of the entire device. Outfits are sold complete including motors or two-cylinder vertical or horizontal engines for operating the carousel, and also imported organ orchestrions, concertinos and trumpetinos for furnishing the music that is usually provided with these machines. The organ cylinders are made in the works and are so designed that they are interchangeable, so that a change can be made every year in the tunes played. The carousels are made in eight sizes and range from 36 ft. in diameter to 48 ft. and one size is a double deck machine 44 ft. in diameter. The different machines carry from 24 to 60 animals and from 2 to 6 double seated chariots which are also carved and beautifully upholstered and frescoed. The double deck machines carry 68 animals and 6 double seated chariots.

The carousels are sold at prices ranging from \$3,000 to \$7,000, depending upon size and finish. In one case an outfit was sold and put up with a tent at the Pittsburg Exposition for \$14,000 which paid for itself the first year.

Mr. Dantzel has been engaged in the manufacture of carousels, swings and other amusement appliances in this country since 1867. His father before him was engaged in constructing similar appliances for amusement more than 70 years ago in Germany. Mr. Dantzel claims that his products are the finest in the world, a result of long experience in this line of work, and from the fact that only the best and most skillful artists and carvers are employed for designing and shaping the animals, while the mechanical appliances are up-to-date in every particular. It is claimed that demand for amusement appliances of this character is increasing from year to

year, but the orders that come to this establishment are not confined to this country merely, but shipments are made to South America and other foreign countries.

A NEW SURFACE CONTACT SYSTEM.

The following description of a new surface contact system was recently given by Mr. W. H. Merriman, in the London Electrical Engineer.

Fig. 1 shows details of the cross section of this system. As a car travels along the road the flanges of the wheels press the treadle A, and with it the short plunger, B, thereby depressing the shorter arm of the lever. The treadle, A, may be either a rigid bar of a length equal to the wheel base of the car, or, preferably, a continuous flexible strip of steel as shown in Fig. 2. It is held in its

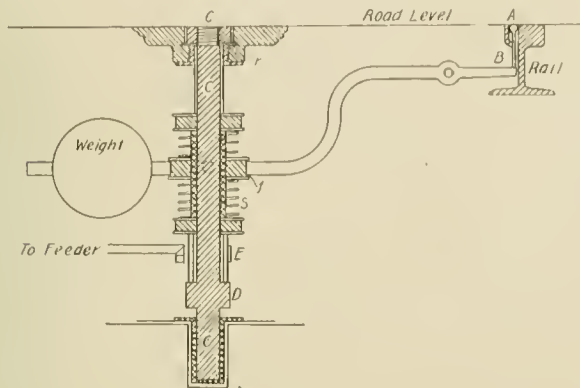


FIG. 1.

normal position by the studs, B, which are placed along the groove of the rails at intervals equal to the wheel-base of the car. When the short arm of the lever is depressed the long arm rises, carrying with it by means of the flexible coupling, f, the contact stud, C, C., which when raised makes electrical contact between D and E, the latter being in direct connection through a fuse with the main feeder. The contact stud when raised presses against the collecting bar fixed on the bottom of the car, a firm contact being secured by the spiral spring, S. At the end of the long lever a weight is fixed which is sufficiently heavy to prevent anything less than the weight of the car from depressing the treadles and raising the contact stud. This weight also insures the contact stud falling back promptly into its normal position. As soon as the car wheels leave the treadle the weight falls, and it will be seen from this arrangement that the stud is raised only when the car is directly over it and only is "alive" at such times as it is raised. Fig. 2

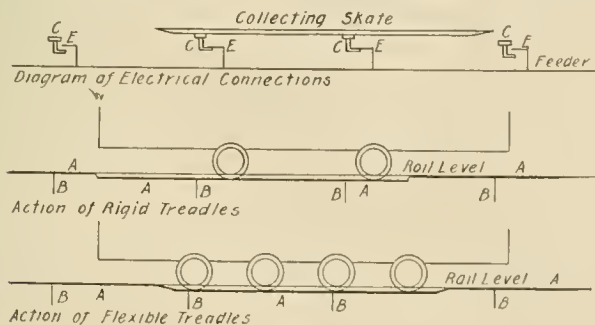


FIG. 2.

shows a diagram of the electrical connections with the alternative systems of rigid and flexible treadles, two of the plungers, B, being shown depressed as the car wheels pass over them, the contact studs consequently being raised.

The system appears to be extremely complicated on account of the number of moving parts and the ease with which dirt, stones, etc., would be able to work into the treadle and eventually prevent its being depressed. While the general idea of contact rising from the road, making connections with the collector and falling back "dead" again after the car passes, has long been an attractive

problem to inventors, the advisability of such a system is doubtful, and experience has proved that it is almost impossible to obtain a smooth working device which contains any great number of moving parts.

STREET CARS IN MANILA.

A private in Co. C, Thirteenth United States Infantry, stationed in the Philippines, writes as follows concerning the transportation facilities in Manila:

"The street cars in Manila are fearfully and wonderfully made, but not more so than some of the other conveniences for hire in the streets. You hear nothing but the whistle of the driver of the approaching street car, who uses an old trumpet with a squeaky and ear-splitting note, playing a weird tune for the purpose of clearing the tracks, which, however, never seem to want clearing."

MUNICIPAL OWNERSHIP WANTED AT SEATTLE.

There is in Seattle, Wash., a considerable party which strongly favors the municipal ownership of street railways and is conducting its campaign through a committee of 100. The committee has applied for a writ of mandamus to compel the city council to submit to popular vote at the election in March next a proposed amendment to the city charter. It is claimed that the council has disregarded a petition praying that such an amendment be submitted.

HIGH GRADE ELECTRICAL INSTRUMENTS.

The complete line of portable and switchboard ammeters, milliammeters and volt meters, made by the Jewell Electrical Instrument Co., of Chicago, has been on the market for two years and is giving perfect satisfaction, as is proved by the fact that the business of the company has so increased within the past six months that it has been necessary to secure larger factory floor space. This has been obtained at the corner of Randolph and Canal Sts., Chicago, and the works will be moved from the present location on February 1st, thus starting out the new year with a quadrupled factory capacity to meet the requirements of the rapidly growing patronage.

In the company's 1900 price list just received special attention is drawn to the following strong features of these instruments; rigidity of construction, especially noticeable in the movements; "deadbeat" qualities; constant temperature co-efficient; hand drawn scales, so that readings are as correct as the human eye can read; scale divisions are uniformly spaced; scale readings all begin at zero and the scale is adjustable; no magnetic lag, as the instruments have no iron in the moving parts; the device for eliminating effects due to static electricity.

A THREE-CENT FARE ROAD.

In order to get a connecting link for its line from Braddock, Homestead and other towns east of Pittsburg to the city, the Monongahela Street Railway Co. was obliged to accept a franchise from the town of Wilkinsburg which provided for 3-cent fares.

The 3-cent fare will be strictly confined to the limits of Wilkinsburg, so that town will now have the distinction of being the only one in America where the street railway rates are so low.

Several officials of the Allentown & Kutztown Traction Co., of Allentown, Pa., were severely injured recently while testing a new gasoline engine for driving street cars. The tank containing the gasoline was carried beneath the forward part of the car and by proper mechanism when the motorman turned a crank the vapor would ignite and the car start. On the first trial when the lever was turned a terrific explosion occurred and the occupants of the car, consisting of officers of the company, were thrown in all directions. It is announced that all experiments with gasoline as a motive power will be abandoned on this road.

The Birmingham (Ala.) Railway & Electric Co. has ordered 30 new summer cars.

PERSONAL.

MR. J. F. TAYLOR has accepted the position of general manager of the Madras Tramways.

MR. THOMAS LEES has been appointed superintendent of the Nashua (N. H.) Street Ry.

MR. HORACE E. ANDREWS has succeeded Mr. S. T. Everett as director of the Little Consolidated, of Cleveland.

MR. ALBERT S. RICHEY has assumed the duties of electrical engineer for the Union Traction Co., of Anderson, Ind.

MR. W. B. LONGYEAR succeeds Mr. W. F. Ham as auditor of the Brook'yn Rapid Transit Co., with all its allied properties.

MR. C. H. WILMERDING, of Chicago, has been appointed superintendent of stations for the Third Avenue R. R., of New York.

MR. R. B. DAVIS has resigned his position as superintendent of track department of the Syracuse (N. Y.) Rapid Transit Co.

MR. H. M. LYNN, of Milwaukee, is in charge of the extensions the Fond du Lac (Wis.) Street Railway & Light Co. is now building.

MR. JAMES R. CARRIER, superintendent of transportation of the Syracuse (N. Y.) Rapid Transit Co., has been succeeded by Mr. Harry J. Clark.

MR. MORRIS M. NASH will take the office of superintendent of the Lowell (Mass.) & Suburban Street Ry., made vacant by the death of Mr. Philip T. Begley.

MR. L. A. SCOVIL, superintendent of the Quincy (Ill.) Horse Railway & Carrying Co., has resigned to take a position with the street railway lines at Kansas City, Mo.

MR. EDGAR F. FASSETT will be superintendent of the new United Traction Co., of Albany, N. Y. Mr. Fassett was formerly assistant superintendent of the Albany Ry.

MR. ALFRED GIBBINGS, until recently engineer to the Bradford (Eng.) Corporation, has been made consulting engineer to the borough, and a new engineer will be appointed.

MR. WILLARD R. KIMBALL, a director and large stockholder in the Syracuse (N. Y.) Rapid Transit Ry., has sold all his holdings in that company and resigned from the directorate.

MR. JAMES WALLACE, formerly road-master of the Toronto (Ont.) Ry., has taken a responsible position in connection with the management of the Winnipeg (Manitoba) Street Ry.

MR. CHARLES E. FLYNN, superintendent of the Carbondale (Pa.) Traction Co., on Christmas eve received a midnight call from his employes and was presented with a handsome opal ring.

MR. ROBERT F. CARR, vice president and general manager of the Dearborn Drug & Chemical Works, of Chicago, is making a two months' business trip to the Pacific Coast and is now at Los Angeles.

MR. H. B. WESTCOTT, general manager of the Cortland & Homer Traction Co., of Cortland, N. Y., has accepted the position of general manager of the Sidney & Louisburg R. R., a steam line in Nova Scotia.

MR. W. G. MELOON, formerly superintendent of the Portsmouth, Kittery & York Street Railway Co., of Portsmouth, Me., has been made general manager of the road, succeeding Mr. A. F. Gerald, resigned.

MR. W. T. GOUNDIE, who has been for many years general manager of the Kings County Elevated R. R. of Brooklyn, has been made general superintendent of all the elevated lines of the Brooklyn Rapid Transit Co.

MR. E. H. MATHIER, assistant general manager of the street railway systems owned by the Connecticut Lighting & Power Co., has resigned to accept the position of treasurer of the Portland (Me.) Electric Light Co.

MR. BROWN CALDWELL, recently secretary of the Peerless Rubber Co., has assumed the position of general eastern representative of the Sargent Co., of Chicago, and will have offices in Pittsburg and New York City.

MR. W. G. WAGENIALLS, formerly superintendent of the Miami Valley Traction Co., now manager of the Millcreek Electric Street Ry., of Cincinnati, received a Christmas present from the employes of his road in the shape of an elegant leather upholstered chair.

GEN. MGR. E. C. HATHAWAY and Supt. R. T. Gunn, of the Lexington (Ky.) Railway Co., received handsome Christmas remembrances from the employes of the road on Christmas morning. Mr. Hathaway was presented with a leather upholstered chair and Mr. Gunn with a gold watch.

MR. W. S. DIMMOCK was last month appointed general manager of the Omaha & Council Bluffs Railway & Bridge Co., of Council Bluffs, Ia., a newly created office. Mr. Dimmock for the last six years has had the virtual position and authority of general manager under the title of general superintendent; the latter office will remain vacant.

MR. GRANVILLE C. CUNNINGHAM, who is known in street railway circles in this country through his connection with the electric railway interests of Toronto and Montreal, has resigned his position as managing director of the City of Birmingham Tramways Co., Ltd., of Birmingham, Eng., to accept the post of general manager of the Central London Ry.

MR. C. LOOMIS ALLEN, who succeeded Mr. John H. Moffitt as general manager of the Syracuse (N. Y.) Rapid Transit Co., has left Syracuse to take up the duties of general manager of the street railway system at Lorain, O. Mr. Allen was presented with a handsome gold watch by the employes of the Rapid Transit Co. the day he left for his new work.

MR. S. L. NELSON resigned as general manager of the Springfield (O.) Railway Co. on December 31st, and it is stated will take a similar position with the Wichita properties recently purchased by Mr. W. B. McKinley, of Joliet and Champaign, Ill. Mr. Nelson left Springfield with the best wishes of every man connected with the railway, and of his many friends among the citizens of Springfield.

MR. WILLIAM F. HAM auditor of the Brooklyn Rapid Transit Co., has severed his connection with that system to accept the office of comptroller of the Washington (D. C.) Traction & Electric Co. Mr. Ham's work in connection with the Accountants' Association has made him one of the best-known street railway men in this country and he will take with him into his new labors the best wishes of his host of friends.

MR. W. B. BROCKWAY, secretary of the Toledo, Bowling Green & Fremont Ry., and secretary of the Street Railway Accountants' Association of America, has resigned his position with the Toledo road to accept a flattering offer from the New Orleans & Carrollton R. R. He will enter on his new duties in New Orleans this month, and carry with him to his new work the best wishes of a large circle of friends.

MR. WALTER H. WILSON, who lately resigned as first vice-president of the Chicago Union Traction Co. and was succeeded by Mr. John M. Roach, was last month chosen third vice-president of the company, a newly created office. At the same meeting four directors were added to the board, Messrs. William Dickenson and John V. Clarke, of Chicago, and Walter S. Johnson and Henry B. Hollins, of New York.

MAJ. E. C. LEWIS on December 14th resigned as vice-president and director of the Nashville Street Railway Co. and the three subsidiary companies, the Nashville & Suburban Street Railway Co., the Citizens' Rapid Transit Co. and the Cumberland Electric Light & Power Co., with which he has been connected. Mr. T. J. Felder succeeds him as vice-president of the latter companies and Mr. S. M. Murphy as vice-president of the Nashville Street Ry.

MR. EDWARD P. BURCH, electrical engineer for the Twin City Rapid Transit Co., has resigned his position with that company to become a consulting engineer. Mr. Burch has been the company's chief electrician for nearly eight years. Among more recent work, he has installed and has supervised the operation of the electrical apparatus at the new 10,000 h. p. water power plant of the Pillsbury-Washburn Co., in Minneapolis, and has had entire charge of the Twin City Rapid Transit sub-stations in Minneapolis and St. Paul. The power plant has ten 1,000-h. p. direct connected units. Power is transmitted from 3 to 10 miles through paper insulated underground cables by three phase alternating currents at 3,500 and 12,000 volts and is transformed and converted at sub-stations into direct current at 600 volts for the entire railway system of Minneapolis and St. Paul. This was the first large installation of the kind. The system has been in operation over two years.

ELECTIONS.

THE QUAKERTOWN (PA.) TRACTION CO. has passed into the control of C. Taylor Leland. The new directors are S. R. Kramer, Perkasio, Pa.; W. H. Davis, Quakertown, Pa.; C. Taylor Leland, Quakertown, Pa.

THE CLARKSBURG (W. VA.) STREET RAILWAY CO., at a recent meeting, elected the following officers? President, S. C. Dunham; vice-president, Leonard Peck; secretary, V. L. Highland; treasurer, F. B. Haymaker.

THE STATEN ISLAND (N. Y.) ELECTRIC RAILROAD CO. has elected the following board of directors: Gen. Samuel Thomas, W. G. Oakman, W. E. Findley, H. W. Poor, J. H. Swinarton, T. F. Ryan, Charles R. Flint, H. H. Rogers and Col. G. B. M. Harvey.

THE HAVANA (CUBA) ELECTRIC RAILWAY CO., which has acquired all the street railway franchises and concessions in Havana, has elected new officers as follows: President, Edwin Hanson; vice-presidents, William L. Bull and R. A. C. Smith; secretary and treasurer, Arnold Marcus. Directors in addition to those above named are P. A. B. Widener, T. F. Ryan, Sir William C. Van Horne, William McKenzie, Frederic Nichols, II. M. Perkins, Thomas P. Fowler, E. H. Androni, William M. Doull, N. Gelats and G. B. M. Harvey.

The Michigan Traction Co., of Kalamazoo, Mich., is now controlled and operated by the Railways Co., General, whose offices are in the Harrison Building, Philadelphia.

CHARLES J. MAYER. A. H. ENGLUND.

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10 SOUTH TENTH STREET,

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A. B. C. Code, 4th Ed.

Electric Railway Material and Supplies of Every Description.

We are exclusive Territorial Representatives of the following leading Manufacturers of Railway Materials:

<p>R. D. Nuttall Co., Allegheny, Pa. Gears, Pinions, Bearings, Trolleys, Etc.</p> <p>Van Wagner & Williams Hardware Co., Cleveland, O. Drop Forged Copper Commutator Segments.</p> <p>The Protected Rail Bond Co., Philadelphia. "Protected" Flexible Rail Bonds.</p> <p>American Electric Heating Corporation, Boston, Mass. Electric Car Heaters of Every Design.</p> <p>Chisholm & Moore Manfg. Co., Cleveland, O. Moore's Chain Bolts.</p> <p>New York & Ohio Co., Warren, O. "Packard" Incandescent Lamps.</p>	<p>The International Register Co., Chicago, Ill. Single and Double Fare Registers.</p> <p>W. T. C. Macallen Co., Boston, Mass. Standard Overhead Insulating Material.</p> <p>Bradford Belting Co., Cincinnati, O. "Monarch" Insulating Paint.</p> <p>Sterling Varnish Co., Pittsburgh, Pa. Sterling New Process Insulating Varnish.</p> <p>Garton-Daniels Electric Co., Keokuk, Ia. Garton Lightning Arresters.</p> <p>D. & W. Fuse Co., Providence, R. I. Enclosed Non-Arcing Fuses.</p>
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Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

We carry the largest stock in this country of Strictly Electric Railway Material.

We are now occupying our entire building, five floors and basement.

Special Attention given to Export Business.

Send for Catalogues.

OBITUARY.

MR. PHILIP T. BEGLEY, superintendent of the Lowell (Mass.) & Suburban Street Ry., died recently.

DR. E. J. FINNEY, the well-known inventor of numerous electrical devices, died at his home in Fox Lake, Wis., December 19th.

MR. JOHN D. OXNER, who was for many years connected with the street railways of New York City, died at his home in Rome, N. Y., on December 21st.

MR. PAUL BEDFORD ELWELL, electrical engineer for the Government Railways in New South Wales, died at Double Bay, N. S. W. on September 10th.

CAPT. THOMAS H. BROWNE died last month of yellow fever. Capt Browne at his death was secretary and treasurer of the Havana Street Railway Co., and has been connected with the street railway system at Boston and with the Metropolitan Street Railway Co., of New York, leaving the latter position to go to Havana in September last.

NEW PUBLICATIONS.

A SECOND EDITION of the lecture by Walter B. Snow on "The Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers" has just been issued by the B. F. Sturtevant Co., of Boston, Mass., by whom copies will be sent upon application.

"DIRECT CURRENT LABORATORY WORK IN AN ELECTRICAL ENGINEERING COURSE," read before the last meeting of the Society for the Promotion of Engineering Education by Frank W. Springer, instructor in electrical engineering, University of Minnesota, has been reprinted in pamphlet form and copies may be obtained by those interested on application to the author.

"WIRE ROPE" is the title of an 80-page pamphlet just issued by the Hazard Manufacturing Co., which describes the steel, iron and galvanized wire ropes made by this company and, more particularly, illustrates some of the many uses to which these materials are put. For the latter purpose there are handsome half-tone engravings of mining, railroad and manufacturing plants, inclined railways, bridges, yachts, ships, etc. This company's works were established in 1848, and it has recently extended the plant and engaged in making insulated electric wires and cables.

THE EMPIRE OF THE SOUTH is the royal title of 200 pages just published by the general passenger department of the Southern Railway Company, of Washington, D. C. It is certainly one of the largest, as well as one of the most handsome railroad publications we have ever seen. Each of the Southern states is taken in turn, and the hundreds of beautiful half-tone illustrations are accompanied by a description as interesting as a novel. No one who has ever traveled the South but will find the utmost pleasure in making the trip again as he peruses this book. Those who have never visited the southland cannot scan its pages without a strong resolution to see the cotton fields and mossy live oaks for himself, while to the young man starting out in life the "go west" may well be paraphrased to "go south and grow up with the country." Copies of the book may be had by sending the amount of the postage, 15 cents, to W. A. Smith, general passenger agent, Washington, D. C., or J. C. Beam, Jr., 80 Adams St., Chicago.

LES MOTEURS A EXPLOSION, by George Moreau, just published by Charles Beranger, of Paris, successor to Baudry et Cie., is a treatise on explosive engines prepared with particular reference to the application to automobiles, and comprises a full exposition of the principles underlying the design, construction and operation of motors for vehicles of this type. The development of the practicable automobile has been entirely in recent years, making this work very timely in its appearance. The plan followed by the author was to begin with the elements of the subject and give a complete analysis, the reader who has some knowledge of mathematics as applied in mechanics and physics will easily follow him.

The introductory chapters deal with general considerations and fundamental principles of thermodynamics and the theory of explosive motors. Following the ideal cycle is a discussion of the imperfections of the actual cycle and the causes of them; this chapter is admirable in its completeness. The problems in design resulting from the conditions imposed by the automobile are next fully treated and there is a chapter on the resistance of materials with formulas for the design of different parts of the apparatus. The calculations of capacity are based upon a consideration of what the author terms passive resistances, under which are friction, air resistance, the effect of the inertia of the moving parts of the mechanism. Chapters on the properties of different combustibles suitable for this type of motors and on the proper method of conducting comparative tests of automobiles conclude the subject. "Les Moteurs a Explosion" comprises 435 octavo pages; the typographical work is excellent.

The motorman of a car belonging to the Bridgeton & Millville Traction Co., while making his last run for the night recently discovered a farm house in an unrequented locality near Bridgeton, N. J., to be on fire, and with the aid of the conductor succeeded in rescuing the three inmates, who had been overcome with smoke.

ECHOES FROM THE TRADE

THE GRIFFIN WHEEL CO.'S products are popular. The Chicago works are turning out 1,500 car wheels a day.

THE GENERAL ELECTRIC CO. has declared its regular quarterly dividend of 1¼ per cent on common stock.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. declared a quarterly dividend of 1¼ per cent payable January 2.

THE ELECTRICAL INSTALLATION CO., of Chicago, is finishing up the work of what has been the busiest year in its history.

THE STERLING VARNISH CO. announces its removal from 324 Water St., Pittsburg, Pa., to the Times Building, 4th Ave., Pittsburg.

EXPORT BUSINESS is worth having—the "Review" advertisers are getting it because our foreign issue reaches every buyer each month.

THE VAN DORN & DUTTON CO., general machinery and engineering, of Cleveland, O., was early in the mails with a handsome wall calendar for 1900.

THE WESTERN ELECTRIC CO.'S. calendar for 1900 bears a fine half-tone engraving of the company's New York factory looking from the Hudson River.

THE CRANE CO., of Chicago, is furnishing all the steam piping, valves and accessories for two tramways at London, England, and one at Bristol, England.

EUGENE MUNSELL & CO., of New York and Chicago, report a larger business during the past few months than ever before in the history of the company.

THE OKONITE CO., of New York, is presenting its friends with an artistic calendar, on which are engraved views of Westminster Abbey and Windsor Castle.

THE W. T. VAN DORN CO., of Chicago, sold twice as many couplers during 1899 as have been sold in any one year since these have been placed on the market.

THE DEARBORN DRUG & CHEMICAL WORKS, of Chicago, is doing an extensive business in the West, and has offices at Los Angeles and San Francisco.

THE RAIL BONDS made by the American Steel & Wire Co., of Chicago, are in greater demand than ever before, necessitating the factory working night and day to keep up with orders.

ALFRED F. MOORE, 200-218 N. Third St., Philadelphia, maker of insulated electric wire, is distributing a large wall calendar, 22 x 14 in., bearing several early colonial views of historical interest.

THE SWARTS METAL REFINING CO., of Chicago, is preparing for an unusually large trade in castings during 1900. The demand has nearly doubled during the past year and prices are high.

THE MORRIS ELECTRIC CO. is the agent for Eastern states of the Spiral Journal Bearing Co., of St. Louis. This company's bearings are in use on a number of St. Louis roads and are highly recommended by them.

THE TWENTY-FIRST ANNUAL NUMBER OF THE TRADESMAN contains practical and valuable articles on the growth and development of various trades in the South, written by experts in the lines treated.

E. G. JOHNSON & CO., 1135 Broadway, New York City, state they are prepared to furnish at short notice experienced street railway superintendents, general managers, engineers, etc., to railway companies having vacancies.

THE TESLA ELECTRIC CO. on Dec. 9, 1899, secured a permanent injunction against the Scott & Janney Electric & Manufacturing Co., to prevent infringement of the Tesla patents Nos. 519015 and 555190 on polyphase motors.

RAILS AND ROLLING STOCK for the San Paulo (Brazil) Electric Light & Power Co. were shipped from Philadelphia on December 14th. The J. G. Brill Co. sent 13 cars and trucks and the Pennsylvania Steel Co. 7259 steel rails.

THE CONSOLIDATED CAR FENDER CO., of Providence, R. I., sent to its many friends at Christmas a small card bearing a "slight token" of its remembrance and best wishes. The token consisted of a bright new penny of the coinage of 1899.

THE GENERAL ELECTRIC CO. on Christmas sent to each of its railway friends a handsome souvenir of the Chicago Convention in the shape of a miniature car controller which on investigation proves to be a combined cigar cutter and match safe.

EXPORT BUSINESS is worth having—the "Review" advertisers are getting it because our foreign issue reaches every buyer each month.

THE WARREN ELECTRIC MANUFACTURING CO., of Sandusky, O., was "at home" to visitors on December 15th, from 2 to 5 p. m., the occasion being the test of three alternating generators the company had just completed for the lighting plant of Armour & Co., at the Chicago Stock Yards.

THE Q & C CO.'S. Stanwood step is being shipped to every part of the civilized world where street railways have been built. Managers that are particular about the details of their rolling stock equipment and desire to have their cars strictly modern and up-to-date should specify the Stanwood step.

MAYER & ENGLUND, of Philadelphia and New York City, are sending out one of the finest desk calendars of the season. Supported on a red background is a medallion portrait of a young woman finished in colors and enclosed in a gilt frame. The date pad is fastened in the lower right hand corner.

THE BABCOCK & WILCOX CO.'S. business for 1899 was nearly double that of the previous year. New works are being erected at Bayonne, N. J., having a greater capacity than the company's present factory at Elizabethport, N. J. The Chicago office is at 1215 Marquette Building, and is in charge of S. P. Wells, jr., manager.

THE MURPHY SAFETY THIRD RAIL ELECTRIC CO. has been incorporated in New Jersey by Matthias Plum, Alexander Beach and William M. Keepers of Newark, Charles T. Hayman of Cincinnati, and George H. Carey, John B. Renwick and Lauron Ingles of New York. The capital stock is \$2,500,000.

THE GARL ELECTRIC CO., of Akron, O., has sold its portable telephone and other electrical supply business to the Standard Silver Plating Co., of Akron, but these specialties will be handled under the name of the Garl Electric Co., as formerly. Mr. Garl will still have the management of the works. The president of the company is Hugo Schumacher.

THE WESTERN ELECTRIC SUPPLY CO., of St. Louis, sent to the trade as Christmas remembrances aluminum pocket cigar cases filled with cigars, which made a welcome and useful present. This company has built up an enormous business in electrical supplies and its success is largely due to the policy of giving all orders the promptest attention possible.

THE BETHLEHEM STEEL CO., of South Bethlehem, Pa., made its friends a New Year's gift of a handsome wall calendar consisting of a heavy cardboard back on which are mounted twelve leaflets, one for each month of the year. Printed on the card-board sheet is the company's valuable reference table of weights and on each leaflet is shown a typical Bethlehem steel forging.

THE EDWARD P. ALLIS CO., of Milwaukee, has enjoyed during the past year the largest trade it has ever had before in any one year, and to aid in meeting the demand for its engines has found it necessary to build a new shop 60 x 250 ft., and has also acquired the works of the Lake Erie Engineering Co., at Buffalo. A large extension to its Milwaukee plant will be built in the spring.

THE CONSOLIDATED CAR HEATING CO., of Albany, N. Y., has just finished delivering electric heaters for 147 cars for the new Northwestern Elevated of Chicago. These heaters are of a special type and 18 will be placed in each car, making 2,646 on the entire order. Richmond P. Scales is general agent for the Consolidated heaters, with offices in the Western Union Building, Chicago.

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THE CHRISTENSEN ENGINEERING CO., of Milwaukee, Wis., is out with a new catalog for 1900, entitled illustrated catalog A. It describes the Christensen system of air brakes with axle driven compressor, and also contains direction for equipment and instruction for motormen and care takers. A valuable feature is a four-page inset diagram complete, of a quick acting automatic air brake equipment.

THE WESTERN ELECTRIC CO., of Chicago, has recently issued bulletin No. 3003, descriptive of power and lighting machines. It contains illustrations of the different types of belt connected generators, and gives a full description of the general details and construction of the machines, a complete list of slow speed multipolar motors from 3 up to 300 h. p., for 110, 220 and 500 volts, and a list of slow speed belt driven multipolar dynamos from 3 to 250 kw.

THE DE WITT SAND BOX CO. is a new company organized in New York by E. F. De Witt, for the purpose of making the De Witt common-sense sand box. The new company will assume the business of the E. F. De Witt Co., of Lansingburg, N. Y., and has offices at 36 Wall St. The officers of the company are: President, G. S. Lewis; vice-president, E. F. De Witt; secretary and treasurer, Daniel E. Wing.

THE SIEMENS & HALSKE ELECTRIC CO. OF AMERICA, with head quarters at Chicago, has elected the following directors: Samuel Insull, M. J. Budlong, O. S. Lyford, jr., C. B. Rockhill, Levy Mayer, T. A. Moran, jr., Martin Moloney, Isaac L. Rice and R. McA. Lloyd. The officers of the company are: President, R. McA. Lloyd; vice-president, O. S. Lyford, jr.; secretary, Willard T. Block; treasurer, F. Vieweg; assistant secretary and treasurer, M. J. Budlong.

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PERCE & RICHARDSON, electrical and mechanical engineers, of Manhattan Building, Chicago, during the year just closed have completed power stations for Adams & Westlake, Armour & Co., Kansas City Electric Light Co. and Kansas City Edison Co., for the Chicago City Railway Co., and many others. The work for the Chicago City Ry. included the remodeling of the 21st St. station and changing it from a cable to an electric plant. They are now at work on a number of important installations.

THE JAPAN-AMERICAN ASSOCIATION, of Tokyo, Japan, announces that it has established American offices in the Singer Building, New York City, for the purpose of furnishing practical assistance to manufacturers, shippers and others of the United States desiring to make reliable business connections for the sale of their products in Japan, China, Korea, Straits Settlements, Philippine Islands and Hawaii. The association does not buy or sell, nor does it accept commissions. An annual registration fee of \$25 is charged.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, Pa., during the year just passed has closed many important contracts. Among the largest in the West may be mentioned a 2,300-ampere-hour battery for the Chicago Edison Co., this being a duplicate of one installed for this company some time ago; also a smaller battery for the Chicago Edison Co., at its 27th St. sub-station. The company has also furnished a 4,000-ampere-hour battery for the Columbia Edison Co., Columbus, O., one of 8,000-ampere-hour capacity for a station at Minneapolis, and batteries for Waterloo, Ia., and Rockford, Ind. The works at Philadelphia are now turning out the batteries for the nine sub-stations of the Union Traction Co. at Anderson, Ind.

J. J. RYAN & CO., brass founders and machinists, Chicago, report that the sales in brass, bronze and aluminum castings during the past year has been something more than 300 per cent greater than that of any year since 1893, and the company has had to increase its foundry facilities three times during the year in order to keep up with orders. Its trade in babbitt metals has increased in the same ratio as castings. In the machine shop every tool has been in use for the first time since 1893. The equipment in this department has been increased by the addition of milling machines and a number of other tools. The polishing, electro-plating and metal pattern departments have been running up to full capacity. The company is looking for a continuation of these conditions for 1900.

THE B. F. STURTEVANT CO., of Boston, Mass., reports an increase of nearly 40 per cent in the volume of its business for 1899 over that of the previous year. The shipments, both foreign and domestic, included fan blowers for all purposes, heating, ventilating, drying and mechanical draft apparatus, engines, electrical apparatus, etc. During the past year an addition covering 20,000 sq. ft. has been made for the use of the electrical department, which has shown the most rapid growth, the output having more than doubled during the year, and covering principally electric fans and special generating sets. The sale of mechanical draft apparatus has been practically quadrupled, while the output of engines has increased one-third over that of the preceding year, and has included many special designs.

THE STAR BRASS WORKS, of Kalamazoo, Mich., has recently made a change in the management and some of the stock has changed hands. The officers now are: Horace B. Peck, president; H. P. Schutt, vice-president; O. P. Johnson, secretary; A. B. Connable, treasurer; Fred P. Crockett, general manager. The officers and Wm. S. Dewing and Charles A. Peck constitute the directors. The company was incorporated in 1898 and engaged in the manufacture of brass and aluminum and similar castings and hardware specialties. On the trolley wheel and harp of its make the works has gained a deservedly high name throughout the country. The harps and wheel are reported to be in use on almost all the principal trolley lines of the country. The works has heavy orders booked and the trade is growing rapidly.

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THE VAN WAGONER & WILLIAMS HARDWARE CO., Cleveland, announce the termination in their favor of the suit against the Billings & Spencer Co., which is more fully explained in the following extract from the opinion rendered by Judge Taft, in the United States circuit court for the northern district of Ohio, eastern division:

"The parallelism of the fiber with the longitudinal axes of the arms is something which has been dwelt upon at great length in the expert evidence for the complainant, but the result of the experiments of the expert, when subjected to cross-examination, shows that the increase in conductivity of the commutator,

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due to this parallelism, is practically unworthy of note. * * * After reading the voluminous record carefully, I am clearly of opinion that the use of the drop-forging for the commutator bars does not produce an article which, in view of the prior art, entitles its first discoverer and user to a patent and monopoly."

THE SARGENT CO., of Chicago, manufacturer of iron and steel castings, has increased its facilities and has placed an order with the Western Electric Co. for one 150-kw. 125 volt belted generator.

ARTHUR W. FIELD, of Boston, agent for street railway specialties, is presenting to his many friends in the trade a small calendar, the upper half of which bears a reproduction of a photograph showing Echo Bridge, at Newton, Mass.

THE W. R. GARTON CO., of Chicago, is prepared to supply very nearly everything in the way of street railway material for which a manager may have a call. Its long list of A-No. 1 agencies enables it to ship at short notice rail bonds, commutator bars, circuit breakers, reflectors, trolley wheels, tape, wire, incandescent lamps, insulating compounds, mica, street car gongs, motor supply and repair parts, gears, pinions, bearings, trolley poles, carbon brushes, etc. The company's motto is "Honorable dealings in business."

NEWS NOTES.

ALLENTOWN, PA.—The Lehigh Valley Traction Co. is preparing for the construction of a nine-mile line from Catasauqua, via Nazareth, to Baty Rights of way through Bath have been applied for. A. F. Walter, secretary Allentown & Lehigh Valley Traction Co.

ALLIANCE, O.—The Alliance, Sebring & Salem Electric Railway has been granted an increase of capital stock from \$100,000 to \$300,000.

ATLANTA, GA.—The Atlanta & Western Railway & Power Co. will procure a franchise for the construction of an electric railway between Atlanta, Austell and Marietta. Petitioners for the franchise are M. B. Earnhardt, Eli West, L. C. Lull, A. E. Childs, W. S. Hays, S. A. Collins, J. S. Schman, W. J. Northen, T. B. Neal, E. P. Black and A. H. Cox. The application is filed by Abbott, Cox & Abbott, attorneys.

ANACONDA, MONT.—The Electric Light & Railway Co. is preparing to build a new power house. The best equipment procurable will be purchased. J. A. Dunlap, purchasing agent.

ASHVILLE, N. C.—It is reported that I. B. Wilford, of Bowling Green, Ky., will build an electric line from Ashville to Weaverville, eight miles distant. A charter has been applied for.

ATTLEBORO, MASS.—A franchise has been granted to the Bristol County Electric Railway Co. for a line that will be constructed in the early spring. H. E. Swazey and D. A. Brooks, Attleboro.

BALTIMORE, MD.—The Patapsco Park Electric Railway Co. is authorized to extend its line from the city to Patapsco park. John Grason, attorney for the company, Baltimore. Surveys have been made for a railway to connect with the United Railways & Electric Co.'s system from a point near the Patapsco river. E. A. Howell, Chester, Pa., chief engineer.

BANGOR, ME.—The Penobscot Central R. R., 26 miles in length, connecting Bangor and Charlestown, may be purchased by Philadelphia and Boston capitalists and extended to Corinth. Inspections of the road with a view to determining the cost of extension are being made by G. D. Howell, Philadelphia, and L. Tillinghast, Boston.

BRATTLEBORO, VT.—B. J. Weeks, of Quincy, Mass., and others, propose an electric line to connect Brattleboro and Keene, N. H.

BROCKTON, MASS.—The Boston, Milton & Brockton Street Railway Co. has petitioned the General Court for authority to construct an electric line over the Blue Hills Parkway. B. Hamilton, secretary.

BUTTE, MONT.—The Butte Electric Railway Co., with a capital stock of \$100,000, has been incorporated to build and operate an electric line in Butte. Incorporators: W. A. Clark, Butte; J. A. McDonald, New York; and H. Gattwater, East Orange, N. J.

COLUMBUS, O.—The Worthington, Clintonville & Columbus Street Railway Co. has applied for a franchise for the extension of its line. T. A. Simons, manager.

CHILICOTHE, O.—The Chillicothe, Clarksburg & Columbus Electric Railway Co. is making surveys of its proposed line, 52 miles in length. Isaac S. Cook, president, writes the "Review" that estimates are being made, and the work of construction will continue through the winter.

COLUMBIA, TENN.—D. F. Carpenter, of Cleveland, O., has a proposition before the Chamber of Commerce of Columbia for the construction of an electric railway between Columbia and Mount Pleasant.

CORSICANA, TEX.—S. W. Bogy, of this place, desires propositions for the construction of a street railway from any persons who may be interested in the project. Mr. Bogy reports Corsicana as a most promising field for such an enterprise.

COLORADO SPRINGS, COL.—The contract for grading the first 23 miles of the projected Colorado Springs & Cripple Creek District R. R. has been awarded to Orman, Crook & Co., Pueblo. Bids for grading the remaining distance will be received and contracts awarded later. The line will be 38 miles in length, connecting with the Cripple Creek Electric line at Cameron.

COFFEYVILLE, KAN.—C. L. Long, of Coffeyville, represents an eastern company in application for a franchise to build a street railway in this city. The city is disposed to grant the franchise, in which case it is promised that the road will be at once constructed.

COLORADO SPRINGS, COL.—C. M. Coleman has applied for a franchise for an electric street railway to be built in this city and suburbs.

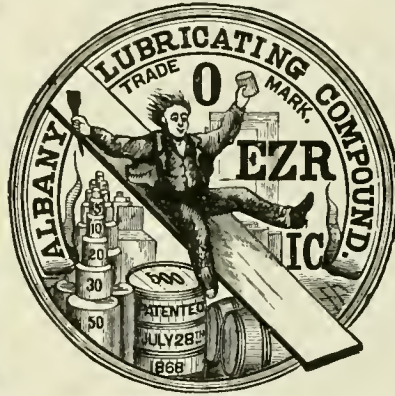
CANTON, O.—Fire in the barns of the Canton-Massillon Electric Railway Co., December 24th, damaged the barn and cars to the extent of \$15,000. The loss is covered by insurance. H. C. Fogle, manager.

The Canton-Massillon Electric Railway Co. has announced its purpose of reconstructing all its lines in the spring, and changing to standard gage. The Massillon branch will be extended to Navarre, five miles distant. H. C. Fogle, manager.

CAMBRIDGE, O.—The Cambridge & Byersville Electric Railway Co. has obtained a franchise through Cambridge for the projected eight mile line from Cambridge to Byersville, via Nocolson. Franchises in Byersville have been applied for. Address A. E. Townsend, Doylestown, O.

CLEVELAND, O.—A Canton syndicate is promoting an electric railway to be built from Canton to Akron, connecting with the Akron, Bedford & Cleveland line and thus affording a direct route to Cleveland. Henry Everett and others who control the A. B. & C. line are believed to support the project. The United States Construction Co. has been awarded the contract for the construction of the Massillon, Akron & Cleveland Ry. The contract calls for 60 miles of road, to be completed within a year. The estimated cost is \$1,000,000. A power house will be built between Akron and Massillon.

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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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NO. 2

At the convention of the League of American Municipalities, which warmly advocates the municipal operation of public utilities, a proposition was made in behalf of the Northwestern Electrical Association and the National Electric Light Association to bear one-half of the expense of an investigation of 20 municipal electric plants, to be selected by the president of the League, in order to determine the true cost of service for comparison with the rates charged by private companies. President Doherty of the Northwestern Electrical Association stated in his annual address that the League would only accept this offer upon the condition of being able to raise the necessary funds, and that so far as he could learn no efforts to raise money for the purpose had been made.

If those active in the councils of the League of American Municipalities are favoring the principles they advocate from purely selfish motives it is not surprising that they should look coldly upon this offer to get at the facts, though the action should place them in a bad light with the public. No unprejudiced persons ever attempted to investigate the cost of an undertaking of this nature as operated by an American city who did not put on record a protest against the methods of municipal bookkeeping.

In December, 1897, page 831, we published data taken from the annual message of the mayor of Chicago, which showed that in 1896 the cost of operating the city lighting plant was \$96.40 per year for each street lamp. Interest at 5 per cent and depreciation at 10 per cent for machinery and 5 per cent for poles, cables and conduits, brought this figure to \$172 per lamp. During 1896 private companies furnished the 517 street lamps by contract at a cost of \$110.24 per lamp; the contract lamps were required to burn the same number of hours per year as the city lamps. We repeat these figures because the subsequent annual reports do not contain data on the cost of investment from which fixed charges can be estimated. The report for 1898 says that the cost of the city lamps was

\$68.52 per year and it is naively added "Formerly the city paid \$137.50 for rented lamps." It is not apparent why comparison should be made with that "former" period rather than with 1896, when the cost of rented lamps was only \$110. The annual message for 1898 does not give the cost of rented lamps per lamp nor the number of such lamps; only the gross rental is shown.

A number of interesting questions are briefly discussed in the introduction to the annual report of Maj. I. B. Brown, superintendent of the Bureau of Railroads of the Commonwealth of Pennsylvania, for the year ending June 30, 1899, an abstract of which will be found on another page. It appears the street railways of the state are in a fairly prosperous condition, the receipts from passengers showing an increase of about \$1,900,000 over the previous year. The 161 operating and subsidiary companies paid in dividends \$9,133,647 and the 90 operating companies have a surplus of \$789,593 from the year's operations. The report calls attention to the wonderful advances made in the last 10 years with reference to the convenience, the speed and the comfort in the local transportation of passengers on street railways and notes the entire disappearance of every vestige of the old horse railways. Mention is also made of the many consolidations and merging of interests that have taken place, the roads in Pennsylvania having been particularly active in this respect.

The report urges legislation for abolishing grade crossings at the points of intersection of steam and street railways, the statement being made that probably one-half of the accidents that occur in the operation of street railways in Pennsylvania are due to crossings at grade.

What seems to be almost an anomaly is presented by the statistics referring to employes. Although the mileage and number of cars have considerably increased, the total number of street railway employes on all lines has decreased from 12,680 on June 30, 1898, to 12,506 at the same time in 1899, the decrease undoubtedly being due in large part to consolidations. But the total wages paid to employes has increased from \$6,542,840 in 1898 to \$6,569,041 in 1899, so that it would appear that while consolidations enable fewer men to care for and operate a greater number of cars and miles of track, it is necessary to increase the actual total compensation to employes.

Another very interesting feature of the report is the observations made on the percentage of pedestrians and bicycle riders to the number of passengers on the cars, which will be found in the resume of the report printed on another page. Of 10,791 persons passing a given point during a given period in the city of Harrisburg, 66.02 per cent were pedestrians, 19.12 per cent were on wheels and 14.86 per cent were in cars. The percentage of wheel riders is considerably lower than for the two previous years, and the figures would seem to indicate that the number of wheels in use had dropped to a nearly permanent level, so that, as is pointed out, the problem now before the manager is not so much how to overcome the competition of the bicycle as it is to make it advantageous for a large portion of the 66 per cent of pedestrians to patronize the cars.

Some of the publications devoted to the growing interests of the horseless carriage are using considerable space in exploiting the possibilities of their various vehicles as active competitors of street railways in the transportation of passengers in cities, and passengers and express in country districts.

The street railway interest has nothing to fear, in our judgment, from competition of the horseless carriage. At the present time its use is more of a pastime for a few wealthy persons who are forming automobile clubs, and for transient service in two or three large cities, than any well organized system of passenger transportation. By this we do not mean to be understood as in any way underestimating the desirability of supplanting the horse for city work in carriage and cab service. But there is a long way, and it is full of obstacles, between this transient service and the transportation of any considerable number of people at fixed hours, and under all conditions of weather, such as enter into the street car problem. The various vapor motors have not yet been brought to any such degree of perfection as to warrant the establishment of large numbers of these vehicles on certain routes with specified schedules. The electrical storage battery carriages and delivery wagons operate quite satisfactorily, but the character of their work thus far has been of such a nature that no particular harm results

when they run out of current or fail to work, as they sometimes do.

To transport any considerable number of people the carriage must be of large size, and with the necessary battery storage, of considerable weight. The heavier this becomes the greater the disparity between the auto with its wheels resting on pavement and the street car which runs upon rails. The auto, possibly, can make even better time in cities than the car, when built to carry say two to four people; but such a service cannot be rendered for less than five to ten times the usual street car fare. To carry at five cents per passenger there must be large carrying capacity to reduce the cost per passenger, of the crew in charge.

The auto would have some advantage over the car in that it has no expensive tracks and paving to maintain, and can run on boulevards and such residence streets as have no car tracks, or where it is impossible to get rights to lay tracks. This would land passengers residing on such streets practically at their own doors; on the other hand, when the auto gets down into the business district it is doubtful if it could make as good time threading its way among other vehicles as the car which has a definite right of way, from which it can not turn out, thus forcing other vehicles to turn out for it.

The cities where omnibus lines and cabs are in service are found to show that the business carried by them is no considerable factor in competition with surface car lines.

In country districts the auto comes under the head of fair weather carriers. They might do good service during certain seasons of the year, and in such districts as have good hard gravel roads could make pretty fair time; but their operation even then must be in the nature of furnishing a service where the traffic would not warrant an electric line. The interurban would easily average from two to four times the speed of the auto.

It would seem then that the auto service cannot expect to compete with the street car, either in time or carrying rates. It should, however, find a field of usefulness in supplying outlying districts which have not yet grown up to the ability to support a street car line, and where some kind of feeder service is desired. For this the auto is adaptable, as the number can be increased morning and night without much trouble, and the day service cut down with a minimum of investment lying idle. It may be that street railways will come to use them in this way, as the batteries could be charged at comparatively slight expense during the late and early hours when the station load is light.

The question of abolishing grade crossing of railroads and highways is one that is attracting more interest and discussion each year, and one of the reasons for this is the increase in the number of highways occupied by interurban electric lines; in cities the grade crossing problem increases in importance as traffic grows in volume, but here, also, the most dangerous crossings are in the streets occupied by street railways. In a series of articles published in the "Review" in October and December, 1897, and February, 1898, an attempt was made to summarize the laws governing crossings of steam and electric roads and the general policy of the states and railroad commissioners concerning crossings. The tendency generally manifested by state legislatures is to prevent so far as possible any new crossings of railroads being made at grade unless interlocking or other safety devices are provided, leaving to the future plans for removing grade crossings now in existence. In New York, Pennsylvania, Massachusetts and some of the smaller of the Eastern states, the work of abolishing the existing crossings has been undertaken with considerable success.

The report of the Massachusetts Railroad Commissioners for 1899 showed the total expenditures of the state, under a general law passed in 1890 and other special laws applying to Boston, for abolishing grade crossings up to Jan. 1, 1899, to be over \$3,370,000. Under the general law mentioned the state bears 25 per cent, the city or town 10 per cent and the railroad 65 per cent of the cost; under the special laws mentioned the share of the state was 31.5 per cent and of the company 55 per cent. The total cost of the work in the eight years was over \$12,415,500. Some idea of the progress made is had from the statement that there were 2,070 grade crossings in the state; 27 had been abolished during the year, 14 were in process of abolition and petitions concerning 155 more were pending.

In New York a law was passed in 1897 providing for the abolition of grade crossings on the motion of the city, the railroad or the

commissioners, the cost being assessed between the state, the city and the railroads concerned in the proportion of 1, 1 and 2. The commissioners in their annual report for the year 1899 gave the number of crossings actually abolished under this act as 19; work is in progress on 25 others, determinations have been made in 13 cases and 44 petitions are now pending.

In Ohio when a city and a railroad company agree upon the elimination of a grade crossing the railroad company is required to pay not less than 65 per cent of the cost and the city not more than 35 per cent. The city of Cleveland has recently taken up this question and is now discussing the abolition of grade crossings of electric and steam tracks within the city limits. The city's portion of the cost of making the changes is estimated at \$400,000, and it asks that this expense be borne by the street railways which use the crossings in question. The steam railroads either own their rights of way in fee or have a perpetual easement; on the other hand the street railways in Ohio are limited to short terms of years in their occupancy of the streets, and this difference in charter or franchise rights does not admit of the same reasoning being applied when discussing what is an equitable division of cost. This was clearly recognized by the city of Cleveland when it asked the street railways to pay its share, as the proposition included an agreement to reimburse the companies in case they do not succeed in securing renewals of their franchises.

As pointed out in a paper on grade crossings elsewhere in this issue, the advantages to the street railway of abolishing a grade crossing are a slight saving in time and in the decreased liability to accidents. The first is not important and the second is problematical in amount and is a benefit which cannot be assigned a money value and which is shared by every other user of the street.

In discussing the problem it is only fair to consider that the steam railroad is the source from which the danger emanates. An electric car might, it is true, run into a steam car standing on the crossing, but it would be with a minimum of damage to the steam car and a maximum danger to itself. A steam train or car, on the other hand, could not fail to injure the street car or occupants when in collision. We fail to recall a single instance where the steam train has been derailed when in collision at any of the recorded grade crossing accidents. This being the case, it would seem to us that the percentage of cost of abolishing grade crossings, which the city of Cleveland wishes allotted to the street railways as their share, is somewhat larger than the conditions warrant, even after admitting certain advantages of time and safety which the street railway gains by the change.

Owing to the extraordinary rapidity with which street railways have been built and developed and the fact that the constructing engineers in many cases had no long term of experience such as prevails in steam road construction, a condition has been created involving a great lack of uniformity. This is not so much a matter of surprise although none the less unfortunate, and is discerned as never before now consolidations are being made.

The electric railway developing with such tremendous energy, and being itself a new engineering problem, there arose the necessity not only of calling in engineers who had never built such roads before, but even using those who had never constructed any street railway whatever. Many of these men were bright, resourceful, energetic fellows, fresh from the engineering schools, but without any previous practical experience. Others had been in the employ of horse roads, and commanding the confidence of the directors were retained to plan and execute the transformation to electric power. That so large a number succeeded as well as they did, and with no greater losses in experimental work is indeed the wonder, rather than that mistakes were frequently made.

The companies manufacturing electric apparatus and machinery were freely drawn on for information as to engineering rules regarding which in the first few years they knew almost as little as those they counseled. Thus the blind tried to lead the blind, and as we look back it seems little short of a miracle that both did not perish in the ditch together.

At the end of 10 years a fairly established practice was reached as to many features; that is, a generally accepted theory was adopted as to certain things which were not to be. But all this time the growing and expansion and extension policy was at work in all our cities. Instead of inspecting carefully a series of roads in as many cities and carefully discarding the weak features and copying the

strong ones, the engineer seemed possessed of an irresistible desire to stamp his own individuality upon his road, and to do this he devised new ways and means. The same experience marked the installation of cable roads, no two of which were exactly alike, and most of the later built were by no means an improvement on the earlier types.

Not only was this great dissimilarity between roads in cities east and cities west; but of two, three or five roads in the same city, no two were alike to any considerable extent. Perhaps each had a different rail section; a different system of feeder wires was usual; as to the power house equipment, one road had high speed belt connected engines; another had simple engines, and a third was running condensing. And when it came to rolling stock! Not only would each company in the same city build a different type of car from that in use on the other roads there, but in many instances there would be such a variety of trucks, motors, and cars on a single road, as would make it a working exposition of electric railway apparatus. We call to mind a road which once ordered one car from each of all the various car builders, and placed under this Babel of car bodies a polyglot of trucks. The idea was to have a personal demonstration of the good or bad qualities of each, letting the fittest survive. These equipments have not yet worn out, and already fully one-third of the building concerns have either gone out of business entirely, or abandoned street railway work.

We should not, however, wholly condemn the engineer, contractor, or manager who has several mitigating circumstances to plead. There was the evolution of the art, and his desire, and frequently the necessity in many directions, to advance with the times and in buying for additions and extensions to purchase the improvements which came with such bewildering rapidity. Some of these new departures proved to be improvements and some proved otherwise. If the engineer guessed right, he took due credit to himself for his perspicuity; if it turned out a disappointment he laid the failure on the builder and comforted himself—and so far as possible his directors—by pointing out others whose condition was such as to be really deplorable.

Nor was the energetic manufacturer, builder and sales agent altogether an unknown quantity in producing this growing chaos of property. The sellers called to their aid scores of bright young men against whose persuasive arguments the bewildered manager was no match. This season one company secured the order for new cars; the next another carried off the prize. And the steady depression in business for five years greatly accentuated this distribution of orders, for the manager felt a strong obligation to purchase from low bidders even if the plans and specifications were by no means similar to those of the previous year. Stockholders and directors also did their full share by putting pressure on the manager to buy cheap even against his better judgment and earnest protest.

And thus has come about, by what may fairly be termed natural conditions, this lack of uniformity which, as intimated in the outset, is now brought forcibly to view since consolidations of several lines in the same city are being consummated every month. The corporation taking over the properties finds itself in possession of a little of everything in the way of track, overhead equipment, power plants and rolling stock. Motors of all types and sizes, trucks and car bodies of varying lengths; wheels of assorted sizes, weights, treads and flanges; axles long, short, small and large diameters. The gates of the Avenue A line will not interchange with a single car on any of the other avenues all the way down to Z; brasses and journal trimmings in variety to keep a small foundry working overtime; curtains on the open cars are found to possess a remarkable individuality; in fact the combined properties bring together a cosmopolitan collection which enables the company's store keeper to fill three stories with thousand of dollars worth of "parts" and keep busy a force of clerks sufficient to conduct a small wholesale establishment.

The picture is anything but an exaggerated one; we only wish it were, for we have visited not a few of these museums of supplies, and many of our readers will not have to go off their own premises to find a well developed example. The drain from this source is often enormous. There must necessarily be always with electric traction a long list of repair parts and supplies greatly in excess of what was necessary under cable operation, which in turn multiplied the wants which were unknown when the motive power was exclusively animal; but the increase has been beyond the fondest dream of any company's store keeper 10 years ago.

We are now beginning to enter the reconstruction period. Already we have scrapped millions of dollars worth of machinery and apparatus displaced by improved design which offered such economy of operation that the change was taken bodily out of the realm of the debatable. In this motors, generators and engine figure most prominently, although each carried with it quite a train of attendants in foundations, belts, gear, etc. The power house problem has been fairly well settled and unless some radically new force, such as liquid air would be, comes in to revolutionize the plant, we may reasonably expect to wear out the machinery now going into our new stations. Experience also has demonstrated what are the economical units, although improved transmission will continue to shut down branch stations and open large central plants in many cities. We have now secured data which could only come from experience and are better qualified to anticipate the future than was possible a decade ago.

Track construction also has settled down to a firmer basis, and there will be more wearing out of rails, and less relaying of the light weights to be taken up and practically thrown away as has been the case thus far.

But the rolling stock is something to vigorously tackle next. Public demand and utility of service are bringing greater stress to bear each year, and this department of operation will have to be taken up and brought to the same degree of exactness which has been attained at the power station. Larger and better cars are becoming a necessity. In our opinion here is now the weak point in our operations. It has been impossible to reach it earlier but the evils hidden in that large item "repairs cars" demand just as critical study and reform on the majority of roads as the power house ever did.

How to get at this and what remedy to apply will furnish a subject for next month.

OHIO INTERURBAN ASSOCIATION.

On January 16th a meeting was held at Columbus, and the Ohio Interurban Street Railway Association organized. The objects are "for mutual co-operation in everything tending to the welfare of interurban street railroads in the state of Ohio, and to fully present and keep before the people of the state the advantages of such companies as common carriers of passengers, express matter, United States mails and light freight."

It is understood that this association will take no part in the negotiations now pending with the Columbus Street Ry.

The officers of the association are: President, O. W. Aldrich, Columbus; first vice-president, J. S. Harshman, Springfield; second vice-president, V. Winters, Dayton; secretary, L. P. Stephens, Columbus; treasurer, I. N. Cook, Chillicothe; executive committee, D. J. Ryan and A. G. Grant, of Columbus; O. B. Brown, of Dayton, and Eugene Rawdon, of Windsor.

FRANCHISE AT GUTHRIE, O. T.

The common council of Guthrie has recently passed a street railway ordinance which shows the attitude in Oklahoma Territory toward such undertakings. The grant is to Mrs. A. C. Beckwith, of San Francisco, Cal., and others, but the road is to be known as the Guthrie Electric Street Ry. The principal provisions of the ordinance, which became a law without the mayor's approval, are as follows:

The franchise grant is for 40 years; overhead trolley system, with iron poles, is contemplated, but any practicable system of traction may be used; company to pave tracks between rails and 2 ft. on each side; maximum fare, 5 cents; fine provided for obstructing tracks by driving teams thereon after a warning from motorman by ringing bell; limits of speed fixed at from 5 to 8 miles per hour in business districts, and from 8 to 12 miles per hour in residence districts; distance of 300 ft. required between cars running in same direction; conductors to announce names of streets and use "proper diligence to prevent women and children from leaving the cars while in motion"; cars not to remain standing at stations for more than 10 minutes; headway to be 10 minutes or less on all principal lines between 6 a. m. and 11 p. m.; right to adopt reasonable regulations reserved by council.

System of the Saratoga Traction Co.

The Saratoga Traction Co., of Saratoga, N. Y., which has for several years operated an electric railway between Saratoga Springs and Saratoga Lake, has recently completed a line to Ballston Spa, aggregating with its race track line already built, 14 miles of single track. All of this, with the exception of about two miles within the city limits, is on private right of way and is fenced.

Ballston Spa, the county seat of Saratoga County, has a population of about 4,500, and is quite a manufacturing center, a paper mill, one of the largest tanneries in the world, a wrapper and other factories being situated here. The summer population, owing to



TYPES OF CARS USED.

several fine mineral springs, is quite large and the people as a rule are a class to patronize street railways.

Saratoga Springs, in which is located the main offices of the company, has a winter population of 10,000. In the summer this is increased to about 35,000, for two months and a half, owing to the racing at the Saratoga Racing Association's Park, situated just out of the town, and also to the numerous mineral springs and beautiful drives. Through the opposition of the Hackmen's Associations, the company has found it impossible to obtain a very suitable entrance into Saratoga, and it has been permitted only on the back streets in the poorest locality and then only for short distances. Despite these hard conditions, the road is gaining ground with the public, and will eventually have a better entrance.

At the close of each season Saratoga has a Flora Fete, which is being arranged on a larger scale each year. This season it lasted three days and in the grand parade of the last day there were over 100 floats, which were fitted up at an expense of more than \$15,000. This feature is very popular with the summer visitors, and during the three days it was estimated there were 60,000 tourists in the town.

The line to Ballston Spa runs through the Geysers, where are located several carbonic acid gas wells from which thousands of cylinders are charged each year and shipped to all parts of the country. There are also five mineral springs.

The road runs through a farming country from the wells to Ballston, and is some distance from the highway. The grading has been done in a very thorough manner and arranged on a 2 per cent grade basis, although the land is quite rolling. The roadbed is 14 ft. wide, all fills are sloped $1\frac{1}{2}$ to 1, cuts are 16 ft. at the base and regular steam road construction practice has been followed. There are two bridges on the Ballston line, one 384 ft. long rests on piling, and the other, made of steel, is 240 ft. long, and was erected by the Berlin Iron Bridge Co. The steel bridge has piers 52 ft. high, resting on concrete and crushed stone mixed in the proportion of 1 of cement, 3 of sand and 6 of crushed rock. The best of portland cement was used. A plank form was made and the cement and rocks poured in, in layers, and then tamped. There are 16 of these piers from 12 to 6 ft. deep, resting on the solid

rock, which was blasted out to make even foundation. On both of these bridges the ties are 6 x 8 in., every fourth tie being 18 ft. long and the others 10 ft. Along the ends of these are laid side guards, 8 x 8 in., placed lengthwise two on each side, 3 ft. apart and supporting a plank sidewalk. This with a 5 ft. railing prevents passengers or cars from being thrown from the bridge. This construction makes the bridges as safe as any point on the line.

The road is laid with Wharton 56-lb. T-rails, 60 ft. in length, on ties 6 x 7 in. x 7 ft., placed 2 ft. c. to c. The joints are bonded with figure 8 flexible bonds of No. 0000 wire. The foundation for the roadbed is gravel and sand. In the city the company is compelled to put in crushed rock in the center and for 2 ft. each side of the track.

The overhead construction is supported upon chestnut poles, 35 ft. long, 6 ft. in the ground and set with 10 in. rake on bracket construction and 18 in. rake on cross suspension. These poles are 100 ft. apart, and have tin tops. In the city cross suspension is used and on all curves of the cross country work. The remainder is bracket construction, Creaghead Engineering Co.'s standard flexible brackets being used. All poles are painted with two coats in two colors, the upper portion of colonial yellow and the bottom golden ocher to match the cars. The trolley wire is No. 00 B. & S. gage. The trolley hangers and insulators were made by the Ohio Brass Co.

The company owns 24 cars, of which four are short trailers, eight are 14-bench open Pullman cars, three are side door double deck Pullman cars, having capacity for 120 passengers, three are closed Laconia cars, one of which is used for baggage and one is a small closed car. All of these closed equipments have vestibules and are heated with H. W. John's electric heaters. One construction car, a Taunton snow plow and two flat cars complete the rolling stock. Brill, Bemis, Taylor and Pullman trucks are used with $3\frac{3}{4}$ -in. and 4-in. axles; the wheels are 33-in. with $2\frac{1}{2}$ -in. thread and $\frac{7}{8}$ -in. flange. For the closed cars "Walkover" seats are provided, finished with plush, and each car is fitted with Van Dorn track scrapers. The company has adopted the G. E. 1,000 motor and K 10 controller as standard, although a few W. P. 50 motors are used.

There are two wooden car barns situated at Saratoga, but these will be replaced soon by larger and better ones. The power station is located at the Geysers near a small pond, suitable for condensing water, and is a 50 x 100-ft. building with a brick stack 90



SCENES ON THE LINE OF THE SARATOGA TRACTION CO.

ft. high with 5 ft. flue. The station contains two 125-h. p. Westinghouse and one 250-h. p. Ball & Wood engine, with M. P. 90 and M. P. 300 generators. The wiring is all done in a substantial manner; the instruments are mounted on a skeleton switchboard made of quartered oak, finished in the natural wood, and resting on a foundation entirely separate from the building. It is so arranged as to be accessible at all points without danger.

In the boiler room there are two horizontal tubular boilers 125 h. p. each, and one 250-h. p. Stirling water tube boiler. The boil-

ers are fed through a Cochran heater which raises the temperature to 210°.

The seven miles of new work between Ballston and Saratoga was finished and in operation in six weeks from the time it was commenced. This line will be extended to Mechanicsville in the spring of 1900. At present the company is building a two mile extension to the Saratoga Lake line in the same general manner and creating a fine park in which will be a rustic theater, casino building, pleasure boats, band stands and everything necessary to a first-class railway park. There are in this park 120 acres, all of which will be laid out, under the supervision of E. A. Blaisdell, of Brunswick, Me., an expert park designer, in walks and flower beds, with rustic summer houses. The grounds are located on the shores of Saratoga Lake and command one of the finest views in



VIEW ALONG THE LAKE LINE.

the vicinity. The population at this point is entirely of a summer nature, and no attempt will be made to operate this branch in the winter.

On the main system, during the summer, cars run on a 30 minute schedule from 6 a. m. to 12:30 p. m., and in special cases each car draws from two to four trailers. In the winter the cars run on a 40 minute headway, the motors on the closed cars being geared so as to run the seven miles from Ballston to Saratoga in 20 minutes. On some portions of the line a speed of 50 miles an hour is made.

The Saratoga Traction Co. was organized and the lake and race track lines built in 1890. The capital stock of the company is \$500,000. The officers are: President, E. A. Noyes; secretary, F. H. Lang; general manager, Geo. E. Macomber; superintendent, F. B. Lee. The construction work was all done by Geo. E. Macomber, of Augusta, Me., under the supervision of Superintendent Lee.

REWARDS FOR EMPLOYEES AT BIRMINGHAM.

Mr. J. B. McClary, general manager of the Birmingham (Ala.) Railway & Electric Co., advises us that the plan instituted some time ago in Birmingham of giving rewards to employes for clean cars and freedom from accidents has been a great success, the increased cleanliness of the cars and the reduction in the number of accidents more than balancing the cost of maintaining the prize system. The plan finally adopted and the one found to give the best results is as follows:

On the cars operated without conductors the motormen are given a reward of \$1.00 2-3 per month for clean cars, and if they have had no accidents during the month for which the company has had to pay out money they receive an additional reward of \$3.33 1-3, making a possible total of \$5.00 a month or \$60.00 a year over their regular wages. On cars having both motormen and conductors the motormen participate in the no accident reward and the conductors in the clean car reward. Inspectors examine the cars every day, and if a man has as many as three reports for dirty cars in any one month he fails to receive a reward for that month. A man who has cost the company any amount, no matter how small, for accidents, also fails of a prize. The company keeps a book properly indexed, and every morning the reports of the inspectors are gone over and all charges entered against the man responsi-

ble. All names against which there is nothing entered at the end of the month are credited with the extra reward on the pay roll. About 90 per cent of the men secured prizes last month.

The company pays its motormen 13 cents an hour the first year and 14 cents thereafter.

Sample pages of the record book have been sent us by Mr. McClary. They read as follows:

JOHN DOE, MOTORMAN.

Sept.	\$3.33
Oct. Killed cow at Red Bank.....	0.00
Nov. Pulled down wire at Big Cut.....	0.00
Hit Jones' dray at 5th Ave.....	0.00
Dec.	3.33

RICHARD ROE, CONDUCTOR.

Sept.	\$1.00
Oct. 7 D. C. (Dirty car).....	0.00
11 D. C.....	0.00
17 D. C.....	0.00
Nov. 12 D. C.....	1.00
Dec.	1.00

LONDON (ONT.) RIOTORS PUNISHED.

We fear that our people have much to learn from the other "branches of the English speaking race" when it comes to enforcing the laws, and particularly in punishing mob violence attendant upon strikes. In our issue of August last we gave a brief account of the riot in London, Ont., July 8, 1899, when a mob attacked the cars of the London Street Railway Co., damaging 10 of them and injuring a number of the non-union employes of the company. Martial law was declared and order restored by troops.

Some 20 indictments were returned against persons participating in the riot and these cases reached trial late in January. At the first day's session of the court four of the men pleaded guilty to rioting or stone throwing and were sentenced to pay fines of \$25 to \$50 or as an alternative undergo imprisonment in jail for from 30 to 60 days. Three others were temporarily granted bail and are to receive sentence later. One of the defendants pleaded not guilty and was acquitted.

January 31st, three others pleaded guilty to stone throwing, and were fined \$25 with option of serving jail sentences of two months. A fourth man who preferred a jury trial was convicted, and was sentenced to imprisonment for nine months. The heaviest sentence imposed was two years' imprisonment in the Central prison at Toronto, which was for assisting in the destruction of a car.

SOUTHERN OHIO TRACTION CO.

January 22d the directors of the Cincinnati & Hamilton Electric Street Railway Co., the Cincinnati & Miami Valley Traction Co. and the Dayton Traction Co. (whose property is leased to the Cincinnati & Miami Valley) met at Cleveland and completed the formal consolidation of those companies.

The consolidated company is to be known as the Southern Ohio Traction Co. and have a capital stock of \$2,000,000, with an authorized bond issue of \$2,000,000. Temporary officers were chosen as follows: President, Will Christy, Akron; vice-president, H. C. Ford, Cleveland; secretary and treasurer, F. T. Pomeroy, Cleveland. The directors are: James Christy, Jr., and Will Christy, of Akron; Peter Schwab, of Hamilton, and H. Clark Ford, M. J. Mandelbaum, H. R. Newcomb, D. H. Kimberley, Amos B. McNairy, A. E. Akins, H. A. Sherwin, R. A. Harman and R. M. Parmely, of Cleveland.

The Cincinnati & Hamilton line is 15 miles long, the Cincinnati & Miami Valley 26 miles, and the Dayton Traction 15 miles long. This gives a 56-mile road connecting Dayton with the urban system of Cincinnati.

Superintendent H. A. Nicholl, of the Rochester (N. Y.) Railway Co., and the Rochester & Sodus Bay Electric Ry., has moved his office from the office building of the Rochester Ry., on State St., to the station on Main St., East, formerly used by the Glen Haven road.

THE UNION TRACTION CO. OF INDIANA.

The forerunner of the extensive electric railway system centering at Anderson, Ind., was a one-mile mule line built in Anderson in September, 1888, the charter for which was granted to Seldon R. Williams and D. C. Williams, of Lebanon, Tenn., on Aug. 19, 1887, for 12 years. Branches were subsequently constructed from this line and in 1892 the Anderson Electric Street Railway Co. was organized by Chas. L. Henry, of Anderson, and Philip Matter, of Marion, for the purpose of purchasing the stock of the old street railway company and reconstructing the system for electric traction. This was done, heavier rails were laid, the old lines were extended and the best electrical equipment known at the time was

this branch is in operation the Union Traction Co. will serve a population of nearly 200,000 people.

The completed system will comprise 165 miles of track, and there is now in process of erection at Anderson, a central station from which power will be furnished on the three-phase distributing system to all lines owned by the company. This station will be 164 ft. 3 in. long x 116 ft. 3 in. wide, and 59 ft. high, front elevation. The structure will be fireproof, with brick walls and steel trusses supporting the roof. In the engine room, which will be 160 ft. 9 in. long x 70 ft. wide x 30 ft. high, will be erected three 1,500-h. p. horizontal cross-compound Rice & Sargent engines, built by the Providence Engineering Works, direct connected to three 1,000-kw. Westinghouse generators built to carry 50 per cent overload.

Babcock & Wilcox boilers of 400 h. p. each will be placed in the boiler room, which will be 160 ft. 9 in. long x 42 ft. wide x 60 ft. high. Stillwell-Bierce & Smith Vaile feed-water heaters and Blake-Knowles condensers have been contracted for.

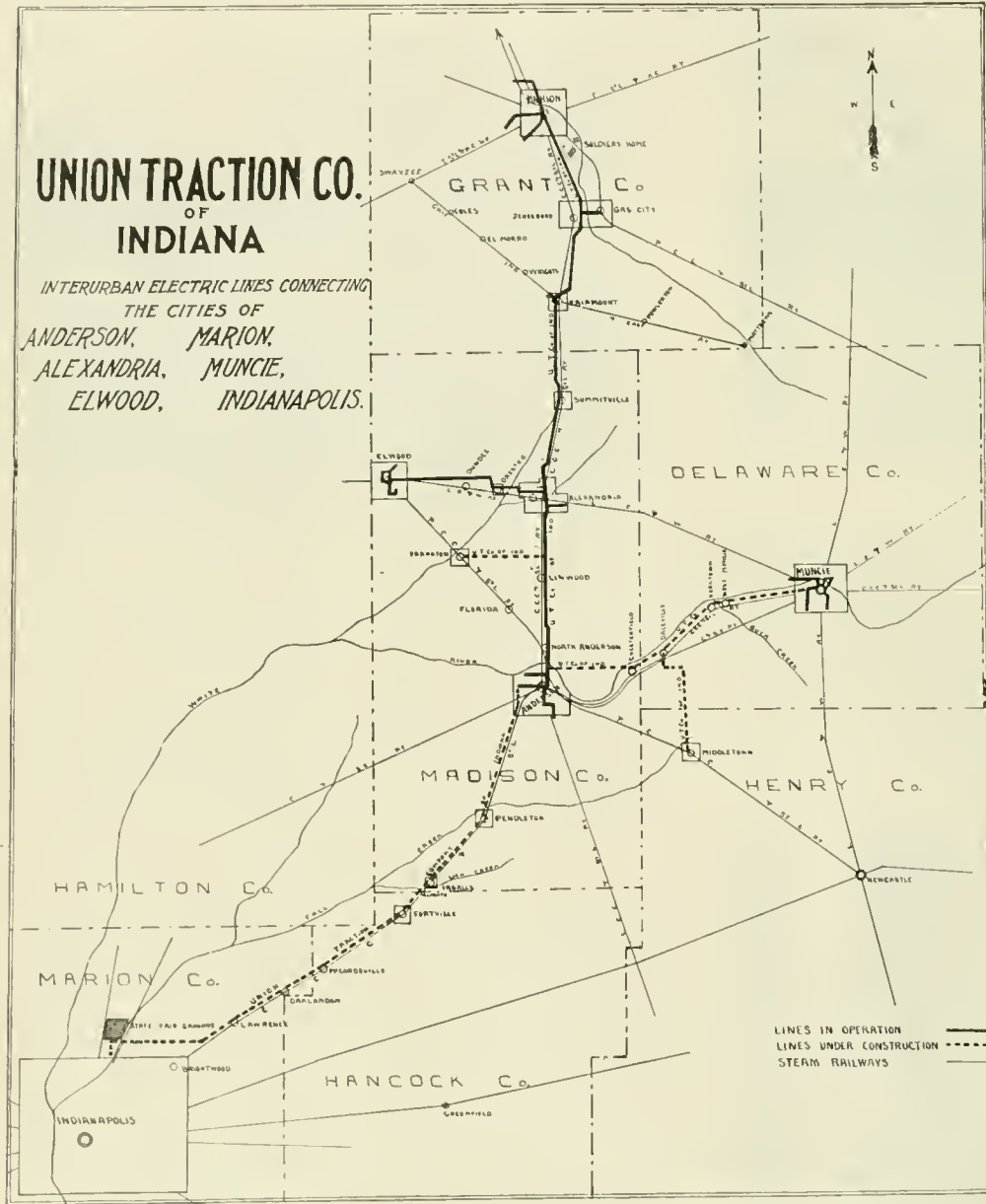
The furnaces will be arranged for natural gas fuel, but to meet the contingency of a shortage in the gas supply, coal bins, with John A. Mead coal conveyers and stokers will be provided. The smokestack will stand a few feet from the boiler room to the south of the main building. It will have a diameter of 19½ ft. at the base and will be 180 ft. high.

Current will be generated at 370 volts, alternating, and by means of 15 Westinghouse static transformers of 250-kw. each, will be raised to 15,000 volts for transmission. At sub-stations, of which there will be eight, located at suitable places along the line, current will be stepped down to 370 volts and changed to 550-volt direct current through rotary converters. For this work twelve 175-kw. and twenty 87.5 static transformers and twelve 250-kw. converters will be installed. Nine storage batteries, supplied by the Electric Storage Battery Co., aggregating 1,100 kw. h. capacity, will regulate the voltage, one battery being placed at each sub-station and one at the central station.

The main switchboard will consist of three generator panels, one storage battery, three alternating current synchronous converter, three direct current converter, and five direct current feeder panels.

A switch will be laid from the P., C. C. & St. L. R. R. direct to the power house, to be used for hauling coal, building supplies and heavy machinery, for which service an electric locomotive will probably be used.

Work on the new road from Muncie to Indianapolis is being pushed with vigor. The abutments and piers are nearly completed for four bridges, one across White River at Anderson, one across the same river at Chesterfield, near the famous Indiana mounds, one across Fall Creek at Pendleton, and one across Lick Creek at Ingalls. All culverts, piers and abutments of these bridges are being constructed of heavy stone masonry laid in hydraulic cement.



purchased. On Sept. 3, 1897, the property and franchises were acquired by the Union Traction Co., of Anderson, which in turn, on June 28, 1899, was consolidated with the Muncie, Anderson & Indianapolis Street Railway Co., of Muncie, under the name of the Union Traction Co., of Indiana, which now owns and operates the city lines of Anderson, Alexandria and Marion, the interurban roads connecting Anderson with Marion and Elwood, and the new line under construction from Muncie via Anderson to Indianapolis, with branches to Middletown and Frankton. The latter branch will connect with the Indianapolis Street Ry. lines at the State Fair Grounds, north of Indianapolis, and cars will run into the city over the lines of that company. It is estimated when

The roadbed construction on this branch will follow steam road practice, the tracks being 70 lb. steel rails, in 60 ft. lengths, laid on 6 in. x 8 in. x 8 ft. ties. Rails are being rolled by the Cambria Iron Co., of Johnstown, Pa. A maximum speed of 42 miles per hour will be reached in the run to Indianapolis.



C. L. HENRY.

The Union Traction Co. carries on an extensive express business. Two express cars are at present employed, one making three trips per day from Anderson to Alexandria, thence two trips to Summitville and one trip to Orestes. The express cars have regular time schedules for collecting merchandise from the local merchants, commission houses and wholesale houses and carrying to destination. All of the passengers coaches have baggage compartments and take trunks, bicycles, parcels, etc., at the same rate as the

special express cars.

The officers of the company are: President, Philip Matter; first vice-president, Jas. A. Van Osdal; second vice-president, Frank M. Riter; secretary and general manager, Chas. L. Henry; treasurer, Geo. F. McCullough; superintendent, Chas. Berry. The general offices are in the Masonic Temple, Anderson.

MILWAUKEE STREET RAILWAY REPORTS.

The reports of the Milwaukee street railway companies exhibit the business of the year 1899, and extracts show the following:

The Milwaukee Electric Railway & Light Co. operates 140.29 miles of track (63.45 double and 13.39 single) in the city, and gives this data.

Amount of preferred stock.....	\$3,500,000.00
Amount of common stock.....	3,500,000.00
Bonded indebtedness.....	8,000,000.00
Indebtedness of the company.....	932,074.07
Receipts from railway business.....	1,668,962.87
Disbursements.....	1,095,445.63
Construction.....	701,981.17
General expense operating railway system.....	75,378.62
Legal expense operating railway system.....	25,034.38
Injury claims and damages.....	50,068.88
Rentals.....	2,462.42
Conducting transportation.....	527,174.47
Maintenance of ways and structure.....	92,300.48
Maintenance of rolling stock.....	73,943.05
For producing power.....	324,000.00

The Milwaukee Light, Heat & Traction Co., which is controlled by the Milwaukee Electric Railway & Light Co., and has the same officers, controls the companies owning the interurban lines to Waukesha, North Milwaukee, Wauwatosa, Racine and Kenosha, and the Belle City road in Racine. It operates 73.18 miles of track, and makes the following statement:

Common stock.....	\$ 500,000.00
Bonded indebtedness.....	1,500,000.00
Other indebtedness.....	244,084.30
Total receipts.....	170,545.03
Total disbursements, exclusive of interest.....	124,274.65
Charged to construction.....	1,028,084.00
Charged to operating expenses.....	120,261.13

FREIGHT SERVICE ON INDIANAPOLIS INTER-URBANS.

The three interurban electric roads reaching Indianapolis are now negotiating with the authorities of that city for franchises allowing a freight and express traffic. Arrangements will be made with the Indianapolis Street Ry. to use its lines within the city. The three roads are the Union Traction Co., with headquarters at Anderson, the Indianapolis, Greenwood & Franklin, and the Indianapolis & Greenfield.

STREET RAILWAY BENEFIT ASSOCIATIONS.

An inquiry recently received from the manager of a street railway who wished to organize a mutual benefit association among the employes of his company, led us to send letter to the benefit associations of which we have any record in our files, asking for the latest data concerning them. The replies so far received are given herewith and will be found of interest by all those interested in such organizations.

It is our wish to secure similar information concerning all such associations among street railway men, and it is earnestly requested that the secretaries or other officers will send us data for their respective associations covering the following points: Name of association. Date of organization. Number of members when organized. How the management is chosen. Initiation fees and dues. Sick benefits allowed. Death benefits. Total sick benefits paid since organization. Total death benefits paid since organization. Sick benefits paid in 1899. Death benefit paid in 1899. Number of members at the present time. Officers. Interesting facts as to the growth of the association.

The employes of the Cincinnati Street Railway Co. organized the Street Railway Employes' Mutual Protective Association, Nov. 14, 1887, having at that time 57 members. Any employe of the company between the ages of 21 and 45 is eligible for membership, after being in the company's service for three months. The initiation fee is \$1. Formerly dues of 25 cents per week were paid, but on Sept. 5, 1899, the Cincinnati Street Ry. appropriated \$5,000 for the Protective Association, so that the monthly dues might be remitted; it is expected that a similar appropriation will be made each year. On the death of a member there is an assessment of \$1 per capita. The sick benefit is \$7.50 per week. Since the organization the association has paid \$6,572.87 in sick benefits and \$6,081 in death benefits. In 1899 the totals were \$2,622.87 for sick and \$781 for death benefits.

The present membership is 762. Officers are chosen by ballot of the membership, and are: President, two vice-presidents, treasurer, financial secretary and corresponding secretary. George Attig is president, and C. C. King, corresponding secretary.

The Columbus (O.) Street Railway Employes' Beneficial Association was organized in October, 1893, with about 200 members, and now has 325 members. The management is chosen by a vote of the membership; besides the president, vice-president and secretary and treasurer, there is a trustee for each division of the road and shops. The dues are \$2 initiation, 50 cents per month and \$1 death assessment. The sick benefits allowed are \$3 for the first week and \$5 thereafter; the death benefit is the result of an assessment of \$1 on each member. Since the organization, the total death benefits paid have amounted to \$2,652, while the sick benefits paid aggregated \$9,017. For 1899 the sick benefits paid were \$1,458, and the death benefits \$303.

The following statement is sent us by Mr. H. R. Beeson, secretary of the association: "The association has been helped financially by the Columbus Street Railway Co., by donations, and today we have a cash balance of \$1,200. The men are all greatly interested in it and the membership continues to grow. One of the best features is the payment of \$50 immediately upon the death of a member, this amount to be deducted from a later settlement with the beneficiary, thus affording relief when it is most needed. The cash collections are made through the division foreman, and turned over to the secretary and treasurer. Sick benefits are paid upon a certificate of the attending physician and trustee of the division to which the member may belong. There is no doubt it has benefited both employer and employe by bringing them closer together in a friendly manner."

The employes of the Chicago City Railway Co. organized the Chicago City Railway Employes' Mutual Aid Association, Sept. 26, 1894, with a membership of about 1,000. Sept. 20, 1898, the association was reorganized and incorporated under the laws of Illinois. The objects of the association is "to establish and maintain a benefit fund out of which shall be paid on the death of a member in good standing a sum not exceeding \$500," to the persons designated by the deceased. It pays no sick benefits.

All employes of the Chicago City Ry. of good moral character, not over 50 years of age, are eligible for membership upon passing the requisite medical examination.

The initiation fee is \$1, the annual dues 50 cents, and the assessments 50 cents per capita, levied as often as may be necessary to pay death claims. Membership in the association is not forfeited upon leaving the employ of the company unless one engage in the manufacture or sale of intoxicating liquors; non-employes who are suspended for non-payment of dues are not eligible to reinstatement, however.

The death benefit is the amount produced by a 50-cent assessment providing it shall not exceed \$500. Since organization the association has paid \$33,000 in death claims, and during the year ending Oct. 1, 1899, paid \$8,500. The present membership is 2,600.

The nine directors, the secretary and the treasurer are chosen by the members, and the president and vice-president by the directors. The present officers are: President, A. Christ, jr.; vice-president, M. P. McDonald; treasurer, T. C. Penington; secretary, C. R. Penington.

The Metropolitan Street Railway Association (New York) was organized among the employes of that company, Feb. 1, 1897, with 100 members. Dues were \$1 initiation and 50 cents per month, and the benefits \$1 per day in sickness (limited to 90 days in any one year) and \$150 on death. Membership is voluntary, all male employes of the company being eligible. Since its organization the association has paid \$21,791 in sick benefits and \$7,650 on account of deaths. In 1899 the sick benefits paid were \$10,870 and the death benefits, \$3,600. The association now has a membership of 3,014. H. H. Vreeland, general manager of the Metropolitan Street Ry., is ex-officio president of the association; H. S. Beattie, treasurer of the company, is ex-officio treasurer; the other officers are chosen by ballot, E. J. O'Connell being vice-president, and D. J. Purfield, secretary.

Feb. 18, 1897, the Middletown (Conn.) Street Railway Co. arranged for a benefit association among its employes, membership being compulsory. The dues were 25 cents per week, and the sick benefit 50 cents per day for employes who had been in the service three months. The superintendent of the street railway is ex-officio president of the relief association, and the clerk to the superintendent is ex-officio secretary and treasurer of the association. Three members are chosen by ballot, and with the officers constitute the executive committee.

The organization is known as the Street Railway Employees' Benefit Association, and had originally 21 members. Since its organization it has paid out \$381.50 in sick benefits (it has no death benefits); last year the sick benefits were \$195.50. The present membership is 24.

The secretary, Mr. C. H. Chapman, has sent us a copy of the by-laws, from which we learn that the weekly dues are 15 cents and the sick benefit \$1 per day (limited to 5 weeks in every 12 consecutive months) the dues having been reduced from 25 cents and the benefit increased from 50 cents. As a safeguard against temporary insolvency, the by-laws provide for an assessment of 25 cents per member in event of sickness at a time when there is no money in the treasury.

The history of this association, which is now three years old, shows that it is not necessary that the company be a large one in order to make an employes' mutual benefit association a success, and for this reason the Middletown association is of particular interest to small roads. The superintendent of the company and ex-officio president of the association, is E. W. Goss, who effected the original organization in 1897.

The Third Avenue Railroad Employes' Relief Association, New York, was organized Mar. 1, 1890, with a membership of 650. All employes of the Third Avenue R. R., in good health, are eligible to membership. The dues are \$1 initiation, 50 cents per month, and a special assessment of 25 cents for the death fund levied on new members when joining the association. The sick benefit allowed is \$1 per day beginning on the eighth day, and the total for one year is limited to \$84. The death benefit is \$150.

Since the organization the total sum paid out for sick benefits is \$32,593, and for death benefits, \$18,670. In 1899, the sick bene-

fits amounted to \$3,407, and the death benefits to \$2,150. The membership at present is 1,000.

The officers of the association are a president, a vice-president, a secretary, a treasurer, a sergeant-at-arms and a physician. The president is the superintendent of the company, and the treasurer, the treasurer of the company; other officers are chosen by ballot.

Mr. C. C. Swertfager, secretary, writes us as follows: "Our association was started by Pres. Louis Lyons, of the Third Avenue R. R., who is now deceased. He presented the men with \$100, which, together with \$200 more realized from a "chowder party," given by the employes on Oct. 9, 1889, formed the financial nucleus of the organization. The good done in the last 10 years can best be judged by the total of benefits paid. At this time we have \$9,000 in the treasury.

"During the first two years we had an assessment of 25 cents upon the death of a member, but for the last eight years there has been no assessment. We give an entertainment sometime during the winter, and a picnic in the summer, and all sums realized from this source, over expenses, are placed in the Death Fund, also all assessments from new members, who pay 25 cents assessment when they become members. Our dues are 50 cents per month; this sum pays sick benefits and other expenses.

"All of the officers of the road are members of the association, from Pres. A. J. Elias down. Supt. J. H. Robertson is the president. Mr. John Beaver, treasurer of the road, is our treasurer.

"A strict account of all money received and disbursed is rendered at every monthly meeting. There are eleven trustees and an advisory board (consisting of the president, vice-president and treasurer), to whom are referred all bills, and no money can be paid out without their orders, except sick benefits, which are paid on the order of the association physician.

"The secretary devotes his whole time to the association, and is paid a salary. Among his duties is that of visiting the sick at least twice a week."

Mr. A. A. Anderson, general manager of the Mahoning Valley Railway Co., of Youngstown, O., in answer to our inquiry, says: "Our employes have no organization or association. I believe a mutual benefit association of street railway employes is a good feature, and we have discussed the matter a number of times. At one time the employes among themselves attempted to perfect such an organization, but for some reason they failed to carry out their plans. I have delayed giving the matter my personal attention for the reason that in starting it off I desired to furnish them with good quarters for their meetings, entertainment during hours when off duty, etc., provision for which I expect to make in the near future."

The Montreal Street Railway Co., Montreal, Can., has no benefit association among its employes, but all permanent employes are insured under contract with the Ocean Accident & Guarantee Corporation. In answering our inquiry, Mr. F. L. Wanklyn, the general manager of the company, did not enter into the details of this arrangement, but we quote the following from a general order of the management, announcing an increase in wages, issued in June last and published in the "Review" for July, 1899, page 475: "On and after July 16th, all permanent employes in the operating department and workshops will be insured in an accident insurance company of good standing, and the premium will be paid by the Montreal Street Railway Co. The insurance will amount to \$1,000 in event of death from accident either on or off duty, one-half of this amount for total disablement, and \$5 per week indemnity for loss of time through injuries or diseases specified in the policy."

According to press reports, flat cars running over the tracks of the Brooklyn Rapid Transit Co. are to be used for removing all the snow from streets in the down-town districts. These cars will be run in the night only, when they will not interfere with the regular service. Wagons will collect the snow in the side streets during the day and will deposit it at convenient dumps along the line, from which it will be removed at night by the flat cars drawn by motor cars. The city contractor receives 21½ cents per cu. yd. for removing snow.

PLANS MADE FOR NEXT CONVENTION.

The executive committee of the American Street Railway Association met in Kansas City on February 5th and 6th, accepted the buildings offered for exhibits and set the date for the next convention, which will be held on October 16th, 17th, 18th and 19th of this year. Members present included President John M. Roach; Chicago; Secretary T. C. Pennington, Chicago; Frank G. Jones, Memphis; Nicholas S. Hill, Charleston; Chas. W. Wason, Cleveland; and John R. Graham, Quincy, Mass. Mrs. Jones and Mrs. Hill accompanied their husbands.

The business transacted included the report of the secretary and treasurer, which showed financial conditions to be better than at any time since organization; the selection of subjects and the appointment of committees to prepare the papers; confirming the selection of Kansas City as the meeting place; and fixing the dates for the convention.

The building to accommodate the sessions and exhibits is always a point of vital importance, and the committee were delighted with what they found. The convention hall is a new and mammoth structure erected by the public spirited citizens of Kansas City more for the credit of the city than with a special view to being a money making institution. It has, however, proved to be both. The building is conveniently situated relative to the leading hotels, and seats 25,000 people. Our illustrations of exterior and interior will convey a very intelligent idea of the structure, which is roomy and attractive and equipped with every modern convenience required in such a place. The lighting and heating arrangements are perfect.

The building is 314 ft. long by 198 ft. wide. In addition to the main floor, there is a row of small stalls extending from entrance to the stage, on the main floor, which will make ideal space for the smaller exhibitors who will have no carpenter work to do. The land and the building cost \$225,000, two years ago. It is altogether the best suited to the requirements of the association of any ever occupied for convention purposes. Tiers of galleries rise one above another until the roof garden is reached by gentle inclines with-

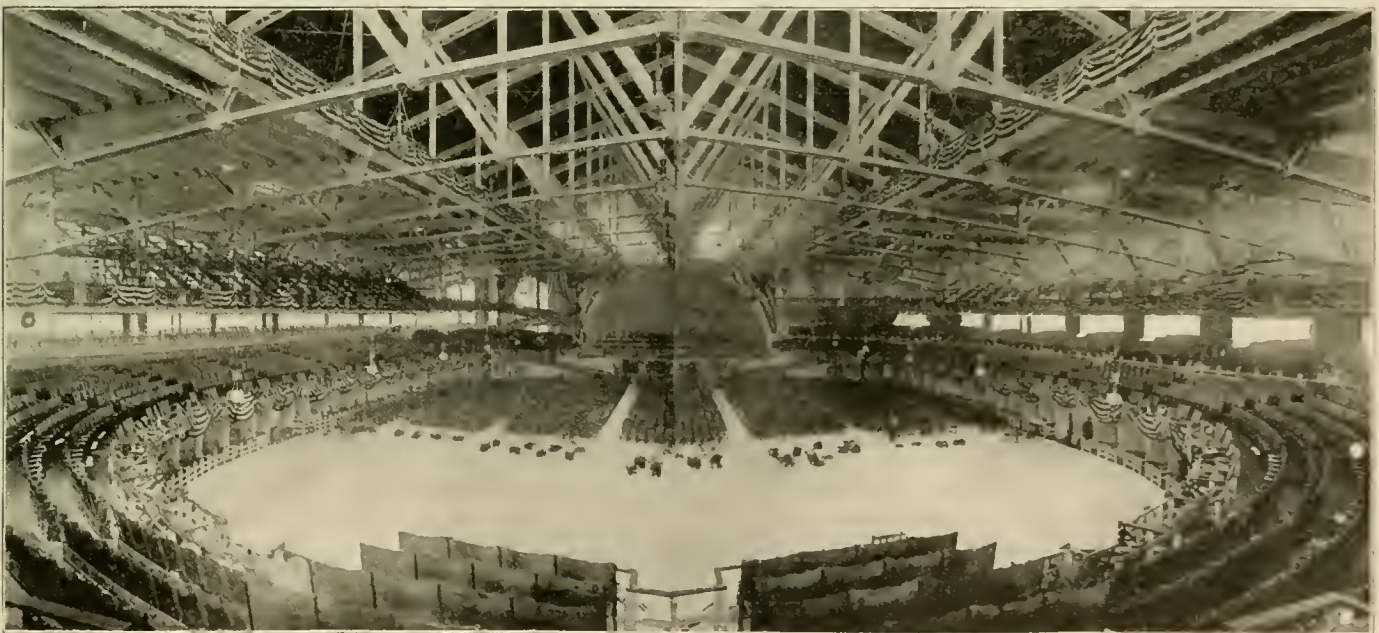
Gore, of Boston, and H. H. Windsor of the "Street Railway Review." On Tuesday afternoon the party made a trip over some of the city lines and visited the new power house, which is being largely increased in capacity with very large units, and which presents one of the best examples of the modern station to be found in this country. Fire Chief White also entertained the party at his headquarters with fire drill and a demonstration of his recent invention by which the phonograph is utilized to instantly an-



EXTERIOR OF CONVENTION HALL.

nounce to telephone exchanges the breaking out of a fire in any room of buildings containing a city telephone. This invention, by the way, has just been sold for \$50,000, and is destined to revolutionize the present system of private watchmen.

The selection of the headquarters hotel will be announced later. In the question of hotels, the committee were very agreeably surprised at the number and quality of good hotels, all convenient to the Convention Hall, and if the entertainment tendered the visiting party is any indication of what is in store next October,—and President Holmes says it was only the index to the book—the Asso-



THE CONVENTION HALL IN KANSAS CITY.

out a single stair. The acoustic properties are remarkable. For the sessions there are abundant meeting rooms, well lighted and ventilated.

On Monday evening, President Holmes, of the Metropolitan Street Railway, gave a theater party to the visiting guests, followed by a banquet at the Midland Hotel. In addition to the members of the committee named above, there were present Gen. Mgr. C. F. Holmes, Secretary Kirkpatrick, Superintendent Satterly, and Purchasing Agent H. C. Schwitzgebel, all of the Metropolitan; F. J. Taggart and John Brown, of Kansas City; Latham Karnes, of the legal department of the Metropolitan Street Railway Co.; Mr.

ciation will not only have a highly delightful and instructive time, but an occasion in no degree less memorable than any conventions which have preceded the one for 1900.

A check for \$69,150 has been sent to the comptroller of Baltimore by the United Railways & Electric Co., in payment of the park tax for the quarter ending Dec. 31, 1899. This is 9 per cent of the gross earnings of the system within the city limits. The amount for the same period of the previous year, which was before the consolidation, was \$68,265.

TOLEDO TRACTION CENTENNIAL BAND.

In the "Review" for February, 1899, was published an announcement of the formation of the Traction Company Centennial Band among the employes of the Toledo Traction Co., and a half-tone engraving of the members. Through the courtesy of Mr. Thomas H. McLean, general manager of the company, we have received a copy of the constitution of the band association, which is reproduced below for the information of managers who may wish to encourage the formation of similar organizations among the employes of their roads.

Eighteen months ago Mr. McLean learned that a number of the Traction company's men had at various times been members of band organizations, and with his customary energy soon had the Toledo Traction band an accomplished fact.

From the very first the idea was enthusiastically received by its members, by the other employes of the Traction company, who regard it with growing pride, by the officers and shareholders of the company, and by the citizens of the city, and today it is the most popular musical organization in Toledo. Under its constitution, the band can accept no paid commissions; it receives no outside compensation for its services, playing only for philanthropic movements, municipal affairs, social mass meetings, and entertainment functions of employes, and company matters.

as shall be hereinafter stipulated; and all members of the band either individually or collectively agree not to play for any entertainment, function, parade or gathering of any kind whatsoever, without first obtaining the permission and approval of the secretary and manager.

III. The officers of this society or band shall be a president, a vice-president, a secretary and manager, a treasurer, a librarian, and an executive committee of three, of which the president shall be a member ex-officio.

IV. The president, vice-president, secretary and manager and treasurer shall be elected annually by ballot and shall hold their respective offices until successors are elected and installed.

The librarian shall be appointed by the manager, and shall serve for such a period as he shall elect.

The executive committee (of which the president shall be chairman ex-officio) shall be appointed by the president and shall serve at his discretion.

V. It shall be the duty of the president or vice-president to preside at all meetings.

The treasurer shall take charge of all funds of the band and shall render an accounting of same to the executive committee whenever required so to do.

The secretary, who shall also be the manager, shall take the minutes of each meeting, spreading same upon a minute book pro-



TOLEDO TRACTION CENTENNIAL BAND.

At this writing the band numbers 36 members. Twelve months ago the Traction company presented them with full uniforms of the Gilmore pattern, and equipped them with a complete set of the C. G. Conn & Besson silver instruments. Two rehearsals are held each week in comfortable club rooms, also furnished by the company.

The officers are: President, J. F. Collins, superintendent of the Traction company; vice-president, F. D. Brooks; treasurer, C. L. Wight, auditor of the company; secretary and manager, A. A. Atkinson, contracting agent of the lighting department of the company.

The accompanying illustration shows the band in its new uniforms. The face of Mr. McLean, who forms the center of the group, is well known to most of our readers; seated at his right is President Collins, of the band, and standing immediately behind them is Manager Atkinson.

CONSTITUTION.

I. The title and name of this organization or body shall be "The Traction Company Centennial Band."

II. The object of this organization shall be the formation of a selected number into an association for the purpose of study and practice in the use of brass band instruments for the purpose of furnishing music for such occasions and under such arrangements

provided for such purpose; shall collect all accounts, including money due for professional services rendered, membership fees, dues, fines, assessments and all other accounts receivable, and shall turn the same over to the treasurer, taking his receipt therefor upon blanks provided, and shall give attention to all correspondence and other duties pertaining to his office. He shall also be the manager of the band, and all matters of business, of finances, and the making of all contracts shall be attended to by him.

BY-LAWS.

The regular meetings of the band shall be held at 7:30 o'clock each Thursday evening. The business meeting to precede the practice or rehearsal.

The director or teacher shall be hired by the secretary, after first being voted upon by the band in business meeting, and shall be hired for no specified time, and can be retired at any time by a vote of the band.

An admission fee of one dollar shall be assessed each member at the time he is enrolled.

Monthly dues of 50 cents per capita shall be assessed each month, payable the first of each month, in advance.

A fine of 25 cents shall be charged for tardiness or absence of a member at rehearsals.

Each member shall be held responsible for uniforms, instru-

ments or music belonging to the organization, and shall take proper care of the same.

The regular order of business of each meeting shall be as follows: Call to order; roll call; reading of minutes; report of committee; new business; good of the order; adjournment; rehearsal.

This constitution and by-laws may be amended or changed by a two-thirds vote of the band in business session.

IN THE OHIO LEGISLATURE.

The question of urban track rights for interurban lines is one that promises to be quite important in Ohio. A bill has been introduced in the Legislature which provides that interurban roads shall have power to condemn rights of way over urban lines, which is as follows:

Section 1. Any railway company incorporated and organized under the laws of this state for the purpose of building, acquiring, owning, leasing, operating and maintaining a railroad or railroads, to be operated by electricity or other motive power, other than steam, from one municipal corporation or point in this state to any other municipal corporation, municipal corporations, point or points, may appropriate, by proceedings in the probate court of the proper county, which shall be governed by the provisions of chapter eight of part third, title two, of the Revised Statutes, for its joint and equal use and occupancy with any existing street railway, the tracks and property of such existing street railway in any such municipal corporation or corporations, and the right of way of any such existing street railway upon streets upon which its tracks have not been laid and its road constructed, for not more than the entire distance between the termini of the route as actually constructed, operated and run over of the appropriating company at the time appropriation proceedings are commenced, not to exceed five miles, whether such termini be wholly without or partly within and partly without such municipal corporation or corporations; but no such right to use and occupy such tracks or property shall be exercised until the owner thereof shall have been first compensated therefor in money. Such appropriation proceedings and payments shall vest in such appropriating company all the rights and privileges, subject to the same regulations, as to those streets jointly occupied, for the unexpired term of the franchise that may have been granted to the company whose tracks and property or right of way have been so appropriated, and for the term of any renewals or extensions of such franchise, without the previous consent of any of the owners of property abutting upon such streets, and without the right to use the same having been granted to such appropriating company by council or other municipal authority; provided, that when there is a difference in the gage in the tracks of the existing company and the appropriating company, the latter may also appropriate the right to lay and construct along the line so appropriated an additional rail to conform to its gage.

Sec. 2. That in ascertaining the measure of compensation to be paid in a proceeding under this act, there shall be taken into consideration the value of so much of the railway structure and materials in place as is sought to be appropriated, including the cost of any paving constructed in conformity with city ordinance; also the damages which such structure will sustain in adapting it to the uses of the appropriating company, and the reasonable cost of keeping the structure in repair; but the amount of compensation to be awarded for such use shall be limited to the value of such use during the unexpired term of the franchise of the company whose tracks are sought to be appropriated, and no compensation shall be allowed for any depreciation in the value of any franchise, nor for any loss of fares, nor for any inconvenience or interruption to business, nor for any consequential diminution in the value of other portions of the line forming part of such street railway system, caused by the joint use and occupancy of its tracks and property or right of way.

To enact this bill would be to innovate a policy almost certain to work grave injustice to the city roads. The matter can much better be left to various companies concerned to be arranged by contract, as has been done in various cities.

Other bills now pending in the Ohio Legislature are on the following subjects:

Requiring conductors on all cars in Dayton.

Requiring all grants, renewal and extension in municipalities to be approved by vote of people before becoming operative, and preventing renewals more than eighteen months prior to expiration.

Requiring all interurban railways securing right of way over highways to pay one fourth cost of macadam road, pike, etc., in cash, before construction, and to keep in repair twenty inches on outside of rail.

Permitting trustees of state institution to grant consent for franchise.

Granting use of berme bank Ohio Canal, Newark to Buckeye Lake, to C. B. L. & N. Traction Co.

Providing that electric railways shall not charge a passenger rate exceeding 2 cents per mile, single fares 5 cents.

Bills being prepared for introduction prohibit county commissioners from granting franchise on the public highways; to establish a standard gage, and to require electric roads to report to state department and pay per cent to maintenance of commissioner of railroads.

THE COPPER KING.

By the courtesy of Mr. John N. Akarman, superintendent of the Worcester (Mass.) Consolidated Street Railway Co., we have received a photograph of William Londrigan, whom the police have named the Copper King. He was caught in the act of stealing bonds from the track of the Worcester Consolidated, and has been bound over to the grand jury. Londrigan had been operating



WM. LONDRIGAN, THE COPPER KING.

for some time, stealing from 25 to 100 lb. of bonds each night. He used an axe for removing the bonds and when detected turned his weapon on the police.

The man's description is as follows: Age, 39 years; shoemaker; married; stout build; 6 ft. tall; weight, 190 lb.; brown hair; hazel eyes; dark complexion; can read and write.

HE EXPERIMENTED AT THE COST OF THE COMPANY.

The Chicago Consolidated Traction Co. for several days last month unwittingly supplied an ambitious inventor with power free of cost for carrying on his experiments with a new electric system. The would-be revolutionist of existing methods selected an infrequently used section of track in a secluded suburb, and after familiarizing himself with the running schedule, took possession of the tracks for the purpose of trying a small motor car, running on the rails and taking current from the line. When one of the company's cars hove in sight he would remove his vehicle and wait until the car had passed, when he would resume his trips. A motorman running off of schedule discovered the inventor and his machine.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

ARNOLD MAGNETIC CLUTCH.

In connection with the "Arnold system" of power station construction, its inventor, Mr. Bion J. Arnold, developed magnet clutches designed to meet the requirement for a ready means of connecting or disconnecting the electrical generating units with their prime movers. While the clutches are friction clutches, the friction between the contact surfaces is due to magnetic attraction.

The energizing circuit is controlled by means of a switch placed at a convenient point, which is quite a decided advantage over the ordinary friction clutch. It is thus possible in throwing a generator in or out of service to control it entirely from the switch-board, where all the regulating devices and measuring instruments are within the reach of one attendant. These magnetic clutches are neat in appearance and compact in design. Even in the larger sizes the amount of space occupied upon the shaft is not much more than twice the diameter of the shaft, and by using a flange forged solid on the end of the shaft, they can be made to occupy even less space when used as cut-off couplings. Having no projecting surface or parts to catch the air when in operation, the windage resistance is negligible. The greatest advantage claimed of this form of clutch over others is that it is self contained—the "action and reaction" being within the clutch itself, and consequently there is no resulting end thrust upon the shaft bearings and no additional friction load due to the operation of the clutch.

It has been suggested that in many instances a clutch of this design could be substituted for the fly-wheel; thus permitting the use of magnetic clutches without great increase in the cost or weight of the engine units.

Fig. 1 shows what is believed to be the largest magnetic clutch ever built. It is 100 in. in diameter, and is designed to transmit

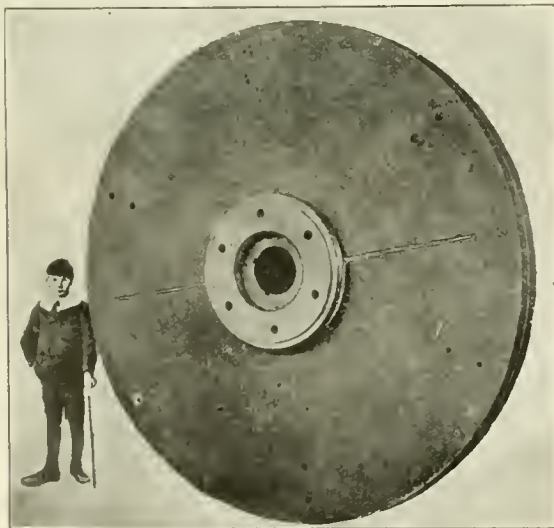


FIG. 1—100-IN. MAGNETIC CLUTCH.

3,000 h. p. at 150 r. p. m. This is one of three clutches now in use connecting the engines and generators in the central station of the Imperial Electric Light, Heat & Power Co., at St. Louis, a view of the equipment of which is shown in Fig. 2. The experience with this plant demonstrates that this form of clutch is applicable to the large size units now being installed for power station purposes, whereas the ordinary friction clutch becomes unwieldy and unsightly after passing the 500-h. p. size.

The current is carried to the clutch coils through contact rings upon the side of the clutch, and carbon brushes held by insulated brush holders, the electrical connections being simple and easily

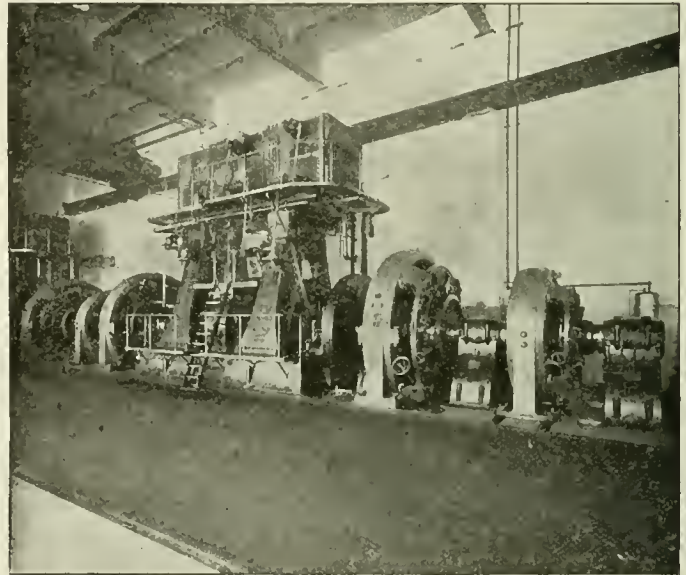


FIG. 2 PLANT OF IMPERIAL ELECTRIC LIGHT HEAT & POWER CO., ST. LOUIS.

accessible for inspection. The loss in the clutch, due to the continuous use of current while the clutch is in operation, is given as one-tenth thousandth of its power transmitting capacity.

CONTINUOUS MEAN PRESSURE INDICATOR FOR STEAM ENGINES.

A paper on this subject was presented before the Institute of Mechanical Engineers (England) by Prof. William Ripper, in which the author described the construction and operation of instruments by which the mean pressures in an engine cylinder can be read directly from steam gages.

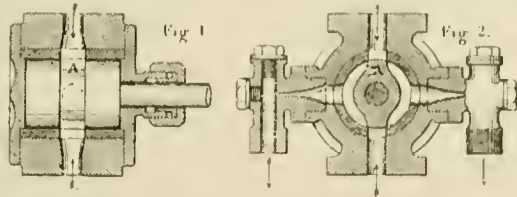
Originally the mean pressure gage was designed for engines of high rotative speeds, but it was found possible to use it for engines running at any speed. The apparatus consists of a valve chest with a valve of the four-way-cock type driven from the moving parts of the engine so that steam from the driving or working end of the cylinder is directed to one steam gage and steam from the exhaust or back pressure end of the cylinder is carried to another steam gage. The valves are of various designs; on long stroke engines there are two valves, one close to each end of the cylinder to avoid long connecting pipes; for very high rotative speeds a rotary valve is used.

The effect of the arrangement is that a series of impulses is directed to each of the two steam gages employed, and by throttling the flow the vibrations of the gage pointers are reduced to any desired reasonable range without, it is stated, affecting the accuracy of the indications; the difference between the readings of the two gages is the difference between the mean forward pressure and the mean back pressure measured on a time basis.

The ordinary indicator diagram is measured on a distance basis, so that its area is proportional to the work done in the cylinder. By reason of the reciprocating motion of the piston and the uni-

form speed of rotation of the engine the piston does not have a uniform speed, and therefore the mean time pressure will in general be different from the mean-distance pressure as measured from an indicator diagram.

The difference between the mean time gage reading and the mean pressure from an indicator diagram will vary with each change in the cut-off, but Professor Ripper states that it is quite



SECTIONS OF FOUR WAY VALVE.

practicable to use an average correction factor, and gives the difference between the two methods in per cent of the mean absolute forward pressure as follows:

Cut-off,	Difference, per cent.
.2	+2.9
.3	-1.4
.4	-3.5
.5	-3.9
.6	-3.4
.7	-2.6
.8	-2.1
.9	-1.1

Below .1 cut-off the difference is much greater, but so early a cut-off being quite rare this does not matter.

In using the mean-pressure indicator it is recommended that comparisons be made between it and indicator diagrams, and so determine the proper correction ratio for the given engine or type of engine.

The concluding sections of Professor Ripper's paper are given below:

READING BY PRESSURE GAGES.

In order to obtain a reading of the mean pressure acting upon the gage, the writer employs two throttling cocks, one close to the instrument and one more or less close to gage. By the use of these regulating cocks the oscillations of the finger of the gage may be reduced to any desired degree of steadiness without inter-

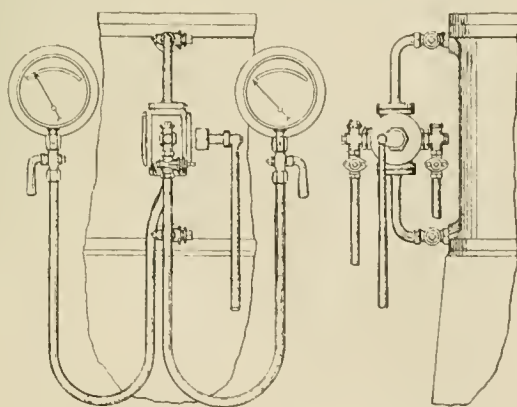


FIG. 3 ARRANGEMENT OF GAGES.

fering with the accuracy of the reading of the mean pressure.

It is not unlikely that some engineers will object ab initio to the arrangement described in this paper, seeing that it is proposed to obtain such an important value as the mean effective pressure in an engine cylinder by means of an appliance so unreliable as the pressure gage is said to be, by some authorities, and still more so when it is proposed to throttle the steam supply to the gage, as has just been described.

But in answer to these objections, the writer desires to give the results of his own experience, as having himself been in doubt as to the accuracy of gages and the effect of throttling, he has made

many hundreds of experiments in order to test the extent of the error to be expected and he has come to the conclusion that readings by a pressure gage may be obtained which are as accurate as consistent and as reliable as by any known instrument for the measurement of pressure, not excepting the best of indicators; also that the throttling, when properly applied, does not endanger the accuracy of the reading, but, on the contrary, gives the true mean effect of the regular successions of momentary variations of pressures acting on the gage.

In order to obtain accurate readings by means of a pressure gage, such gage must (1) be properly constructed; (2) be properly used. That a large number of the pressure gages in ordinary use in practice are more or less unreliable is well known, but it will be admitted that such gages, of the unreliable class, have not been constructed for the purpose of extremely accurate measurements, and have not received that care in the process of manufacture which is necessary to enable them to be classed as "instruments of precision." Their deficiencies are usually not due to defect in the principle upon which they are constructed, but are rather a question of quality of manufacture. But however perfectly constructed a gage may be, it is of course necessary that it should be carefully used, if it is expected to give uniformly accurate readings. Probably no instrument used by engineers receives such scant attention as the pressure gage; and while some of our measuring instruments must be carefully cleaned, oiled and set, before we may have a single measurement, the pressure gage may be dirty or rusty, or hot or cold, or its syphon may be empty or full, but under all these conditions it is expected to be equally accurate.

PRESSURE GAGE SYPHONS.

The importance is admitted of maintaining a column of water in the syphon of the pressure gage to keep the gage cool, so that its readings may be consistent, and so as not to subject the gage to high or variable temperatures. It is generally supposed that if the gage has a syphon there is always water in it, and that when the syphon is once full of water, the water is easily retained therein, but these assumptions are not warranted by the facts of the case. The water will disappear from the syphon from various causes: (1) If there is the smallest leak in the gage end of the syphon, then the water is all gone in a minute or two by being blown out by the steam, though the leak may be almost imperceptible. (2) If the pressure to which the gage is subjected is a variable one, as is the case when the gage is attached by its syphon to the valve chest of an engine regulated by a throttling governor, then the water will disappear from the syphon as usually constructed in a few minutes, especially on a sudden reduction of load and consequent fall of pressure, in the same way that water in the engine cylinder disappears during expansion and exhaust. (3) When the gage is liable to be subjected to a vacuum, as is the case when it is attached anywhere on the engine side of the throttle valve, then if the throttle valve is closed by the governor, or by hand, while the engine continues running, especially if it is a condensing engine, the engine becomes an air pump and the water in the syphon is displaced by the expanding air initially contained in the spring tube of the gage and its connections. Thus if the pressure in the engine falls to 3 lb. absolute, the volume of water displaced in the syphon equals 15 ÷ 3 = 5 times the volume of air in the gage. If now the steam is again suddenly turned on the engine, it is certain that the gage readings will be different from what they were when the syphons were full of water. When there is water in the syphon, the syphon pipe is practically cold with a steady pressure. When the pipe is very hot, the water has probably gone from the syphon, unless it happens that the pipe is in contact with some hot metal. (4) If the gage is subjected to a vacuum, and there is the smallest leak in the fitting at the gage end of the syphon, then the water in the syphon is displaced by the air which enters the syphon through the leak.

When the cause is due to the variable nature of the pressure acting on the gage, the water may be retained in the syphon by the method of double throttling already mentioned. When the mean-pressure instrument was first constructed, only a single cock was fitted to the syphon of each pressure gage, and great difficulty was found to keep the water in the syphon. Many devices were tried to overcome this difficulty, but without avail. A second cock would have been fitted at an early period of the experiments, at the end of the syphon farthest from the gage—which, when throttled, would instantly have stopped the trouble—but for the fact that

the writer set out with the notion that if the throttling of the syphon cock was a throttling of water the pressure would be transmitted to the gage undiminished, but that if the throttling took place in the steam a loss of pressure would follow, and the reading of the gage would be low. This erroneous notion cost about twelve months' experimenting to try to discover how to do without the use of water in a syphon.

Fig. 4 shows the arrangement employed for experimenting on the effect of double throttling. A short water gage glass A is secured between two plates B and C held together by bolts. The glass is connected at the top with the engine cylinder D by the pipe as shown, and at the bottom of the glass the gage pipe is attached. There are regulating cocks at E and F. When the cock E is opened wide and the engine is running, the change or pressure in the cylinder between the driving and the exhaust stroke caused a more or less violent agitation of the water in A, being the more violent as the range of pressure was greater. When the range of pressure was not more than about 10 lb., the water in the glass was quiet; but when the range of pressure exceeded this (by increasing the load on the engine) agitation again began. The action appeared to be due first to the heating of the water in the tube by the rush of steam, mixed with globules of hot water, into the tube; and secondly, to the re-evaporation of the heated water when the pressure fell during expansion and exhaust in the cylinder. It is not possible to give numerical data as to the effect of different ranges of pressure, because the behavior of the water was most

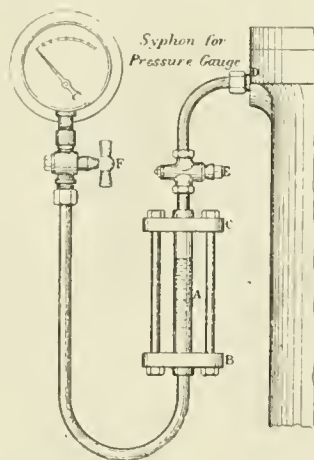


FIG. 4.

erratic. Sometimes, with a given range of pressure in the engine, the water was violently agitated and would disappear from the glass in a few minutes; in other cases it would remain quiescent in the glass for hours, though the conditions appear to be unchanged. Then it would suddenly commence to boil and to disappear without any apparent cause. But in all cases of agitation of the water in the tube A, when the cock E was throttled down the agitation immediately ceased.

The amount of throttling of the cock E which was necessary to stop the agitation still left a fairly large movement of the gage finger across the scale, and the final adjustment for steadying the figure to the smallest possible movement was obtained by throttling the cock F. Throttling the cock E had no effect on the pressure reading by the gage unless the throttling was carried too far. It was not necessary in order to stop the ebullition to throttle the cock E so far as to reduce the pressure. If any doubt remained as to whether the cock E was throttled too much, a little more opening of E would show at once whether such was the case. But it is only necessary to move E sufficiently to stop the ebullition and consequent disappearance of the water, and this leaves a good margin before the throttling of E is excessive.

With such an arrangement the effect of suitably throttling the cock E is to automatically fill up the syphon, if partly empty from any cause, and the water in the syphon will thus reach as far as the cock E when the apparatus has been at work a short time. In this way the problem of keeping the water in the syphon continuously and free from agitation was solved, and there is now practically no difficulty in obtaining a constant and accurate reading of the mean pressure by gages subjected to variable pressures.

When the cause of loss of water in the syphon is due to the gage being subjected to a vacuum, a type of gage is preferable from which the air in the Bourdon tube has been excluded, and the tube filled with liquid to its extremity; there is then no air to expand in the tube to expel the water from the syphon.

To sum up: (1) The instrument here described gives a correct record of the mean-time pressure. (2) The mean-time pressure bears a definite ratio to the mean pressure as given by an ordinary indicator. (3) The correction may be made by the use of a factor, or by a corrected scale on the gage dial. (4) Pressure gages when properly made and properly used may be relied upon to give accurate readings.

ROCKFORD RAILWAY, LIGHT & POWER CO.

Mr. T. M. Ellis, general manager of the Rockford (Ill.) Railway, Light & Power Co., has sent us a copy of the report of the operation of the company's electric railway for the months of December, 1899. The company operates 22 miles of track.

In connection with the data for December, we reprint the corresponding figures for July, 1899.

BALANCE SHEET.

	July.	Dec.
Cash from passengers.....	\$6,346.40	\$5,226.07
Ticket sales.....	1,055.00	1,695.00
Received from carrying mail.....		50.00
	\$7,401.40	\$6,971.07
Operating expenses.....	3,715.03	3,578.30
Net earnings.....	\$3,686.37	\$3,392.77

SUMMARY.

Passengers carried.....	163,222	148,225
Average earnings per day.....	\$238.75	\$224.87
Average cars operated per day....	11.34	10 2-3
Earnings per car per day.....	\$20.32	\$21.07
Operating expenses per day.....	\$119.84	\$115.42
Operating expenses per car per day	\$10.20	\$10.82
Total motor car-mileage.....	54,457.5	48,832.6
Mileage per day.....	1,756.7	1,575.2
Mileage per car per day.....	149.5	147.7
Earnings per car-mile.....	13.59 cents	14.28 cents
Operating expense per car-mile...	6.82 cents	7.33 cents
Net earnings per car-mile.....	6.77 cents	6.95 cents

This is a particularly good showing, as, notwithstanding the decrease in the number of passengers, due to the season, of 9.2 per cent, the decrease in net earnings was only 8 per cent and the net earnings per car-mile show a gain. The operating expenses, 7.33 cents per car-mile, is a particularly good showing.

The total energy for the month, including that required for motors in the repair shops and lights in the car house, was 55,110 kw. h., or 1.13 kw. h. per car-mile.

For the whole year the gross earnings were \$71,096; the operating expenses, \$43,921; bond interest and other charges, \$17,446; surplus \$9,729. The number of passengers carried was 1,554,058, an increase of about one-third over the preceding year. The business for January, 1900, shows an increase of 20 per cent over January, 1899.

The Rockford Railway, Light & Power Co. now has all of the street railway lines in Rockford and is making numerous improvements. Loops are being put in at all the terminals where practicable and in the business district a loop two blocks each way is to be provided, which will greatly facilitate the handling of cars and improve the service. A new waiting room for passengers has been arranged at the company's offices and also a club room for employees.

This company has a beautiful park about three miles from the city, at which is a summer theater having a seating capacity for 2,000 persons; there are also other amusement features, such as bowling alleys, dancing pavilions, merry-go-rounds, etc.

One interesting feature of the road is that while it owns a power plant, it has been found cheaper to keep that plant closed and buy power, which it gets at the rate of 1.5 cents per kw. h.

MECHANICAL DEPARTMENT

A FOUR-MOTOR SNOW PLOW.

BY JOSEPH H. SMITH.

A well-known railway electrician once made the statement that if he could put a nose on the front of one of his four-motor cars, he could push all the snow that would come in front of him, and it was mainly because of this suggestion that the Interstate Consolidated Street Railway Co., of North Attleborough, Mass., determined to have a four-motor snow plow.

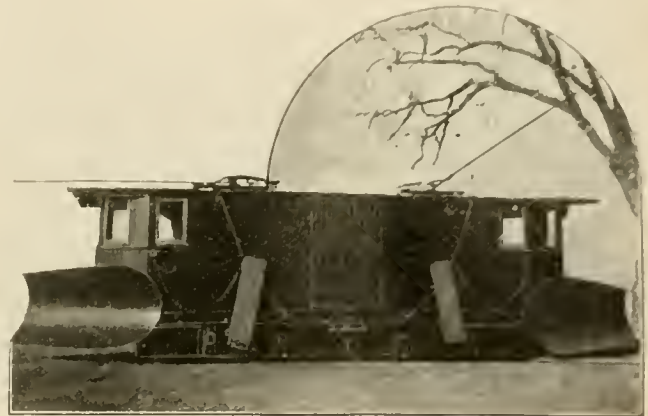
During the severe winter of 1898-99, when so many railway companies met such hard storms as to completely tie up their systems, on two different occasions the value of a first-class plow, something better than had been put out as yet, was easily seen. Though the Interstate Consolidated had its cars in operation several hours before any other road in the state, still the management, with customary enterprise, was not satisfied to have its lines tied up at all. So it was decided to spare no time or expense to place the road in such a condition as to be equal to any emergency.

The value of a snow plow lies in the weight available for adhesion and in its power; these two factors have been carefully observed in the construction of this plow. The total weight of this plow is 20 tons, distributed as follows: the body, 4 tons; noses, 2 tons; trucks and motors, 14 tons. Adding to this 10 barrels of salt and sand that will be carried, 3 tons more, gives a total weight of 23 tons on the wheels. There being eight driving wheels, the weight on each wheel will be 5,750 lb. The equipment consists of four G. E. 1,000 motors with 4-turn armatures; the shaft of each armature carries a 22-tooth pinion which meshes into a 62-tooth gear, giving a speed reduction of 2.81.

The plow, including the trucks, was built by Polard & Grothe, of Woburn, Mass., who are to be congratulated upon the thoroughness of their work. The trucks were designed especially

to envelop the motor wheels and brake rigging, thus preventing any snow from falling back in between the wheels. The trucks have Bemis wheels on a 3 3/4 in. axle, key seated for G. E. 1,000 or W. P. 50 motors.

Ice cutters or diggers are fastened directly to the truck, ensuring a good ground contact at all times, and also allowing them

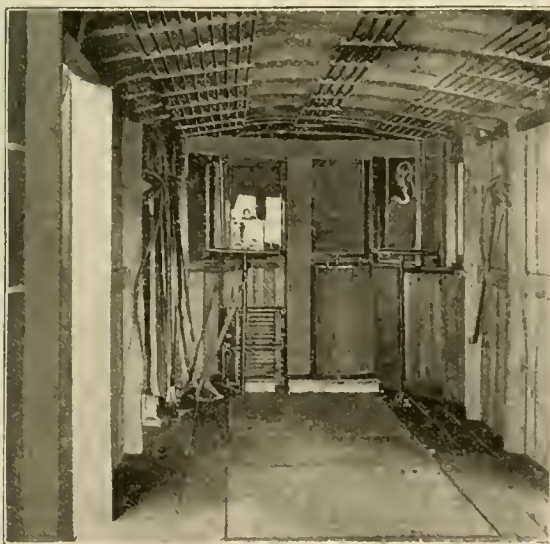


4-MOTOR SNOW PLOW.

to be on the rail when going around a curve, which would not be the case if they were suspended from the body.

The digger post is of steel 3 1/2 in. square, with a changeable cast shoe. A sleeve about 8 in. long keeps it in position, and a helical spring acts upon the sleeve and returns it to its normal position should it strike a high joint or any other obstruction. This prevents it from getting bent or knocked out of shape in any manner.

It was a matter of great difficulty to arrange the diggers so that they could be fastened to the truck and controlled inside the body and still not interfere with the truck swinging. A clasp with a projecting stud is fastened to the upper end of the digger-post; this stud engages with a lever, the other end of which is moved by a rod running horizontally to the other post; another rod is fastened perpendicularly to this one and projects about 4 in. above the top of the truck. The lever inside presses down a plate upon



INTERIOR OF CAB.

for this work and combine strength and durability with the minimum number of parts. The body rests upon a stationary bolster with the usual circle and recess at the center, chafing plates at the ends of the bolster and at the corners of the trucks. There are no springs used except those on top of the journal boxes and in the suspension. The truck is enclosed by a steel frame which completely

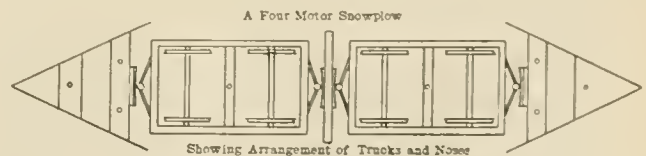


FIG. 1.

the end of this rod and raises the posts and they come down by their own weight when the lever is released. In swinging around a curve the perpendicular rod slides on the face of the plate which moves with the body.

Fig. 1 shows the arrangement of the trucks and noses. A cast iron roller 5 in. in diameter and 18 in. long is set at each end of each truck and opposite to these are concave plates on which the rollers bear. At the ends these bearing plates are on the nose, while in center they are on a centerboard which is fastened to the body. This brings the force of both trucks directly on the forward nose, so there is no stress on the body.

The nose is made of 1 1/4-in. steel and is of the moldboard type, with a heavy cast-iron point. From this point to the end, along the side, the nose is 10 ft. long, and 4 1/2 ft. high. It is raised by

a wheel which turns a worm and gear. A wing 4½ ft. long is set at each corner. With these set down, the plow will cut a path 13 ft 8 in. wide through the snow.

From point to point the length is 39 ft. 8 in. The body inside is 27 ft. 8 in. long and 7 ft. wide. Windows at each end give all the light necessary by day, and six lamps arranged around the walls serve at night. Each headlight contains three 16-c. p. lamps and a red light burns in the rear as a danger signal.

The controller is set at the extreme end directly under one of the windows. A little back and to the left is the brake wheel and on the right is the wheel for raising the nose and the digger lever. All the wiring is exposed, being merely cleated to the ribs on the ceiling. This prevents any water from resting around it, and

one of the features for the coming season. Arrangements have been made with a theatrical agency for a first-class light opera troupe of 35 members to play from May 15th until July 1st, and longer, if the patronage warrants it. No pains or expense will be spared to make this a first-class up-to-date place of amusement.

PRIZES FOR TRANSFER STATION DESIGNS.

The New York Municipal Art Society has offered prizes of \$300, \$200 and \$100 for the best three designs for a public transfer station for street railway passengers at Seventh Ave. and 59th St., New York. The society does not promise that the building will be

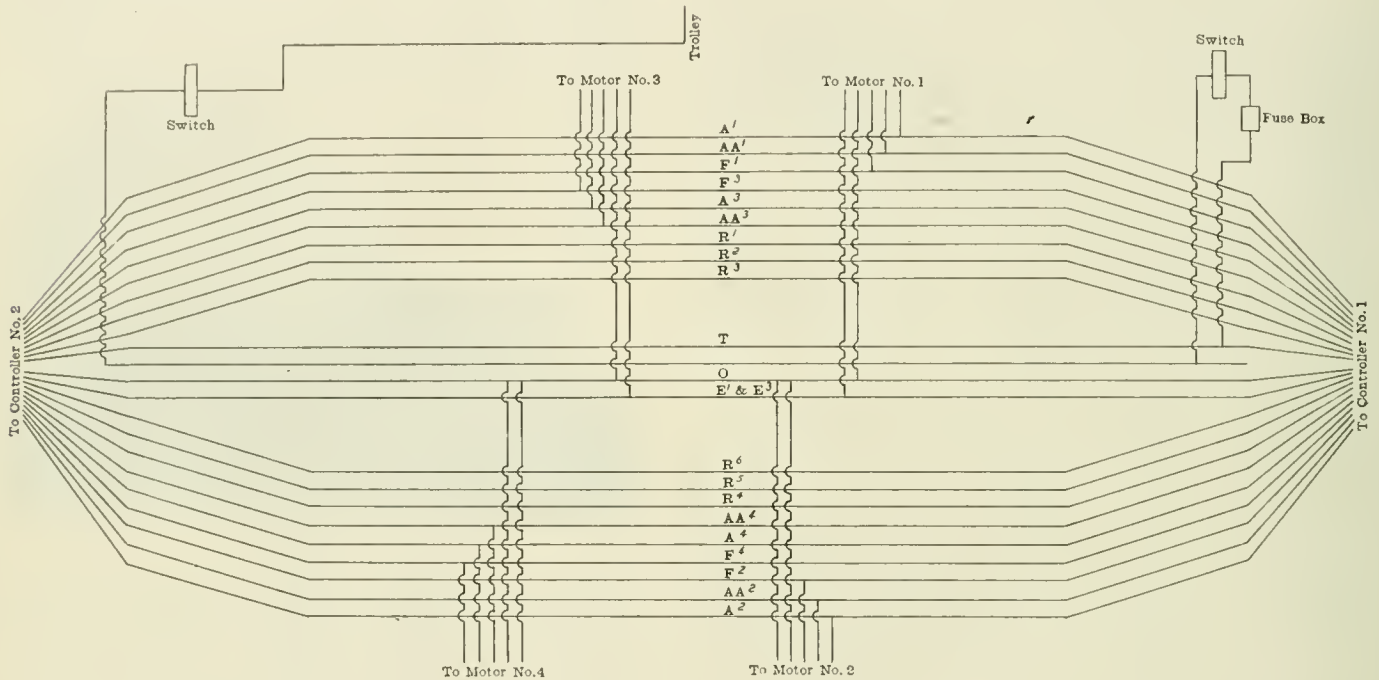


FIG. 2 DIAGRAM OF WIRING.

makes it easy to locate the cause of trouble, should any occur. Fig. 2 shows the wiring in detail; the center wires are No. 2 B. & S., while the others are No. 6.

A 2-in. steel pipe set flush with the floor on each side opposite the door allows enough sand and salt to strike the rail to keep it in good condition.

On account of the length of the body, it was necessary to put on two trolley poles. This arrangement has the advantage of having a spare pole to fall back on in an emergency, and if there is ice on the wire they can be run in tandem, the first one to clear the way for the second.

Though at the present writing the opportunity has not yet arrived to test this land-battleship, yet every confidence is placed in her to perform her duty to the best satisfaction.

PARK IMPROVEMENTS AT NASHVILLE.

The officials of the Nashville (Tenn.) & Suburban Railway Co. have definitely decided upon the character of improvements to be made at the resort known as Glendale Park, and in the line running thereto. This branch is single track, but 3½ miles of additional track will be built from the park back to the city by another route, forming a loop and making it possible to go out to the grounds one way and return another, giving pleasure passengers the advantages of varying scenery and a longer ride in the country.

At the park a large force of men is at work improving and beautifying the grounds in a number of ways. Wires have been run from the power house for the purpose of illuminating the place at night and a number of arc lamps have been placed at frequent intervals throughout the grounds. Florists have been engaged, and at least two acres of land will be laid out in large flower beds. The casino will be enlarged and repaired and an excellent restaurant made

erected, but agrees to submit the successful plans to the city and to the Metropolitan Street Ry., and to use its influence to have the best design accepted. The proposed structure is not to cost over \$5,000. The competition was to have closed February 15th.

FURNACE FOR DRYING SAND.

We are indebted to F. L. Wanklyn, manager of the Montreal Street Railway Co., for the particulars of a sand drying oven that has been erected by his company and which appears to answer admirably the purpose for which it was constructed. It consists of a rectangular brick chamber, about 5 x 10 ft. inside, with a "V" shaped boiler plate bottom, which is placed immediately over the fire-grate. To prevent undue warping and buckling of this plate, it is stiffened with T irons and protected inside by a firebrick arch, in which there are openings at intervals to permit the heated gases to reach the plate. The sand as it dries falls by gravity through openings in the outside of the brick wall into screens, on which it is sifted and prepared for use. The furnace is large enough to permit old waste wood to be used as fuel.

FIRE AT FREDONIA, N. Y.

A serious fire at Fredonia, N. Y., on the morning of January 25th, destroyed, among other property, the electric power house of the Dunkirk & Fredonia Railroad Co., compelling a suspension of the traffic between those points. The loss to the railroad company is estimated at \$60,000; the total loss was reported at \$200,000.

A dividend of 1½ per cent has been declared upon the common stock of the Twin City Rapid Transit Co., of Minneapolis, payable February 15th.

NORTHWESTERN ELECTRICAL ASSOCIATION.

The eighth annual meeting of the Northwestern Electrical Association was held at Milwaukee on January 17th and 18th. The papers presented in addition to the president's address were as follows:

"Modern Development in Alternating-current Series Arc Lamps," by R. Fleming, General Electric Co., Lynn, Mass.

"Fundamental Ideas of Alternating Currents," by Professor Dugald C. Jackson, University of Wisconsin, Madison, Wis.

"Central-station Heating in Connection with Electric-lighting Plants," by W. H. Schott, Chicago.

"Central-station Economics," by H. W. Frund, Vincennes Electric Light and Power Co., Vincennes, Ind.

"The Polyphase Induction Motor," by Ralph D. Mershon, Westinghouse Electric and Manufacturing Co., New York.

"Relative Efficiency and Desirability of Various Types of Engines in Central-station Loads," by Prof. A. W. Richter, University of Wisconsin, Madison.

"A Life Test of Incandescent Lamps," by Prof. George D. Shephardson, University of Minnesota.

"A Canadian Plant," by L. G. Van Ness, Quebec.

Officers were chosen as follows: President, Pliny Norcross, Janesville, Wis.; vice-presidents, H. W. Frund, Vincennes, Ind., and H. J. Gille, St. Paul, Minn.; secretary and treasurer, Thomas R. Mercin, Milwaukee; directors, W. H. Schott, Chicago; G. D. Westover, Cadillac, Mich.; Mr. Innes, Eagle Grove, Ia.

It was decided to hold the summer meeting of the association at Waupaca, Wis., which lovely spot one of its friends described as "the center of the world, bounded on the east by the rising sun, on the west by eternity, and on the north and south by woods."

NEW JERSEY GRADE CROSSING DECISION.

In New Jersey the conditions under which a new railroad, electric or steam, may cross the track of an older road are very largely in the discretion of the chancellor of the state, who is charged with the duty of protecting the public and equitably apportioning costs between the two companies. Last month the vice-chancellor rendered a decision which will require the West Jersey Traction Co. (which is controlled by the Camden & Suburban Ry.) to tunnel under the tracks of the Pennsylvania R. R. at Haddonfield, the estimated cost of the crossing being nearly \$13,000. The traffic of the steam road over this crossing is 72 regular and often as many as 30 special trains daily in the summer season. In his opinion the vice-chancellor said concerning grade crossings in general:

"It cannot be denied that there is an element of danger in every grade crossing of a steam railroad. If all persons were constantly vigilant danger would disappear or be reduced to an infinitesimal proportion. So long, however, as men are careless, as they always will be, the instances of collision on grade crossings will engage the attention of courts and create the wish that grade crossings may be abolished."

A NEW PROPOSITION.

We have had tunnel roads operating entirely underground, conduit systems and surface contact systems, but here is a new one. Andrew McGill, of Dunedin, New Zealand, has invented a system in which half of the car is underground and half above. It is proposed to construct a conduit of sufficient capacity to receive the truck and running-gear of an electric or cable car. Attached to the truck and passing up through the slot, are thin wide bars, of sufficient cross section, to support the body of the car. Special provision is made to facilitate passage around curves.

A committee appointed by the Franklin Institute to investigate the invention reports that in its opinion, "the disadvantages of inaccessibility to the truck mechanism, especially in the case of electric railways where prompt access to the motors and their connections is of the highest importance, would more than offset the advantages claimed for the system." We think they would.

The Chicago & Northwestern Ry. has reduced the fare from Milwaukee to Waukesha to 60 cents in order to meet the competition of the electric railway running to that town.

HANDLING FREIGHT ON THE ISLE OF MAN TRAMWAYS.

The Isle of Man Tramways Co., in addition to its regular passenger traffic, has developed an extensive freight and heavy goods haulage business, the receipts from which form a considerable part of the road's net income. To handle this traffic with the least expense and with the smallest possible interruption to the ordinary service, three Bonner rail wagons, made by the Bonner Rail Wagon



TRAIN OF BONNER RAIL WAGONS.

Co., of Toledo, O., have been acquired and are in daily operation with very satisfactory results. The Isle of Man Tramway is about 25 miles long, with a number of severe grades, some as steep as 1 in 58, and numerous sharp curves, the conditions under which the wagons are used being unusually hard in this respect.

The Bonner rail wagon is more or less familiar in the United States. It is in successful operation at Toledo, O., at Detroit, Mich., and at other points and has satisfactorily demonstrated its usefulness in the hauling of heavy goods, as stone and ores, farm products and general merchandise. As the adaptability of the electric railway to the carrying of this class of freight becomes more widely



VIEW AT DHOON GLENS STATION.

recognized, these wagons will undoubtedly come into more general use.

In the Isle of Man, a large part of the freight business consists of hauling granite from quarries owned by the tramway company

to the shipping dock. This was formerly carried on by one-horse, two-wheeled carts of 1,700 lb. capacity, which hauled the stone a long distance to the railway, when it was unloaded from the carts, and loaded into the cars. On reaching the coast it had to again be loaded into carts and taken to the docks. With the present system the stone is loaded into Bonner wagons at the quarries, drawn by a two-horse team to the street railway tracks, and without unloading, the wagons are attached to a motor car in trains, of two or three and taken directly to the nearest point to the docks, where horses are again hitched on, and the wagons driven to the side of the ships. The saving in time, convenience and expense over the old way is evident.

The wagons are very strongly built and otherwise but little different from the ordinary road vehicles. The bodies are 13 ft. long, 6 ft. wide and 2 ft. 6 in. deep, and are capable of carrying from 4 to 6 tons. The four sides are hinged, and can be lowered, so that they can be loaded with facility. The bodies are mounted on four strong, wide-tired wheels. When it is desired to go by rail the wagon is drawn by horses on to four specially constructed, inclined planes, which are placed two on each side of the rails, and which raise the wagon to the required height. These planes are



UNLOADING TRAIN AT RAMSEY STATION, ISLE OF MAN.

shown in one of the accompanying illustrations. A low bogie truck of the same gage as the tracks and consisting of a stout and well braced frame carried upon two axles is run under the wagon, and fastened thereto by means of cast iron stops, which are raised to receive the axles of the wagon, by small hand levers. The bogie truck is then coupled to the motor car and taken to any desired point on the line. In removing the wagon from the truck, the former operation is, of course, simply reversed. The bogie is stopped over the inclined planes, the engaging stops lowered, and the wagon drawn off by horses.

ACCIDENT AT UTICA, N. Y.

At 10 p. m. on January 19th there was a head-on collision between a work car and a regular car of the Belt Line Street Railroad Co., Utica, N. Y., which resulted in the death of one person and slight injuries to seven others. The work car was returning from Oriskany, where it had been summoned to extricate a horse from a bridge, and a dense fog prevented the lights of the regular car being seen in time to avoid the collision.

The platform of the work car being some inches higher than that of the other and strongly built, it cut through the vestibule of the passenger car and into the body. The motorman of the passenger car had both legs cut off and died from the injuries received.

A general order issued by Superintendent W. P. Read, of the Salt Lake City (Utah) R. R., requests all the employes of the system to undergo vaccination.

NO STRIKE AT LOUISVILLE.

The employes of the Louisville Railway Co. began the new year with threats of a strike unless certain demands should be granted. These demands were recognition of the union, an increase in wages from 16½ to 20 cents per hour, the right to arbitrate cases of the removal of employes for various offenses, and the right to buy uniforms in the open market.

January 17th the company made its answer, which was a refusal to recognize the union or make any agreement as to arbitration. Concerning uniforms, it was pointed out that the demand was misleading, as all the company requires is that all the men shall get uniforms from the same firm, which is chosen at suitable intervals by a committee of the employes. The prices now paid are \$12.35 for winter and \$9.50 for summer uniforms.

As to wages, the company announced it could not pay the 20 cents asked, but that it would on February 1st put the following schedule in effect, having decided upon the increase before the demands were made by the men: For motormen, 16 cents per hour for the first 100 days, 17 cents per hour for the next 265 days, 17½ cents after the first year's service. For conductors, 17 cents per hour

for the first year, 17½ cents per hour thereafter. Other employes, an increase of 5 per cent.

This was considered satisfactory, and on January 24th the men decided not to strike.

DANGER IN POLITENESS.

A returned traveler has given the public a rather amusing account of how his ideas of courtesy towards women passengers and the rules of the street railway company failed to mix satisfactorily in Hamburg. The European street car is full when a given number of passengers are on board and the law strictly forbids the conductor from making room "for one more," as is the accepted rule in this country.

Sometimes, while the conductor is in front collecting fares, a lady will step on the car, which is already "occupied." As there is no conductor on hand to prevent her, the lady steps inside, and the gentleman who may offer her a seat comes out and takes his stand on the platform. When the conductor, after going his rounds, returns to his post, he promptly requests the gentleman to step off the car, as he has forfeited his seat, and the car is fully "occupied." Should he refuse to leave the car he is put off. The policemen on the streets are instructed to watch the cars sharply, and if they find a car carries even one more passenger than its proper complement the conductor is fined 72 cents.

The extension of the Fond du Lac (Wis.) Street Ry. to North Fond du Lac was formally opened January 20th.

THE STREET RAILWAYS OF PENNSYLVANIA.

That section of the annual report of the Secretary of Internal Affairs of the Commonwealth of Pennsylvania for the year ending June 30, 1899, which contains the report of Maj. I. B. Brown, superintendent of the Bureau of Railroads, gives an interesting resume of the street railway situation in that state, from which we take the following extracts:

The street railways of Pennsylvania have been in a process of financial change to a greater degree than perhaps any other class of corporations that have existed under the laws of the commonwealth. The number of charters taken out, especially since the introduction of electricity as a motive power, has been remarkably large, and yet there are comparatively few lines being operated under these chartered rights. In many cases the charters have died through non-usage, or the powers and rights conferred by the granting of such charters have been merged into other similar corporations.

So far as the public is concerned in the growth of street railway interests in the state, there can be but one opinion expressed, and that is that the means of local transportation have been greatly improved and the cost to the passenger has been greatly reduced on account of the centralization of managements in the development of these interests.

From the returns received it appears that of the 324 street railway corporations making reports, 90 are operating companies, 71 are subsidiary companies and 163 are corporations whose lines were not so far constructed as to be in whole or in part in operation at the close of the fiscal year, to wit, June 30th. In addition to these, there are 56 street railway corporations, whose capital stock, rights and franchises have been acquired by operating companies, and whose reports are included in the statements made by such operating companies.

The total capital stock outstanding of operating companies is \$103,122,319; funded debt outstanding, \$31,309,425; total current liabilities, \$13,139,149; total capitalization and liabilities, \$147,570,893. Compared with the year ending June 30, 1898, the capital stock for 1899 shows an increase of \$2,212,984; the funded debt a decrease of \$1,131,425.

Of the \$103,122,319 capital stock outstanding, six companies, i. e., the Consolidated, of Pittsburg, the Pennsylvania Traction, the Union Traction, of Philadelphia, the United Traction, of Pittsburg, the West End Traction, of Pittsburg, and the Wilkes-Barre & Wyoming Valley Traction, together have \$73,909,380, or 71 per cent of the total.

In addition to the capitalization reported by operating companies, there is reported by subsidiary or lesser companies capital stock outstanding of \$53,407,639; funded and unfunded indebtedness of \$41,649,487; which, added to the total capitalization of operating companies, \$147,570,893, makes a total capitalization of operating and subsidiary companies of \$242,628,019. In considering this total, however, it must be taken into account that there is some duplication, as many of the corporations have purchased the stock of subsidiary companies out of the capital which has been secured by the disposal of their own stocks.

The total cost of road and equipment as reported by all companies is \$197,161,214.

The operating companies report as receipts from operation, \$21,046,808; from other sources, \$922,448; total receipts, \$22,569,256. The total receipts from operating companies for the previous year was \$19,745,706. The volume of business done by street railways in the state has, therefore, greatly increased, but not in proportion to the increase of business in other enterprises, as, for instance, the business done by steel and iron companies.

From the total receipts from operations, \$10,519,810 was paid in operating expenses, or substantially 46 per cent. The amount of taxes paid was \$1,314,470; interest on funded debt, \$2,257,765; rentals, \$6,237,691; other expenses, \$279,453; dividends paid, \$1,179,474; total, including dividends, \$21,788,663. The surplus for the year is therefore \$780,593. In addition to the dividends paid by the operating companies, there has been paid as dividends by the subsidiary companies the amount of \$7,954,173, or a total, with the dividends paid by the operating companies, of \$9,133,647. This, however, if considered as a disbursement, produces a duplication, as the amount of dividends paid by subsidiary companies is largely

derived from the \$6,237,691 received by subsidiary companies in the way of rentals from operating companies.

The total mileage of street railways operated in the state given at 1,812.94; in 1898 it was 1,708.32. The total number of cars owned is 5,804; in 1898 the number was 5,616. The total number of employes for 1899 was 12,506; the previous year the number was 12,680. The total compensation of employes in 1899 was \$6,569,004; in 1898 it was \$6,542,840. The number of passengers carried in 1899 was 473,313,258; in 1898 the number was 432,770,314, an increase of 49,533,944.

The total number of passengers killed during the year was 17; injured, 484; the total number of employes killed was 3; injured, 139; the total number of other persons than passengers and employes killed was 77; injured, 504; or a total of fatal casualties of 97, and of non fatal, 1,127. For the previous year the number of passengers killed was 15, injured 506; employes killed, 11; injured, 86; other persons killed, 89; injured, 409; total killed, 106; injured, 1,001.

In the report for the year ending June 30, 1898, as well as that for the year ending June 30, 1897, an account was given of observations made on the use of bicycles, or, more particularly, of the number of persons who passed a given point on Third St., in the city of Harrisburg, on wheels and of those who patronized the cars of the Harrisburg Traction Co. In the investigation for the year 1897 it was found that the number of persons passing the given point during the given twenty-four hours, both on wheels and in cars, was 6,078. Of this number, 1,962 were on the cars and 4,116 were on wheels. That is, 67.7 per cent were on bicycles and 32.3 per cent on the cars. In the report for 1898 the number of persons passing the same point on a certain day was given as 5,819. Of this number, 3,449 were on wheels and 2,370 in cars, or a percentage of 59.3 on wheels and 40.7 on the cars. In the investigation made for the 1899 report, during the same length of time and on a day when the conditions for traveling were substantially the same as on the days selected for the observations of the two previous years, the total number of persons passing on wheels was 3,784, in cars, 2,941, or a total of 6,725, the percentage on wheels being 56.27, and on cars, 43.73.

There is evidence in these figures to indicate that while the wheel is still in constant use by a large number of people, yet the percentage of those who ride on wheels as compared with those who ride in cars has considerably decreased during the period covered by these observations. A feature of the observations made for the 1899 report is the counting of the number of pedestrians who passed a given point during the same hours that the observations were made of those riding on cars or on wheels. The total number of such pedestrians was found to be 13,066, or 6,341 more than the combined number on wheels and in cars. From the above figures it will be seen that the total number of pedestrians, bicyclists and passengers on cars is 19,791, of which 66.02 per cent were pedestrians, 19.12 per cent on wheels and 14.86 per cent in cars.

The report adds: "These observations probably are not of much weight, and yet they present a problem for all street railway companies to solve, and that is to make it advantageous for this large number of pedestrians to ride in the cars, rather than walk."

NO PAYMENTS BY UNION LOOP, CHICAGO.

When the Chicago Union Elevated Railroad Co. was granted a franchise to build the Union Loop, the mayor would not sign the ordinance until the company agreed to pay the city a portion of its gross receipts in excess of \$2,500,000, increasing from 5 per cent for the first five years to 25 per cent for the last 15 years. One of the provisions of the original ordinance was that private passages might be built from buildings to the loop, but after a few such passages had been erected the city refused to permit any new ones. On this ground the company considered itself released from the contract, and the present city administration has decided to make no attempt to compel the payments by the company.

The Toledo (O.) Traction Co.'s employes' band has tendered its services to the Playground Association, a charitable institution of the city. The band recently gave the sixth of a series of concerts that have been very much appreciated by the people of Toledo.

GRADE CROSSINGS.

Read before the Engineers' Club of Cleveland by Augustus Mordecai, and published in the "Journal of the Association of Engineering Societies."

In the discussion of the question of eliminating grade crossings of highways with railroads we must be careful to avoid prejudice. It is hard to overcome the natural impulse to make the corporation bear as much of the burden as possible, whether it is right or wrong to do so. "The corporation can afford it," we say. It is hard even for an employe to divest himself of this feeling, and still more so for one not so employed. Often we notice an employe throwing away as worthless a bolt, for example, that has lost a nut; but if the bolt belongs to his bicycle, how carefully he preserves it for future use.

Even to the most wealthy, the expenditure of millions of dollars must be a matter of careful and judicious thought, not lightly to be entered into.

Let us see what are the rights of the parties, the public and the railroads, in the highway. They are equal as far as occupancy is concerned, and both can go their ways, provided that in so doing neither interferences unreasonably with the other. All are obliged to use caution in the use of the common highway. The individual must be careful he does not take any unnecessary chances in crossing the tracks of the railroad. The electric company, if there is one, must see that its conductor knows that the way is clear before he allows its car to cross; and the railroad company must, by watchmen and gates, or by bell and whistle, warn the public, and use every precaution to have the way clear before its train crosses the highway. Neither of the parties must obstruct the crossing for an unreasonable length of time, consequently all would be benefited equally by the elimination of the grade crossing if it were not for certain conditions not common to both. By the abolition of the grade crossing the public saves time, annoyance due to delays or to precautions necessary for the prevention of accident, and damage caused by the accident itself. A very large proportion of accidents (judging from the records of the Erie R. R., as high as 60 per cent) is due to the contributory negligence of the individual. The street car company saves time—not a large item, as the men are paid by the trip—and the liability of accident, which is a much more important consideration with them than with the steam railroad, as its car is weaker and the passenger much more liable to injury. The steam railroad saves the expense incident to watching the crossing, an expense which legally, but perhaps not justly, it is forced exclusively to bear; the time which would be lost in taking precaution against accident (a larger item than in the case of an electric railroad, as the steam road generally has many highways to cross) and the liability of injury in case of accident, which, as shown, is lower in the case of the steam railroad than with the electric road or with the public. The laws of New York make it obligatory on the part of the parties interested to abolish the crossing if the Board of Railroad Commissioners says it should be abolished; the railroad company paying one-half, the city or village one quarter and the state one-quarter of the cost. In Ohio, if the railroad company and the municipal authorities agree that the crossing may be abolished, not more than 35 per cent of the cost is paid by the municipality, and not less than 65 per cent by the railroad company. This is certainly not burdensome on the municipality, especially when we remember that the railroad company, being a large taxpayer, eventually pays no mean proportion of the 35 per cent charged to the municipality.

In the design for the work, if the railroad is put under the highway, there should be not less than 18 ft. headroom and 2 ft. for floor of bridge. In Ohio there is a statute obliging an obstruction over a railroad track to be at least 21 ft. above the top of rail, but I think this should be amended so as to give the Railroad Commissioner some discretion in the matter. Out on the open road, where trains run fast, and in the days before the nearly universal use of air brakes had greatly diminished the brakeman's duties in running from one car to another to set the brake, it might have been proper to require such headroom; but in these days and in cities, where there is slow movement and where the locomotives and cars are equipped with air brakes, it does not seem necessary in all cases; and in fact other cities are adopting less headroom, and the Erie R. R. has been running for years in this city under

bridges of very much less headroom, properly protected, without accident. I think the headroom should not be less than 18 ft., however; first to allow for the future probable increase in height of locomotives and cars which are constantly growing higher and higher, and also to allow a brakeman if he is on top of a car, to sit down without being struck. If it were impressed on him that he could not stand, but might sit down, on going through a city, the liability to accident would be much reduced.

If the highway is put under the railroad there should be at least 13 ft. headroom allowed, with 2 ft. for floor of bridge at highways where there is or may be an electric railroad, and 12 ft., with 2 ft. for floor of bridge, at highways where no electric railway is likely to be built. This will not allow the use of a double-decked electric car, but I think it is not unreasonable to make this restriction. In fact, it must be remembered that the placing of the highway under the railroad immediately restricts materially the height of the vehicle and its load that can pass under the bridge, a restriction that, except for the trolley wires, which I hope are but temporary, is not encountered in any other part of the highway. The gorgeous band-wagon of the circus, for instance, or the floats of an industrial parade will have to take another route, whereas the railroad equipment is restricted just as much by other things, such as the heights of the top bracing on bridges or the cross-section of the tunnels, etc. This is one of the strong arguments in favor of placing the highways above the railroad.

The width of the highway should not be restricted unless under exceptional circumstances. It is true that London bridge, with its enormous traffic, is but 56 ft. wide, and that Chestnut St. bridge, in Philadelphia, is but 40 ft. wide; yet room seems to be necessary in this bustling life of ours, and the people are entitled to it. The grades on the highway approaches should be not more than 5 per cent. This is the grade used in Chicago, and many cities have steeper natural ones; certainly Cleveland has. I mention Chestnut St. bridge because it is on one of the main thoroughfares between populations nearly twice as large as in Cleveland, and carries two street railroad tracks.

Nor should the width of the railroad be curtailed. It is hard to foresee what conditions may arise, and allowance must be made for future growth. If a highway becomes congested there are other highways, but to obtain other railroad tracks is another matter; always expensive, often impossible. The grades on the railroad should not be changed to make them a burden at the time or in the event of any possible future improvement to the railroad property, and for this reason great care must be taken in raising the elevation of the railroad tracks or in increasing their grade, as such change might involve a very serious burden on the property. There may be very little, if any, reserve power in a locomotive. It is usually loaded to its capacity; whereas, in the individual and electric car, within certain limits, there is ample reserve power, and the same is true of most horses. The railroad is an essential and admirable instrument in the growth and development of a city. It is a tool not to be abused and knocked about, but, like all other good tools, to be handled somewhat affectionately; to be kept always neat and clean and in through working order.

Other things being equal, it is certainly lighter, pleasanter, in every way better, to raise the highway. This may or may not involve the depression of the railroad tracks. If the tracks can remain as they are, well and good. In that case we have only to see that the structure and its supports are so constructed that they shall not interfere with the railroad and its operation; and, although the railroad authorities are seemingly actuated by selfish motives, it is pretty safe to conclude that they are fairly good guides to follow in these and in similar cases. If the tracks must be raised or lowered in order to avoid steep approaches or excessive property damage, it may be wise to lower them, the depth depending on circumstances. Through the residence district of a great city it may be well to lower the tracks the full distance required. An elevated track is an eyesore, noisy, extremely ugly and altogether horrid. Through the manufacturing districts of the same city it is better to elevate them, other things being equal; or, at most, to depress them but a few feet, so that existing manufactories can meet the changed conditions without excessive expenditure, and that adjoining unimproved property owners may not be deprived of the use of their property for the best purpose to which it can be put, as might be the case if the railroad tracks were depressed

the full distance required. It is also true that, especially with railroad tracks, it is much easier and cheaper to raise them than to depress them.

The difficulties incident to the location of sewers, water mains, etc., in the depression of the tracks have no terrors for the engineer who is familiar with the work done by the cable car company in New York City, or with that proposed to be done by the Rapid Transit Co.

The question of damage to abutting property on the highway is always comparatively an important one where conditions are changed ever so slightly, and is always very thoroughly considered in cases of this kind; but it should not be given undue importance. Granted an equitable division, the cost is a secondary consideration, as the work is for all time and should be done in the best manner. Then again, the damage is only the cost of changing the buildings and other improvements to meet the changed conditions. The value of the land itself is rarely changed, for that depends upon the ease of access to and from a more or less crowded thoroughfare. For instance, the most valuable land in the world is at the intersection of Fleet St. and the Strand in London, because of the crowds passing it. The corner of Broad and Wall St., in New York, is possibly equally valuable, and especially in a raised highway this condition is not changed. What, then, is the damage to the improvements? If, for instance, all the buildings at the corner of Euclid and Willson Aves. and 200 ft. each side were wiped out by fire in a night, the most sensational report would not put the loss on the buildings alone at any enormous figure. The insurance companies would certainly pay much less, and I do not doubt that the owners' sworn estimates of their value made to the tax assessor would show a very much further reduction from the amount the insurance companies would be called upon to pay; and again, the buildings in the aggregate would be damaged much less than half their value. Looked at in this way, the damage is reduced to a less formidable proposition. The trouble consists in arousing the antagonism of the owners themselves, who generally, and by the very nature of things, are men of influence and standing, and of much more power in the community than is the intangible stockholder of the railroad company, for instance; so that it is easy for them to obtain excessive judgments, especially when municipalities and corporations are to pay them. The process of awarding damages is human, therefore fallible. It might be better to appoint one or a few good men as commissioners to award them in place of the ordinary jury, as has been done in New York; but this may seem arbitrary to many accustomed to the old way.

In the actual performance of the work, that party who is in position to do any part of it best and most cheaply should do it. The municipality should settle the damages with abutting owners; and, as it can borrow money more cheaply than can the railroad companies, it might, if desired, lend its credit to the latter under well-considered conditions. The railroad companies might build part or the whole of the structure. The general principles being agreed upon, the details can easily be arranged.

As far as the maintenance is concerned, each party should maintain that part worn or used by it exclusively, and those parts where failure would render it liable in damages to others; where several parties use the same part, or where several would be liable, the expense should be divided proportionately.

This paper is of interest at this time by reason of the fact that the city of Cleveland is desirous of abolishing railroad grade crossings over the streets used by street railways, but seeks to have the street railways bear the city's share of the cost, 35 per cent.

Storage battery automobile busses may make regular trips in Denver, Col., in competition with the street railway lines, as it is announced that a company is soon to be incorporated for that purpose.

It is said the first Bessemer rails ever made were rolled in 1856, and analysis shows they contained the following: Carbon, 0.08 per cent; silicon, traces; sulphur, 0.162 per cent; phosphorus, 0.428 per cent; arsenic, traces; manganese, traces; iron, 99.33 per cent. Owing to the effects of the sulphur and phosphorus, the rails were not satisfactory and their manufacture was abandoned and not resumed till 1864.

EWING SINGLE-RAIL TRAMWAY.

The accompanying illustrations are reproduced from an article in the Electrical Review, of London, descriptive of a single-rail tramway invented by Charles Ewing, C. E., of Adyar, Madras. This system was the subject of a paper before the United Service Institution of India by Lt. Col. F. F. R. Burgess, who said in part:

"On a level road one pair of bullocks can, on a single line, draw a train of trucks, carrying a net load of from six to seven tons, a distance of 15 miles in a day with ease; it requires from 16 to 18



TRUCKS TO CARRY 3½ TONS EACH.

pairs of bullocks to draw this load in ordinary carts carrying the military regulation 800 lb. load.

"The trucks run on a single line of rail laid on the ground or roadway and are mounted on two or three double-flanged wheels placed under their center. These wheels are of small diameter, varying from 15 to 30 in., according to the size and weight of the trucks and rails, the flanges being twice as far apart as the width of the rail on which the wheels run.

"The whole weight of the truck is thus borne on two or three double flanged wheels which run on the single rail, so that, unless it were supported in some way, it must fall over. The necessary support is afforded by a lightly constructed iron 'balance' wheel of comparatively large diameter, from 4 to 5 ft., with a 4-in. wide tire, placed at the side of the truck.

"This balance wheel runs on the surface of the ground or roadway about 4½ or 5 ft. away from the rail. It runs on an axle



TRAIN LOADED.

which is pivoted at right angles to the center of the truck and is kept in position by a horn plate fixed to the frame of the truck. The axle is also furnished with a double helical spring which eases the jolting of the balance wheel when going over any inequalities. The platform of the truck, which carries the load, extends to an equal distance on each side of the central line of the truck over the rail and flanged wheels, and the load would usually be evenly distributed on it, but should it not be so, there would be no risk of the

truck upsetting, as the balance wheel provides for an excess of several hundredweight."

The rails used vary with the loads it is desired to haul. Colonel Burgess mentions one with 22 miles of track which has rails weighing 14 lb. per yd., it being designed for loads of three-quarter ton per wheel. The rails may be laid along the edge of the roadway except at bridges, where they would have to be carried out far enough to permit the carts to clear the sides.

Our contemporary suggests that electricity could readily be adapted as the motive power for such a system, and furnish a cheap equipment for light work.

In a letter to the Electrical Review the inventor states that patents were secured on the system in many countries in 1895. He also states that as early as 1881 he exhibited a single-rail tramway worked on the same principle as that of the system patented by M. Cailletet (see St. Ry. Rev., Mar. 1897, p. 169). In this system the draft animal was harnessed at the side of the car and it was abandoned by Mr. Ewing because of the width of road occupied, the fact that the animal was necessary to balance the car, and that one team could not draw a train of cars. The cheapest motive power suggested by Mr. Ewing is that of a traction engine running on the roadway and drawing a train of these cars.

REPORT OF CHICAGO CITY RY.

The annual meeting of the Chicago City Railway Co. was held on January 15th, when the following directors were elected: S. W. Allerton, D. G. Hamilton, Joseph Leiter, Arthur Orr, G. T. Smith, W. B. Walker, Otto Young.

The president's report showed the passenger receipts for the year to be \$5,162,665, an increase of \$363,059.27; receipts from other sources were \$31,774.40, making the total \$5,194,439.40 an increase of \$361,633.59.

Operating expenses were \$3,325,677.27, an increase of \$399,186.90. The operating expenses were 64.42 per cent of the passenger receipts and 64.02 per cent of the gross earnings; for 1898 the corresponding figures were 60.97 and 60.55 per cent.

Interest on bonds was \$207,877.50, leaving the net income \$1,660,884.63, which was 13.287 per cent on the capital. Dividends of 12 per cent were declared, leaving a surplus of \$160,887.63.

The car-miles during the year were: Electric (55.1 per cent of the total), 14,517,690, an increase of 1,954,310. Cable (44.5 per cent of the total), 11,741,840, an increase of 63,820. Horse (0.4 per cent of the total), 11,470, a decrease of 32,430. Total, 26,371,000, an increase of 1,985,700, or 8.1 per cent more than last year.

The company now has 160,005 miles of electric track, 34.75 miles of cable and 1,731 miles of horse track. During the year 9,635 miles of new track were built and 21,158 miles rebuilt. It has 195 horses and 1,946 passenger cars.

During the year paving was done as follows:

	Sq. Yd.
Granite	58,671
Cedar blocks	38,573
Brick and asphalt.....	1,113
Granite and asphalt.....	496
Brick	3,192
Total	102,045

The officers elected by the board were: President D. G. Hamilton; vice-presidents, Joseph Leiter and W. B. Walker; secretary, Frank R. Greene; treasurer, T. C. Penington; auditor, C. N. Duffy; general manager, Robert McCulloch.

At the annual meeting the following resigned from the operating staff: George O. Nagle, assistant general manager and superintendent; A. C. Heidelberg, assistant superintendent; C. E. Moore, master mechanic; Frederick Stevens, track master; J. J. O'Keefe, chief supervisor.

Michael O'Brien was appointed master mechanic and H. B. Fleming, track master. Both of these gentlemen were formerly with the National lines of St. Louis.

The city fathers of Kansas City, Mo., are said to be much dissatisfied with the action of the Metropolitan Street Railway Co. in withdrawing annual passes and issuing books of tickets, as announced in our last issue.

ON MUNICIPAL OWNERSHIP.

From the address of President Doherty before the Northwestern Electrical Association.

The agitation about "municipal ownership" seems to be as active as ever; and, to be frank, I think it is increasing rather than diminishing. Without commenting on the motives of many of the leaders, it must be admitted that others of them are sincere and honest in their advocacy of this cause. If this craze is allowed to run its course, popular opinion will, in time, desert it; but, in the meantime, many of our properties will be injured, and the cities adopting it will reap a harvest of disappointment for their failure to give the matter proper consideration.

One of my political friends once wrote me as follows: "They (the people) want it, and I am on record as favoring it. I am no longer so sure I am right, but there are other reforms that I know I am right about. Were I to experience a change of heart on this question, it would remove all chances for my election and would elect my opponent, who knows less about this subject than I, and who has but this one plan in mind. Even should our electrical venture not prove thoroughly successful, I can manipulate other reforms that will more than compensate for this. No matter what my personal views may be, my election will make me their servant, and I can but do as 90 per cent of the people want me to do. Even if I admit that most municipal electrical plants have been failures, it does not follow that ours will also be a failure. I think you will grant that it will be honestly run during my administration." There is a lesson for all of us in this letter. Here is a man that, to my personal knowledge, is as honest as the average man; in fact, even more so. To his mind 90 per cent of the people want a municipal plant; and no sane man would express opposite views to 90 per cent of the people and expect to receive an election at their hands. I fear we are wasting our breath in trying to educate the municipal officers. A majority of them already know that municipal ownership is a rank fallacy, but they are too wise to express views contrary to the people they must look to for re-election. By championing the views of the people—even though they know them to be wrong—offers an easy road to office. We must educate the people.

"You can't fool all the people all the time," and more than one community has awakened to the fact that municipal ownership did not yield what was promised. I challenge any one to cite a single instance where a municipal plant cost no more than was anticipated and yielded all that was promised.

I attended the convention of the League of American Municipalities by invitation from them, as the representative of the Northwestern Electrical Association and the National Electric Light Association. Other representatives and myself contended that municipal ownership had not been a success in the past, and we could not see how they could expect to make it a success in the future. We offered, on behalf of the National Electric Light Association, to bear half the cost of an investigation of 20 municipal electric plants, selected by the president of the league, to determine the true cost of service, for comparison with the rates charged by private plants.

We made this offer in good faith, believing that an investigation would vindicate our position. I regret to state that the league failed to accept our proposition in a manner insuring its execution. Their acceptance on any terms was only secured by a great effort, and their final acceptance was promised conditional upon their ability to provide funds, and, as far as I know, they are making no effort to raise them. I would recommend, if they cannot otherwise be induced to make this effort, that our association solicit subscriptions and notify them that if they will make an earnest effort to solicit funds among the advocates of municipal ownership, we will guarantee them enough more to make the necessary amount of \$2,500. I promise \$100 toward this subscription, and recommend that this matter be placed in the hands of a suitable committee.

Governmental and municipal ownership, if carried to their reasonable ultimatum, would include every form of industry, and the undesirable result of this is too apparent to call for comment. Unconsciously, or otherwise, the advocates of municipal ownership seek to thrust upon us a bad foreign policy, and the best examples they can cite are among those nations that are "traveling toward the night." We have enough municipally operated plants in this

country from which to seek our examples; but these examples fail to strengthen the theory of these people, and they, therefore, seek examples in countries where workmen are practically serfs and their rate of pay is such as to maintain them in an ignorant and dependent state.

America's greatness is not due to imitation or adaptations of foreign policies. Let us think and act for ourselves. Individualism has made us a great and prosperous nation; and even if individualism is open to criticism, let us be sure that paternalism is better before it is adopted, even in the slightest degree.

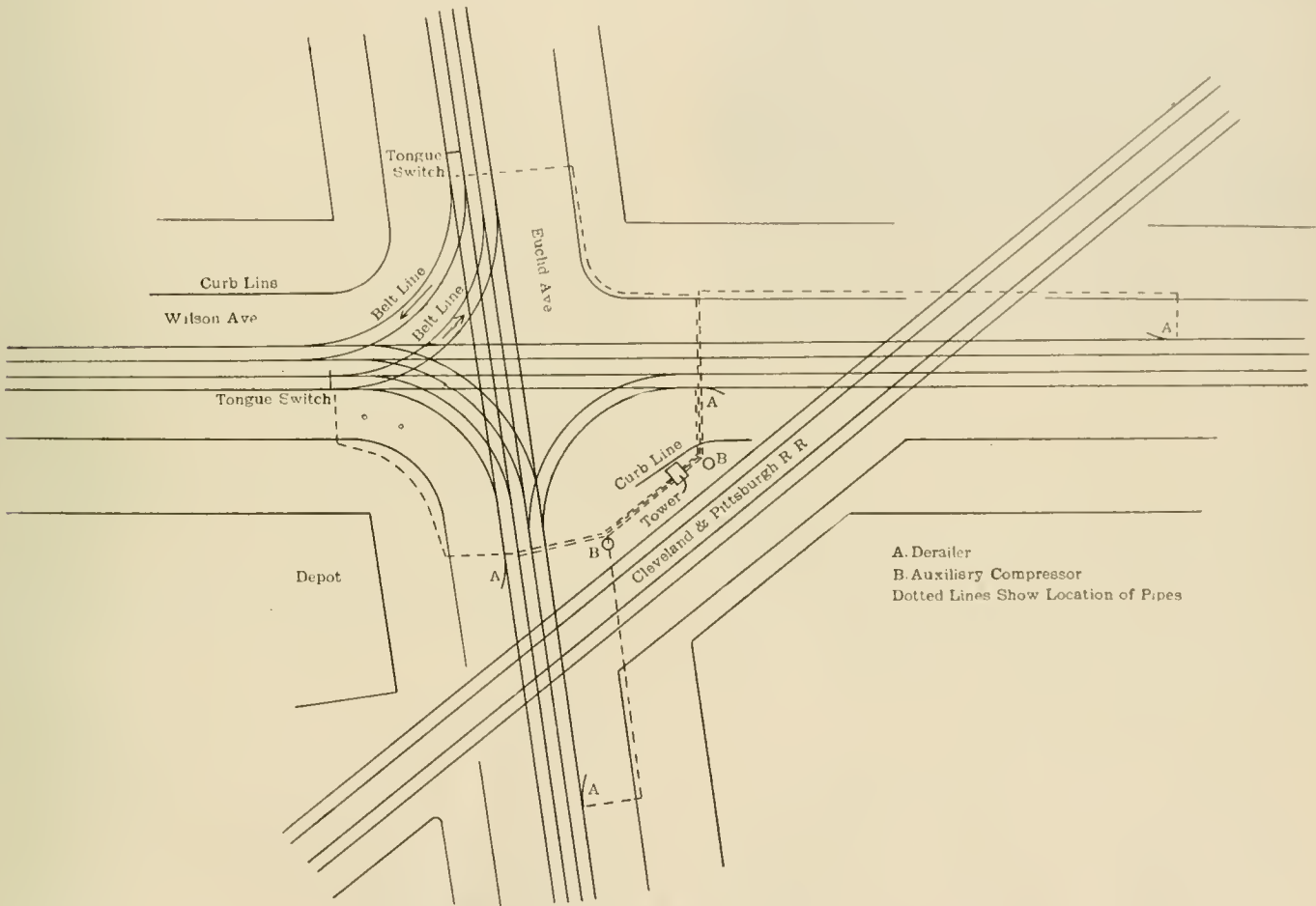
REMOVING SNOW IN WORCESTER, MASS.

A new agreement has been made between the Worcester (Mass.) Consolidated Street Railway Co. and the Worcester city officials as to the portion of the cost of removing snow each party should pay. For the purpose of having a definite basis upon which to

SWITCH TOWER IN CLEVELAND.

The Cleveland Electric Railway Co. has a very complicated crossing at Euclid and Willson Aves., the nature of which is shown in the accompanying diagram. At this point the Euclid and Willson Ave. lines intersect and three different sets of crossovers are laid connecting the Euclid line with the Willson line. In addition the Cleveland & Pittsburgh R. R., which is a part of the Pennsylvania system, diagonally intersects both of these lines a few feet away from the crossing of the two avenues. To more fully protect this point there has recently been erected at the spot marked "tower" in the diagram a three-story switching tower which is shown in the accompanying half tone illustration.

Up to the middle of last summer the safety devices at this place consisted of the regulation gates operated by a gateman in a small tower near the site of the new one. From this were operated the gates on Euclid Ave. alone and another tower and gateman operated the gates on Willson Ave. In addition there was a flagman



MAP OF CROSSING AT WILLSON AND EUCLID AVES., CLEVELAND.

work, the city engineer had prepared a table containing the area of every street in which a street railway track is laid, and also the areas included between the tracks in those streets. From this it was found the area covered by the tracks was about 40 per cent of the total, and an agreement was immediately signed by which the company is to pay 40 per cent and the city the remainder of the cost of removing snow from all streets occupied by rails. In making up the table the width of the adjoining sidewalks was also included as well as the space between curbs, as snow that falls on sidewalks is thrown into the streets and enters largely into the question of snow removal. This method of settling this vexatious question seems entirely fair to both sides.

Orders have been issued by the Board of Railroad Commissioners to the Manhattan Elevated Ry., of New York, directing the latter to extend its structure from 177th St. and Third Ave. to Bedford Park, and from 145th St. to West Farms, a distance of 4½ miles, or forfeit franchises granted for these extensions several years ago.

on the ground to look out for the safety of teams and pedestrians on Euclid Ave. These men were in the employ of the Pennsylvania R. R., and the same policy will be continued, the top story of the tower being for the Pennsylvania's gateman and the lower one for its flagman.

The Cleveland Electric Railway Co. formerly had derails on each side of the track on both streets operated by a lever on a pole set in a position to control a view of the steam railroad in both directions. The street cars were obliged to come to a full stop at the derailing switch and stand while the conductor ran ahead to the pole and set the switch in position by pulling the lever. This not only took valuable time, but it was noticed the people took advantage of the conductor's absence from the car and would get on and crowd in among the other passengers, where it would be next to impossible to find them and get their fare, even if they were observed getting on.

To overcome these difficulties a change was made in the operating device on Euclid Ave. and both levers were put on one pole and a man stationed there to operate them, thus allowing the

conductor to remain on his car. This plan worked so well that it was decided to adopt it permanently and also connect up the derails on Willson Ave. and let one man look after both crossings.

To protect him from rain and cold some kind of a shelter was needed, and an arrangement was entered into with the Pennsylvania company for the present tower. After some investigation it was found that the pneumatic derailing switches could be put in cheaper than the change could be made on the old ones, and, as they were considered better, were adopted. These switches are to be operated from a compressor located in the second story of the tower, except from 11 p. m. to 5 a. m., while the night cars are running, at which time the derail will be thrown by the conductor,



SWITCH TOWER AT WILLSON AND EUCLID AVES., CLEVELAND.

by means of an auxiliary compressor located on the ground on each street.

It will be noticed that the route of the Belt line cars takes them around the southwest corner of Euclid and Willson Aves., the right hand Belt switching off Euclid and the left hand off Willson. Should it be found that one man can manage it, these switches will also be attached to the main compressor and operated from the tower. These various derails operate for 1,340 cars each day.

It will be seen that this improvement saves both time and revenue and also insures greater safety. The arrangement was conceived and put into effect by Mr. R. M. Douglass, the general superintendent of the Cleveland Electric Ry.

DOUBLE SIGNAL GONG FOR CARS.

There is a certain class of accidents whose frequency could undoubtedly be greatly reduced if the conductor had some simple yet positive way of signaling the motorman to stop instantly, and it is a little surprising that some device for this purpose has not been forthcoming before this. As it now is the best way for giving the motorman an emergency signal is by means of three taps of the bell, this method being recommended in the report made in October, 1898, by the Committee on Standard Rules and Regulations for the Guidance and Government of Employes appointed by the American Street Railway Association. In this report under rules for bell signals from conductor to motorman, Rule 4 reads, "Three quick taps of the bell, when car is running, is the signal to stop immediately. This signal should be used to prevent accidents or when trolley is off the wire." But this rule is not entirely satisfactory. It is too complicated for an emergency signal and takes too long to give, especially as the conductor is apt to be laboring under excitement at the moment the signal is most required. Furthermore the code is not usually known to the passengers who may be aware of the impending accident before the conductor, and had they some means of communication at once with the motorman the mishap in a number of cases could be avoided.

The double action signal gong shown herewith is designed to provide a simple and unmistakable signal for an immediate stop

and one that can be operated by the same cord or strap used for the ordinary starting and stopping signal. Fig. 1 is a side view of a gong fitted with the improvement and Fig. 2 is an elevation of the same with the cap of the bell removed. The bell cord is bifurcated at its one end, one of the branches connecting with the regular bell-clapper for producing the usual starting and stopping signal, and the other, which does not come into action until a

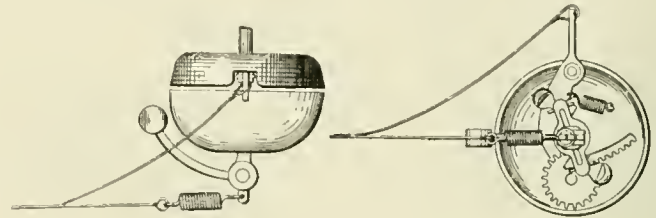


FIG. 1.

FIG. 2.

greatly increased tension is put on the cord, controlling the emergency signal, which in the case shown in Fig. 2 is the well-known ratchet-lever mechanism with meshes and small revolving knockers, that fly out against the bell by centrifugal force and produce a continuous ring. Almost any form of bell-ringing mechanism may be utilized, but the gong should be in two sections, the regularly used clapper acting on the cap and the emergency knocker on the base section.

It will be seen that an ordinary pull on the cord will operate the usual signal only, while an extra hard pull will cause both mechanisms to come into action, giving a combination signal that cannot possibly be misunderstood by the man at the controller. As shown in Fig. 1 a small spiral spring is interposed in the cord to the ordinarily used knocker, necessitating an abnormal pull before the other cord will become taut enough to actuate the ratchet signal. The device is the invention of H. S. Rodgers of 190 E. Second St., Covington, Ky.

SOUTH SIDE ELEVATED, CHICAGO.

In our issue for January, page 49, we gave the average daily traffic by months of the South Side Elevated Ry. for the year 1899. The president's annual report was presented to the stockholders on January 25th and from it we take the following additional data:

EARNINGS.

Passenger	\$1,131,403.70
Other earnings	34,985.42
Miscellaneous	3,991.56
	<hr/>
	\$1,170,380.68

EXPENSES.

Maintenance of way and structure.....	\$ 50,754.53
Maintenance of equipment.....	79,489.50
Conducting transportation.....	297,489.93
General expenses.....	88,471.29
Loop rental and expenses.....	153,727.12
	<hr/>
	\$669,932.37

Net earnings	\$500,448.31
Deduct interest on bonds.....	\$33,750.00
Deduct dividends on capital stock..	306,672.00
	<hr/>
	340,422.00

Surplus for year 1899..... 160,026.31

The ratio of operating expenses to gross earnings by months varied from .499 in October to .599 in June, the average of the figures for the 12 months being .572.

The board of directors was unchanged.

Steam was admitted for the first time to the engines in the power station of the Dayton (O.), Springfield & Urbana Ry. on January 14th, with appropriate ceremonies. Mrs. J. S. Harshman, wife of the president of the company, opened the throttle valve.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

PROTECTION OWED PERSONS LEARNING TO RIDE BICYCLES ON STREETS.

Louisville Railway Co. v. Blaydes (Ky.), 52 S. W. Rep. 960. Oct. 7, 1899.

The evidence showed that the plaintiff in the court below was on a street, trying to ride a wheel, and being unaccustomed to riding, and by reason of a grade in the street, she lost control of the wheel, and ran into another street, and, in trying to turn, the wheels of her vehicle were caught in a street railway track, between the rails and rocks. While in this condition, and without warning of any kind, a car ran over, and seriously injured, her. She sued the street railway company, and obtained a judgment for \$2,500. The company appealed, seeking to obtain a reversal on the ground that it was error to refuse a peremptory instruction to find for it, and that the verdict was flagrantly against the evidence. But the court of appeals of Kentucky affirms the judgment of the lower court.

The street railway company insisted that the plaintiff in the court below was shown, by her own testimony, to have been guilty of such contributory negligence as precluded a recovery of damages. It cannot, however, be held, as a matter of law, the court of appeals maintains, that she was so guilty in being on the streets of the city trying to ride a wheel. But, if it might be said that she was guilty of negligence on this occasion, the court holds, it was the duty of the company to keep a lookout for persons on the track, and to avoid injury to them.

The proof, the court goes on to state, conducted to show that the motorman could have seen this plaintiff in ample time, after she was caught on the track, to have avoided the injury. At least, there was sufficient proof to that effect to go to the jury. The place of injury was a public street. It was the duty of the operator to use the highest degree of care in avoiding injury, after discovering the perilous position of the plaintiff. So the court holds that, if her testimony as to how the accident occurred was true, the company was liable.

CONSTRUCTION OF LIMITATION OF USE OF LAND AND STIPULATION FOR DAMAGES.

Atlanta Consolidated Street Railway Co. v. Jackson (Ga.), 34 S. E. Rep. 184. Aug. 2, 1899.

A deed conveying to a street railroad company the title to the right of way over the land of the grantor contained a recital that the grantee was to run its cars over the right of way a specified number of times during the day, perpetually, and the habendum clause, as it is called, was as follows: "To hold and to have so long as the party of the second part * * * uses the said right of way * * * for all legitimate railroad purposes as herein set forth, and no other." The successor to this company abandoned the right of way, and an action was brought against it for breach of the alleged covenant. Taken to the supreme court of Georgia, the latter, however, holds that the above does not constitute a covenant, but is a conditional limitation, and that the land reverted to the grantor at the same instant when the company abandoned the right of way.

To constitute a covenant running with the land, the supreme court goes on to say, the covenant must have relation to the interest or estate granted, and the act to be done must concern the interest or estate created or conveyed." Hence, when such an habendum clause further provides, as it did in this instance, that "in case the party of the second part or their assigns default in complying with the covenants herein set forth, in whole or in part, all the rights and perquisites thereof shall revert to the party of the first part and his assigns, together with lawful damages as shall be awarded by due process or otherwise," the court holds that the stipulation for damages is not such a covenant running with the land, under the above definition, as would render the successor to the grantee, who purchased at judicial sale, liable for a breach of covenant, although it abandoned the land after its purchase.

WAITING ROOM OBSTRUCTING VIEW NOT A NUISANCE.

Cummins v. Summuduwoot Lodge (Kan.), 58 Pac. Rep. 486. Oct. 6, 1899.

Where a waiting room is erected in the streets of a city by the authority of the council thereof, the court of appeal of Kansas holds, it cannot be abated as a nuisance, on the complaint of an abutting lot owner, for the reason that said building partially obstructs the view of his business house by persons passing over a particular portion of the street.

The plaintiff in the court below was the lodge. The defendant was a party who had entered into an arrangement with a street railway company for the erection of the building complained of, whereby he was to erect said building and maintain a portion thereof as a waiting room for passengers on said railway; said defendant in consideration of the erection and maintenance of said building to also use and occupy the same for the sale of cigars, fruit, newspapers, periodicals, and other similar articles.

In consideration of this case, the court of appeals ignores the fact that a part of the uses for which the building in controversy was erected was of a private nature, and considers it from the standpoint of a waiting room alone. It does this, it says, for the reason that, if the defendant had a right to erect and maintain the building as a waiting room, its erection could not be enjoined, or its removal as a nuisance ordered, although a portion of it was used for other purposes.

That a waiting room at or near the point where this building was located was a public convenience was apparent, and the court of appeals quotes the supreme court of the state as holding that "the city corporation may make every use of a street which reasonably conduces to the public convenience and enjoyment." So the court of appeals thinks that the city had the right to authorize the erection of the building, and did so authorize it by the franchise ordinance providing that "said grantees may construct and maintain at such points along the line of said railway such depots and waiting rooms, with stairways leading thereto, as may be necessary and requisite for the accommodation of the public."

Then, on the nuisance question, it holds as first stated, reversing the judgment of the district court.

NO RIGHT TO RELY UPON PEOPLE GETTING OUT OF WAY AT CROSSINGS.

Towner v. Brooklyn Heights Railroad Co. (N. Y.), 60 N. Y. Supp. 289. Oct. 17, 1899.

The second appellate division of the supreme court of New York declares here that the Hickman case, reported on page 467 of the "Street Railway Review" for July, 1899, 56 N. Y. Supp. 751, was not intended to lay down any new rule of law in negligence cases, and that that decision is not to be extended to cases in which the same circumstances are not present.

This case was similar to that one only in that the plaintiff in this case testified that he looked in both directions before leaving the curb, and that he saw no car or other vehicle approaching, and that he then stepped down, and started across the street, and that he was just leaving the track when he heard the gong of an approaching car, and simultaneously he was struck and thrown a distance of 20 feet, the car running 50 to 75 feet before it was stopped. Then, the court goes on to point out that in the Hickman case the streets did not cross the avenue on which the cars ran, and that the cars had the paramount right to the use of the tracks, while in this case the accident occurred at a street crossing, where the rights of the parties were equal, and where the defendant owed the plaintiff the duty of having its car in control, or at least of giving warning of its approach.

The defendant, in this case, the court goes on to say, had no right to rely upon people getting out of the way of its cars at crossings. It was charged with the duty of operating them with reasonable care, and the plaintiff had a right to rely, in some degree, upon the

discharge of this duty on the part of the defendant. The plaintiff, having looked in both directions before starting to cross, and seeing no car, the court here holds, was justified in walking across the street at a point where the rights of both parties were equal, and in assuming that a car running at a rate of speed calculated to make the crossing dangerous would give some notice of its approach, or that it would be in the control of the motorman sufficiently to prevent his being run down.

And, declaring that there was certainly nothing in the Hickman case which justified the conclusion that the plaintiff in this case was guilty of contributory negligence as a matter of law, the court holds that it was error to dismiss the complaint, and grants a new trial, after also stating that there was evidence in the case from which the jury might reach the conclusion that the defendant was guilty of negligence, and that the plaintiff was free from negligence contributing to the accident.

CASE OF CAR STARTING AND COLLIDING WITH TRAIN REVERSED FOR INADEQUATE CHARGE AS TO DAMAGES OF PERSON INJURED.

Todd v. Second Avenue Traction Co. (Pa.), 44 Atl. Rep. 337. Oct. 6, 1899.

The plaintiff alleged that while standing in the rear car of a railroad train he was injured by being thrown against the radiator or stove through a street car which had been standing about 20 feet from the railroad crossing starting suddenly forward, breaking through the safety gate, and colliding with said rear car.

Of course, says the supreme court of Pennsylvania, it devolved on the plaintiff to establish by competent evidence the negligence he imputed to the street railway company, and, failing in this, he could not maintain an action against it for damages. He obtained a judgment in the court of common pleas. But it was difficult to determine from the evidence whether the starting of the car was caused by improper management of the company's employes in charge of it, or by defects in the machinery discoverable by them, or, if discoverable, not within their power to remedy or control. However, it was too clear for argument that the employes charged with the operation of the car did not intend to start it while the safety gates were down and a train was on the crossing, and that they exercised their best skill and judgment in the discharge of their duty as they understood it.

Under these circumstances, the supreme court discovers no substantial ground for complaint or criticism in a charge to the jury that it was the duty of the street railway company "to furnish reasonably skilled and competent men to operate the cars and the machinery and appliances," and in the judge saying, in immediate connection therewith, "That is just where the plaintiff claims the defendant failed in its duty." And it holds that certainly the instruction that it was for the jury to determine whether the defendant exercised proper care under the circumstances was unobjectionable.

But the court reverses the judgment rendered in the plaintiff's favor, because, in view of the evidence, and the circumstances surrounding it, it considers inadequate, and especially so in that part of it relating to the plaintiff's loss of earning power, a charge relating to the measure of damages which was exceedingly brief and nothing more than a perfunctory specification of the items constituting the damage claimed as the result of the negligence attributed to the defendant. These items consisted of expenses incurred as a consequence of the injury received, the inconvenience and suffering naturally resulting from it, and the abridgement or loss of earning power, whether temporary or permanent, consequent upon the character of the injury. No reference to or explanation of the evidence or law applicable to either item was made. Thus, the jury was left without such aid or guidance to a conclusion, the supreme court thinks, as it was fairly entitled to.

LEASING OF ROADS TO MOTOR POWER COMPANIES.

Pinkerton v. Pennsylvania Traction Co. (Pa.), 44 Atl. Rep. 284. Oct. 6, 1899.

By a clause in the Pennsylvania act of March 22, 1887, motor power companies are authorized "to lease the property and franchises of passenger railway companies which they may desire to operate, and to operate such railways." The title of the act is "An

act to provide for the incorporation and regulation of motor power companies for operating passenger railways by cables, electrical or other means." It was argued that the clause mentioned was unconstitutional, because it contained a subject not indicated in the title, to wit, the lease of their roads by passenger railway companies. But this objection to the constitutionality of the clause in question the supreme court of Pennsylvania pronounces wholly untenable.

The supreme court says that as the very object of the incorporation of the motor power companies indicated by this title was to operate passenger railways, they must have some means of obtaining such railways to operate. It was clearly not intended that they should build, nor necessarily to buy, for in either case they would become not merely operators, but passenger railway companies themselves. The most obvious, if not the only other, way in which they could operate roads was to lease them. The title of the act gave notice that they were incorporated with power to operate passenger railways, and an obvious way to do so was by lease of already existing roads.

Nor does the court consider that there was any weight in the objection that the passenger railways had no power to lease their roads. The power to take leases is expressly given to the motor companies, and the corresponding power in the passenger railway companies, as owners, to give leases, is necessarily implied. Without it the grant in the act would be nugatory.

The objection that the powers of passenger railways cannot be indirectly enlarged, the court holds, is answered by the established principle that the constitutional mandate as to revival, amendment, extension, etc., of acts by re-enactment at length applies only to express amendments, etc., and does not affect those which are merely incidental to the passage of other acts, complete and valid in themselves.

The Pennsylvania act of May 14, 1889, contains no express prohibition of the power to lease, and as such power was already granted by necessary implication, so far as concerns motor power companies as lessees, under the act of 1887, the court holds that the later act cannot be construed as an implied repeal of a power already existing, and not necessarily inconsistent with the act's own purpose.

Last of all, the court declares itself of the opinion that the settled principles of law and the decided weight of authority are in favor of the rule that, where a lease is duly authorized by law, as under the act of 1887, there is no further liability of the lessor for negligence of the lessee in the operation of the road.

WHEN MANDAMUS CANNOT BE USED TO GET CROSSING BEFORE APPEAL IS HEARD IN CONDEMNATION CASE.

State ex rel. Oshkosh, Algoma & Black Wolf Railroad Co. v. Burrell, circuit judge (Wis.), 80 N. W. Rep. 460. Oct. 20, 1899.

This was a mandamus action brought in the supreme court of Wisconsin to compel a judge of the circuit court to enter an order directing a writ of assistance to be issued to put the relator, a railway company incorporated for the purpose of carrying persons only, and endeavoring to condemn a right of way for a trolley electric line across the right of way of the Chicago & Northwestern Railway Company, in possession of a crossing 16 feet wide across said latter company's right of way. The condemnation proceedings had been carried successfully through the circuit court, the amount awarded by the commissioners had been deposited in court, and judgment entered dismissing the appeal of the Chicago & Northwestern Railway Company from the award, to the circuit court. From this judgment an appeal had been taken to the supreme court. And thereupon the street railway company instituted this action, contending that it had then an absolute right to a writ of assistance, under the Wisconsin statute.

The Chicago & Northwestern Railway Company opposed these mandamus proceedings on the ground that if they were of any validity at all, they were proceedings by one railway company to condemn lands of another, and that, under section 1854 of the Revised Statutes, in such cases the question of the necessity of taking the land is open for retrial in the circuit court, and no crossing should be forced, by means of which a street railway will cross a steam railway on grade, until the question of the right to cross it is finally settled. In this view, the supreme court seems to concur.

In order to justify mandamus in such a case as this, the court says that it must appear that the duty of the court below was plain, the refusal to perform such duty clear, the result of the refusal prejudicial, and the remedy by writ of error or appeal utterly inadequate. The Chicago & Northwestern Railway Company having given a sufficient undertaking to protect the street railway company from loss in case it should be finally determined that it was entitled to a crossing, it not appearing plain that it was the duty of the court to award a writ of assistance, nor that there was any emergency calling for immediate action, nor that the remedy by appeal or writ of error was not entirely sufficient, and the questions involved being deemed very important and deserving of that careful consideration which they are promised to receive upon the hearing of the appeal upon the merits, the supreme court denies the peremptory writ sought, adding that, if it were to take up the questions and decide them in this action, it would be causing the writ of mandamus to serve the purpose of a writ of error or appeal.

RIGHTS UNDER WRONGLY PUNCHED TRANSFER TICKETS.

O'Rourke v. Citizens' Street Railway Co. (Tenn.), 52 S. W. Rep. 872. Sept. 6, 1899.

As to the conclusiveness of the face of a ticket, the authorities are in irreconcilable conflict. Many of them treat the face of the ticket as the sole criterion of the holder's right of passage, justify his ejection in case of defective ticket and refusal to pay fare, and allow him, as his only remedy therefor, an action of damages for the negligent mistake of the agent, or for breach of contract, and not for expulsion. Others, on the contrary, deny the ticket such conclusive force and dignity, and rule that the passenger has the right to rely upon the acts and statements of the ticket agent or conductor, and that, if he be expelled on account of a defective ticket when he has acted in good faith and is without fault, the carrier is liable in damages for such expulsion.

The supreme court of Tennessee takes the latter view, and holds here, where a conductor, through mistake, punched a transfer ticket to indicate its issuance at 1:40 p. m., when, as a matter of fact, it was issued nearly an hour later, that a person who makes a valid contract is entitled to passage according to its terms, though the face of the ticket furnished him may not in any true sense express the contract. It is the contract, it says, and not the ticket, that gives the right to transportation. The ticket is but an evidence of the contract, made out and furnished by the carrier; and, if it fail to disclose the true contract, the fault is with the carrier, and it is responsible for the natural consequences of the variance.

The passenger, the court goes on to say, is not required in law, nor allowed in fact, to print or write or stamp the ticket. The carrier alone has that right, and the passenger is authorized to believe and presume that it will be properly exercised, and that the ticket, when delivered, is a faithful expression of the contract as made. The ticket, whether for transfer, as in the present case, or for original passage, may well be called the carrier's written direction by one agent to another concerning the particular transportation in hand; and if the direction be contrary to the contract, and expulsion follow as a consequence, the carrier must be answerable for all proximate damages ensuing therefrom, just as any principal is liable for the injurious result of misdirection to his agent. The legal result, in such a case, cannot be influenced by the fact that the carrier has conducted the transaction through two agents instead of one; for the combined acts of the two agents constitute but one continuous act of the carrier. Each agent is the alter ego (another self) of the carrier. The issuance of the void ticket is the fault of the first agent, the expulsion is the fault of the second agent, and both faults are those of the principal, which stands before the court as if it had made the contract, issued the ticket, and expelled the passenger through one and the same agent.

Beyond question, continues the court, carriers have the legal right to require passengers to procure and present tickets; but that does not imply that passengers who have done their part in the matter may be rightfully expelled from the car because the tickets they offer chance to be defective or void. Before the rule of expulsion for want of proper tickets can be made absolute and universal in its application, the carriers must discharge the reciprocal duty of absolute and universal accuracy in the issuance of

the tickets. The latter would be impossible, the former harsh and unreasonable. To require a passenger who has made a valid contract for transportation and paid the requisite fare, as did the plaintiff, to retire from the car, and suspend his journey, because of an original defect in the ticket furnished him by the company's agent, is to visit the wrong of the offender upon the offended. It is to make the rightful passenger suffer for the fault of the carrier, and that, too, in the latter's interest. The court will not yield its assent to a result so unjust and oppressive.

The plaintiff, the court holds, had a right to believe the transfer ticket all that it should be. With it he diligently sought and promptly entered the first transfer car, and, upon being challenged by the conductor of that car as too late to use the ticket, he made a fair and reasonable statement, showing that he had just left the first car, and that the first conductor must have wrongfully indicated the hour of issuance on the face of the ticket. On that statement, the court maintains, the plaintiff should have been allowed to pursue his own journey to its end. He, the court adds, owed the company no other duty, and his expulsion, under such circumstances, was a tortious breach of the contract, for which he became entitled to recover all proximately resulting damages, including those for humiliation and mortification, if they were in fact sustained.

Nor does the court consider it an answer to the legal right of the bona fide passenger to say that the carrier's general interest is better subserved by his expulsion than by his carriage; by the violation of his contract than by its observance. His right is not to be affected by the mistakes of ticket agents, or the attempted frauds of impostors. These are to be met, if met at all, otherwise than through a rule that excludes innocent as well as fraudulent passengers. It is not allowable to punish the innocent with the guilty, to prevent the escape of the guilty.

Every expulsion of a rightful passenger is wrongful.

Over against the testimony of the conductor that he was respectful, and used no more force than was necessary, the court holds that testimony of the plaintiff, who was accompanied by his little boy and little girl, that both cried and he thought that the little girl would go into spasms, was admissible, as possibly shedding some light on the real demeanor of the conductor.

Again, the court says that no explanation the conductor might make could affect the plaintiff's legal right as a passenger. That right depended upon the contract, and not upon the face of the ticket; and it was incumbent on the conductor to heed the plaintiff's explanation, and observe the contract, rather than upon the plaintiff to accept the conductor's explanation as final, and abandon his contract. The disclosure of the fault of one agent by another agent could not absolve their principal from the obligation of the contract, and render the plaintiff a trespasser. Such a result cannot be justified in law, whatever the rule of the company may be.

On the face of the transfer check were printed the following words: "Transfer. Passenger, in accepting this transfer, agrees to read and be governed by the conditions on the back hereof, subject to the rules of the company—F. G. Jones, V. P. & G. M." Among the conditions printed on the back of the transfer check was one in this language: "Part of the conditions upon which this transfer is given and accepted are that the passenger examine date, time, and direction, and sees that the same are correct, and complies with all its conditions." This condition, the supreme court holds, is unreasonable, because no passenger can be bound to verify the act of the conductor in issuing a transfer check; and also because no inexperienced passenger, however intelligent, could, in the time at his command on so brief a trip, "examine date, time, and direction" indicated by the punch marks, and, without an explanation, see "that the same are correct."

Another condition on the back of the check was expressed thus: "In accepting this transfer, passenger agrees that in case of controversy with conductor about this ticket, and its refusal, to pay regular fare charged, and apply at the office of the company for refund of same within three days." This condition, the court holds, is unreasonable, in that it makes the conductor, for the time, the sole judge of the sufficiency of the ticket, and requires the passenger to pay additional fare, though his ticket may be refused without sufficient cause; and, further, in that it requires the wronged passenger, who so pays, to apply for refund at the office of the company, which must be remote from the houses and business places of most passengers, and then limits the amount to be received by such

person to that wrongfully exacted. It puts, declares the court, all of the burden of the "controversy" upon the wronged passenger, and none upon the wrongdoing company, and thereby makes the just suffer for the unjust.

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FAILURE OF DRIVER TO SEE CAR PREVENTS INFERENCE THAT HIS WAGON WAS SEEN.

McFarland v. Third Avenue Railroad Co. (N. Y.), 60 N. Y. Supp. 273. Oct. 4, 1899.

In reversing a judgment for damages to a wagon from a collision at about 11:30 p. m., the appellate term of the supreme court of New York holds that, if the plaintiff, who was driving, looked and did not observe the approach of the car, no inference could be drawn that the servants of the defendant in charge of the car observed the plaintiff in time, and neglected to stop the car before it struck the wagon. No greater duty in that respect, the court insists, was imposed upon the defendant than was required of the plaintiff, especially in view of the fact that the collision occurred at a point where the defendant had a paramount right to the use of that portion of the roadway upon which its tracks were located.

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STREET RAILWAY COMPANY IS BOTH A "RAILROAD" AND A "TRANSPORTATION" COMPANY.

Old Colony Trust Co. v. Allentown & Bethlehem Rapid Transit Co. (Pa.), 44 Atl. Rep. 319. Oct. 6, 1899.

Under statutes respectively conferring upon courts of common pleas general power to entertain bills for the foreclosure of mortgages given by railroad companies and in cases of mortgages of the property and franchises of transportation companies, the supreme court of Pennsylvania declares itself very clearly of the opinion that jurisdiction can be maintained under both acts to foreclose a mortgage given by a street railway company, for the plain reason that the mortgagor company is both a railroad and a transportation company, within the plain meaning of both acts. The attempted distinction between "railroad" and "railway" companies, the court insists, has long since been exploded, and, indeed, it adds, never received its sanction in this class of cases.

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NOTICE FROM AUTHORITIES NOT NEEDED TO IMPOSE DUTY TO REPAIR STREET.

Simon v. Metropolitan Street Railway Co. (N. Y.), 60 N. Y. Supp. 251. Oct. 4, 1899.

This action was brought to recover damages for an injury to a horse that stepped into a hole contiguous to one of the rails of a street railway track. The defendant contended that it was not liable because section 98 of the New York railroad law only makes it the duty of a street surface railroad company to keep in permanent repair the street between and two feet in width outside of its tracks "under the supervision of the proper local authorities and whenever required by them to do," whereas there was no evidence in this case that any local authority had given the company notice of the condition of the pavement. But the appellate term of the supreme court of New York holds that such notice is not a condition precedent to the performance by the company of the duty assumed by it of keeping the public thoroughfare in repair, neglect of which renders it liable in a civil action to any one of the public sustaining special damage from such neglect. And it calls attention to the fact that the defendant was aware anyhow, through its officers, of the bad condition of the street, as further settling the question of the necessity of notice.

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GROSS CARELESSNESS TO LEAVE MILK WAGON STANDING ON TRACK.

New York Condensed Milk Co. v. Nassau Electric Railroad Co. (N. Y.), 60 N. Y. Supp. 234. Oct. 4, 1899.

A milk wagon was left standing upon a street railway track a little before sunrise, while the driver went down a side street to deliver milk to three customers, halfway down the block. As stated by the driver, the wagon was painted white, and without lights. The snow was piled up on either side of the railway track, and there had been a fall of snow during the preceding night, so that the side street

was covered to the depth of 12 or 14 inches—so deep that he thought he could not drive through it. The superintendent of the company admitted that, though difficult, it was possible to drive through the snow upon the side street, and a truckman, called as a witness by the plaintiff, testified that he had driven just before the accident through the next side street, which was in the same condition as the one upon which the customers lived. As the driver knew, cars were constantly passing and to be expected, yet he left his wagon upon the track, where it was not likely to be seen; for, although there may have been bright moonlight that morning, the place of the collision was dark, because it was covered over by the structure of an elevated railway. This, the appellate term of the supreme court of New York holds, was gross carelessness, contributing to the accident, and, therefore, a judgment for damages for the injury done by an electric car to the wagon and its contents should be reversed.

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CONSENT OF CITY MADE SUFFICIENT BY COMPANY'S CHARTER AND COUNTY CONSENT NOT NEEDED.

Almand v. Atlanta Consolidated Street Railway Co. (Ga.), 34 S. E. Rep. 6. July 25, 1899.

The authorities, the supreme court of Georgia says, are conflicting as to whether the powers over streets usually granted to municipal corporations are sufficient to authorize them to permit street railways to use the streets longitudinally, but, without deeming it necessary in this case for it definitely to decide whether or not such powers are sufficient, the court states that the weight of authority seems to be that they are not.

However, when a street railway company has power, under its charter, to lay its track along the streets of a city, the court holds that the city authorities may consent to such use of its streets by the street railway company, although there may be no express power in the charter of the city authorizing it to grant such a privilege. It says that if the street railway company had no charter authority to use the streets of the town, consent by the authorities of the town would be ineffectual to confer such power; but the railway company having such charter power, and the constitution impliedly recognizing that any city may consent to such use of its streets, it has the power to do so. The authority to construct a railway along a street may therefore, it declares, be derived either from the charter of the city or from the charter of the railway company that is applying for the use of the city's streets.

Moreover, the court holds that the general rule is that, when a municipal corporation is created, it becomes vested with jurisdiction over the territory embraced within its corporate limits, and the mere fact that there has been a valuable improvement made by the county authorities on one of the streets of an incorporated city does not oust the municipality of its jurisdiction over such street. And the above, it holds, is true, notwithstanding the street improved was before the incorporation of the city a part of an established public road of the county.

The court says that if the authorities of a municipal corporation see fit to permit individuals, private corporations, or even the authorities of the county in which such municipality is located, to expend money in improving one of the streets of the municipality, this will not have the effect of relinquishing control over such street, and placing the same under the jurisdiction of those who have made the improvements upon it. When the improvement is completed, although the street may be radically changed, it is still a street of the city, and under its control. It goes almost without saying, adds the court, that any municipality would grant permission to any person or corporation so disposed to voluntarily and gratuitously pave and improve one of the streets of the municipality; and the mere fact that the authorities take advantage of an offer of this character, and allow the improvement to be made, would not amount to a relinquishment of control over the street thus improved.

Then, it was contended, in this case, that an injunction should have been granted because it did not appear that the county authorities had given their consent for the railway company to appropriate that part of the public road of the county between the city in question and a certain other city, and that therefore it would be impossible for the railway company to construct and operate a continuous line as contemplated, and the city street ought not to be disturbed

when it could never be used for the purpose for which it was intended by the company. But this contention, the court holds, was disposed of by evidence, properly admitted, to the effect that, if there should be any difficulty in obtaining the consent of the county authorities to use that part of the road necessary to make the line continuous, the railway company could and would acquire the necessary property contiguous to the road in question.

EXPOSURE OF PASSENGERS TO DANGER FROM OVERCROWDING CARS IS NEGLIGENCE.

Reem v. St. Paul City Railway Co. (Minn.), 80 N. W. Rep. 638. Oct. 26, 1899.

The exposure of a passenger to danger which the exercise of reasonable foresight would have anticipated, and due care have avoided, the supreme court of Minnesota holds, is negligence on the part of the carrier. And more particularly does it insist here that, when a street railway company undertakes to carry large numbers of people, vastly in excess of the seating and standing capacity of its cars, and permits passengers to ride on the platforms, stops its cars when in such crowded condition that other persons may get upon them, and, because of the crowd, a passenger who has boarded a car before it was crowded is pushed off a platform and injured, the company is guilty of negligence.

ASSUMPTION BY NEW COMPANIES OF AGREEMENTS FOR PASSES.

Wallace v. Ann Arbor & Ypsilanti Electric Railway Co. (Mich.), 80 N. W. Rep. 572. Oct. 24, 1899.

It is undoubtedly the rule, says the supreme court of Michigan, that such an agreement as one to give a land owner and members of his family passes until the premises are transferred in consideration of an encroachment thereon does not run with the land, and is not binding upon the purchaser of the rights, franchises, etc., of the old company, in the absence of a statute or contract making such purchaser liable. But where the bill of sale contained nothing inconsistent with the assumption by the new company of contracts for the right of way, and the vice-president of the old company testified that the purchase was subject to all the conditions attached to the old company as well as told the landowner that the transaction was nothing more than a consolidation of the old and new companies, the supreme court thinks that this made out a prima facie case of consolidation, under which the consolidated company succeeded to all the rights and obligations of the old company. Yet the fact that a connecting line had also for several years honored the old company's pass would not bind the new company to furnish transportation beyond its line extending only to city limits.

LIABILITY FOR INJURY DONE BY MOTORMAN THROWING STONE TO FRIGHTEN BOYS AWAY.

Dolan v. Hubinger and others (Ia.), 80 N. W. Rep. 514. Oct. 19, 1899.

The petition in this case contained allegations that a certain motorman on being employed had been instructed to use special diligence to prevent the further mischief of boys who had for a long time been placing obstructions on the tracks at a point where there was a steep grade; that, one day, observing some boys running away from the track and finding at the place obstructions left there by them, he stopped his car, got off to remove the obstructions, discovered the boys hiding about fifteen feet away, and, believing them to be in waiting to do more mischief, sought to frighten and drive them away as he believed it to be his duty to his employer to do; that, to do this, he picked up a small stone, and threw it violently at the walk, near the boys, but not intending to hit them; that the stone struck the plaintiff in and over his right eye, severely injuring him, etc.

The question was raised by demurrer whether this petition stated a cause of action. The lower court sustained the demurrer. But its judgment is reversed by the supreme court of Iowa.

First, however, the supreme court says that the facts stated did not show that the motorman had authority to bind the street railway company by the act of which complaint was made; that is, it did not appear that in throwing the stone he was acting within the scope of his employment. Nor was it shown that the motor-

man was authorized to repel trespassers. What was affirmatively charged in the petition was that a trespass had been committed, and those engaged in it had retreated, when the stone was thrown that caused the injury to the plaintiff. In such an event, declares the court, it cannot be said that the act done was within the scope of the servant's employment.

The reversal is explained to be because of the error of the trial court in sustaining the demurrer when the latter nevertheless stated it to thereby hold that the act, as done, constituted a crime, and therefore could not be ratified. The supreme court says that it will be noticed that the petition affirmatively alleged that the motorman, when he threw the stone, had no intention of hitting either of the boys. As charged, the act was a tort, but not a crime. Any act of the motorman which might have been previously authorized by the company could be ratified by it so far as to incur civil liability therefor. Surely, adds the supreme court, the corporation might have made itself responsible in this case by authorizing the motorman to use force against trespassers.

The test applied in order to determine whether the master is liable is not the character of the servant's act, but whether it was done within the scope of his duty. When it is said that the master is not responsible for the willful wrong of the servant, the statement must be understood as referring to an act done outside the line of employment. The general rule is that, if the act done is in the execution of the authority given by the master, the master will be liable, whether the wrong be occasioned by negligence or by a wanton, reckless purpose to accomplish the master's business in an unlawful manner.

NO INJUNCTION AGAINST ERECTION OF SUBWAY PREVENTING USE OF PORTION OF EQUIPMENT.

Chicago General Railway Co. v. Chicago, Burlington & Quincy Railroad Co. (Ill.), 54 N. E. Rep. 1026. Oct. 19, 1899.

Neither a city alone, nor a city in conjunction with a railroad company, has a right, the supreme court of Illinois holds, to build or erect over a public highway any permanent obstruction which will interfere with the passage of such persons and vehicles, including street cars, as have the right to use such highway. But, the court goes on to say, when the tracks of a steam railroad company are raised, the city is not obliged to make the subway there under high enough for the passage of vehicles of an extraordinary and unnecessarily great height. It is only obliged to make such a subway as will permit the passage of such cars, or cars of such height, as are customarily run upon street railway tracks. And an injunction, it holds, will not be granted at the instance of a street railway company, to prevent the construction of a subway of say less than 16 feet headroom where the allegations of the injury it will suffer if the subway is built as proposed are indefinite and do not show that such injury will be irreparable, as that it will thereby be prevented from using "a portion of its equipment," damages for which there is nothing to indicate could not be recovered in an action at law.

RIGHT OF CAR FIRST HAVING MADE REQUIRED STOP AT CROSSING TO PROCEED.

Becker v. Detroit Citizens' Street Railway Co. (Mich.), 80 N. W. Rep. 581. Oct. 24, 1899.

The supreme court of Michigan states that it does not think that it can be said, as a matter of law, that a motorman, who has already made the stop required at a crossing of street railways by a city ordinance, is guilty of contributory negligence in attempting to cross with his car when the approaching car on the other railway is 150 or 200 feet away, and is also yet required, by the ordinance, to stop before reaching the crossing. The reason given is that if he must wait before he goes forward until he knows that the approaching car will stop, he will fail to meet the demands of modern street railway traffic. Nor does the court consider that this ruling is changed by a state statute which provides that, at all crossings of the tracks of two street railways, when a car on each road approaches such crossing at substantially the same time, the car on the track first laid shall have precedence and be entitled to the right of way, even if this would under other circumstances give the approaching car the right of way. The statute, the court holds, does not authorize a street railway company in a city to

ignore the provisions of an ordinance requiring a car to come to a full stop before making a street railway crossing, and so it maintains that the second car here referred to did not have the right of way until it made the stop.

ILLEGAL EVASION OF PAYMENT OF FARE IN TRYING TO FORCE TRANSFER AGAINST A REASONABLE REGULATION.

Commonwealth v. Jones (Mass.), 54 N. E. Rep. 860. Oct. 19, 1899.

A street railway company owning electric railway lines over different streets and required by law to give transfers from one line to another in such a way as to make the rate of fare not more than five cents for a continuous ride over one or more of its lines made a rule than transfers would be given from a certain one of its lines to another which ran parallel with it for a short distance in the heart of the city only at the point where they diverged. The defendant took a car on the first mentioned line and on tendering his fare demanded a transfer right away, his purpose apparently being to thereby be able to take a car on the other line sooner than he otherwise could. The conductor refused to give the transfer then, and the man refused to pay his fare without he got it. At the earliest possible transfer point he got out, took the other car, and paid the usual fare of five cents for riding on that. Subsequently he was prosecuted for, and convicted of, evading payment of fare on a street railway, in which the supreme judicial court of Massachusetts finds no error.

The court says that there was nothing to show that the rule of the corporation was not a reasonable one, and holds that the defendant was bound by it. He argued that the statute did not contemplate a conviction unless there was moral turpitude in the evasion or attempt to evade. The court thinks that it goes further, specifying acts, the commission of either of which shall constitute an offense, and that one is guilty who evades or attempts to evade "either by giving a false answer to the collector of the toll or fares, or by traveling beyond the point to which he has paid the same, or by leaving the train or car without having paid the toll or fare established for the distance traveled or otherwise." One who willfully or intentionally does either of these things, it maintains, is within the meaning as well as the language of the statute. That the defendant, after he left the car, entered another car, and paid the fare prescribed for his ride upon that, and that if he had conformed to the rules of the corporation he could have obtained a continuous ride over the route covered by both cars on payment of a single fare, the court pronounces facts which were immaterial.

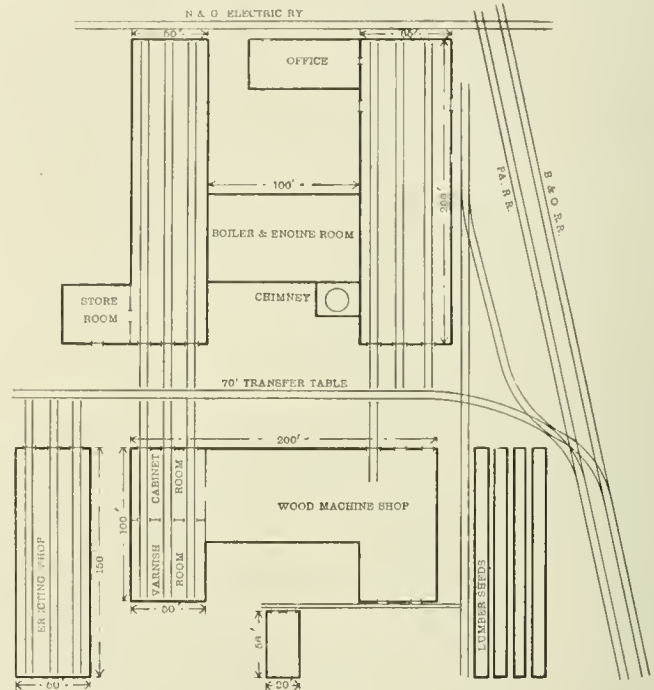
EXTENSION OF JEWETT CO. PLANT.

We take pleasure in showing herewith the ground plan of the new shops of the Jewett Car Co., at Newark, O. This company was formerly located at Jewett, O., and under the old management met with very little success. The company was reorganized in 1864, and then went into a receiver's hands, the shop being closed, but in the fall of 1895 it was opened and business was conducted by the receiver. In 1897 it was sold by the receiver to Howard Hazzlett, of Wheeling, W. Va., and immediately purchased by Sisson & Krebs, general contractors and builders, of Wheeling. The factory then was opened and business was solicited under the name of the Jewett Car & Planing Mill Co., with the following acting officers. A. H. Sisson, manager; C. E. Krebs, secretary and treasurer, and N. Paulson, superintendent. Under this management business rapidly increased and it was only a short time before it was found that the company was handicapped on account of location and poor shipping facilities, and would be obliged to either build a larger shop at Jewett or seek new quarters.

In December, 1899, the company was incorporated under the old name of the Jewett Car Co., and located at Newark, O., in the new shops. Part of the plant was built and at the time of the removal in December, 1899, it was thought that more shop room would not be needed, but during the month of January the company received a great many orders and found it would be obliged to build large additions. It now has one of the most complete shops in the country, and has taken orders from some of the largest roads. It makes a specialty of interurban cars, and now in this particular

line is filling a great many orders. The shops and lumber sheds cover about five acres.

The shops are adjacent to the tracks of the Baltimore & Ohio and the Pennsylvania railroads, with switches to all the buildings. The main erecting shops, three in number, are of pressed brick with slate roof. Two of them are 50 x 200 ft. and the other 50 x 150 ft. The wood working shop and the paint shop is 200 x 100 ft., and is separated from the erecting shop by a 70-ft. yard, in which there is a transfer table for handling the cars in moving them from one shop to another. Back of the wood working shop is a dry kiln with a capacity of 50,000 ft. The company have built several lumber sheds so that all of its lumber will be kept under cover.



PLAN OF JEWETT CAR CO'S. NEW PLANT.

The present officers are: W. S. Wright, Wheeling, W. Va., president; H. S. Hands, Wheeling, W. Va., vice-president; A. H. Sisson, Newark, O., general manager and treasurer; N. Paulson, general superintendent. Mr. Sisson will also act as general sales agent. Mr. Paulson was for many years connected with the sleeping car department of the Pullman company, and is thoroughly acquainted with car construction, and is giving special attention to the construction of heavy cars.

ORLEANS TERMINAL, PARIS.

In the "Review" for June, 1898, we gave the preliminary plans of the Orleans Railroad of France for building an underground extension of 2½ miles in order to secure a more central terminus in Paris, and in February, 1899, announced that a three-phase transmission line with transformer substations would be used.

Considerable progress has been made in the construction of this line which follows the River Siene, partly in tunnels proper and partly as a covered subway with arched openings in the wall towards the river. The new station on the Quai d'Orsay is to be a large building with 15 tracks, all of which connect with the double track underground road. Electric locomotives similar to those of the Hoboken Shore road will be used for handling the trains between the old and the new terminals. These locomotives will have four axles to each motor driven. Current will be taken from a third rail laid on the same ties as the track rail; the plans contemplate placing the third rail in different positions relative to the track rails and therefore the locomotives will have three contact shoes at each end. The locomotives are to have two controllers and will not be turned at the termini.

ELECTRIC TRAMWAY AT BATAVIA, JAVA.

One of the first electric railways to be built in the East Indies is now nearing completion at Batavia, a city of about 100,000 inhabitants, situated on the north coast of the island of Java. This system may properly be called a suburban road, as it is constructed for a considerable distance through open stretches of country and for a portion of the route on private right of way. The construction work would do credit to an American town and the service is excellent, a five minute schedule being observed on market days

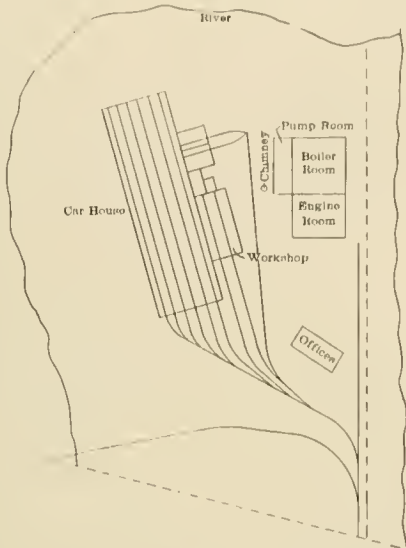


FIG. 1—ARRANGEMENT OF BUILDINGS.

and a ten-minute headway on other days. The cars often reach a speed of 15½ miles an hour and average from 7 to 10 miles.

Owing to the climatic and social conditions the work of installing the system was necessarily slow and attended with exceptional difficulties. Native Malay labor was relied upon almost exclusively and most of the foremen were educated natives. The transportation of heavy boiler and engine sections was particularly difficult and at times even dangerous. As an example of the peculiarities of the help employed it is stated that before each trolley

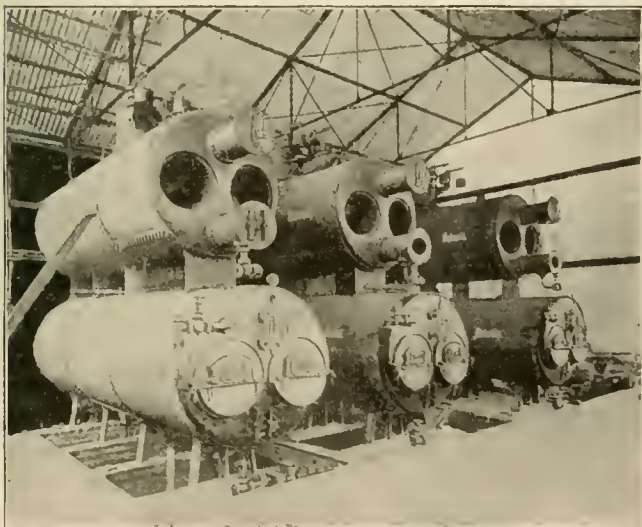


FIG. 2—BOILERS IN COURSE OF ERECTION.

pole was placed in position it was necessary to offer up a prayer for the safety of the erection gang.

At present three lines are in operation, aggregating 8.6 miles of track. The gage is 3 ft. 11 in., and grooved rails laid on wooden ties are employed. The ties are cut from the Djatti tree or Indian oak, as it has been found this material successfully resists the climatic conditions and the attacks of tropical boring insects. The

lines at present are single track with turn outs, but it is expected that eventually double tracks will be built throughout, and this fact has been kept in mind while completing the road. The trolley poles were designed to facilitate double tracking when this should become necessary, and a double trolley wire has been erected the entire distance, this latter feature making unnecessary the use of overhead crossovers and also effecting a saving in feeder cables. Hard drawn copper wire of .682 sq. in. sectional area was adopted for the trolley wire. The overhead construction is divided into sections, 550 yd. long, in order to localize disturbances of the system, each switch serving as a feeding point, and each section being protected by a lightning arrester. The rails are bonded with copper bonds of .166 sq. in. sectional area and in addition are connected every 55 yards with wire of the same capacity.

The arrangement of the various buildings belonging to the company is shown in Fig. 1. In the engine room are three generating units, each consisting of an horizontal tandem compound engine rated at 150 h. p. at 235 r. p. m., belted to a six pole continuous current 500 volt generator. The generators were supplied by the Union Elektricitäts-Gesellschaft, of Berlin. Each engine has two fly-wheels, one carrying the generator belt, and the other the governor belt, and the machines are arranged to run condensing or non-condensing as desired. A surface condenser of the Worthington type has been installed. The pumping system is in a separate room adjoining the boiler room as shown in Fig. 1. There are two Worthington feed pumps each having a capacity of 2,500 gallons per hour, two injectors having a capacity of 800



FIG. 3—TRACK SHOWING LINE CONSTRUCTION.

gallons per hour, with a lift of 20 ft., and a storage tank, into which condenser pumps discharge fresh condensing water in addition to the water returned by the surface condenser. The boiler feed pumps draw directly from this tank, forcing the water through a Green economizer before it reaches the boilers.

In the boiler room are three boilers as shown in Fig. 2. These are of the double drum type, and have a heating surface of 1,030 sq. ft., and a normal evaporating capacity of 3,300 lb. per hour. The drums are 6 ft. 11 in. in diameter, the upper drum being 20 ft. long and the lower one 23 ft. long. The two water and steam spaces are directly connected by enclosed tubes. Both drums may be separately fed, and any section of the feed pipes between the boilers and pumps may be cut off. The fuel employed is Australian coal, although it is proposed to utilize petroleum waste for this purpose at an early date, as this material can be secured on the grounds at low cost.

The furnaces are so arranged as to enable the hot waste gases to be passed either through the economizer or through an unobstructed flue direct to the chimney, which is 150 ft. high and built of iron plates riveted together. The chimney stands isolated from the power house building, the flue connections being underground.

The Colorado Springs (Colo.) City Council has passed an ordinance requiring all cars in the city to be vestibuled during the winter months.

CREOSOTED WOOD BLOCK PAVEMENTS IN INDIANAPOLIS.

Read before the American Society for Municipal Improvements by M. A. Downing, President Board of Public Works, of Indianapolis, Ind.

Before, and when, I became a member of the Board of Public works a number of years ago we often had property owners say, "Why can't we have such wood pavements as we see in Paris, London and other European cities? They seem to be so much cleaner and quieter than asphalt or stone." They insisted that there was a fine dust, a glare, a noise and heat that were positive discomforts, which they could escape to a great extent if they could have a wood pavement, and if we could give them a durable wood pavement they wanted it, and many wanted the wood without conditions, and many petitions for it were presented.

A careful study of wood pavements in this country and Europe followed. There can be no doubt that the consensus of opinion in this country is that the wood block pavement as commonly known has not been a success. It seems strange that the glaring defects—one might almost say the kindergarten defects—of those pavements had not been noted and eliminated, but they were not, and millions of square yards of wooden block pavement have been laid and are yet being laid, the only foundation for which is plank laid on sand. The blocks were cut from round, green cedar posts, with the sapwood left on, and in some instances the bark. These blocks, without further preparation, were laid on boards, some gravel tamped into the joints and covered with coal tar. It would seem almost absurd to call such a structure a pavement. In saying this, I am not forgetting the Nicholson pavement, the principal defect of which was the lack of suitable wood. It seems to me that all the ingenuity and inventive genius of that time was exercised along the line of discovering some odd or novel way to cut and lay the blocks, or to bind and lock them together. As far as I have been able to discover, these things were of little avail. The cardinal defects were:

First. Failure to select wood with sufficient strength and toughness to withstand the loads and abrasion, and

Second. The total absence of any attempt to create conditions to prevent the rotting of the blocks.

Just why it was considered necessary to select white pine and cedar when the country abounded in the harder and stronger woods it would be difficult to conjecture, but the fact remains.

And why no adequate effort was made to properly season and treat the wood I leave to engineers to answer. It may have been because it was a new field and explorers are scarce. Certain it is that if any architect had attempted to build a house of such material treated in the same way he would have been severely criticized by his professional brethren, to say the least.

As a result of our studies of wood pavements, we decided to require the concrete foundation in every instance. We first laid Washington red cedar, rectangular blocks without treatment of any kind. This wood was very soft and porous. It was practically the Nicholson pavement. The blocks were laid close together on a 1-in. cushion of sand over the concrete. Two heavy traffic resident streets were laid in this way and they are now in their fifth year; both are considerably worn on account of the softness of the blocks, while here and there rotted blocks are visible. Washington red cedar was still in the specifications when I became a member of the Board of Public Works. A provision was inserted providing for creosoting, but the specifications were indefinite. The following spring and summer, 1896, four streets were paved with creosoted (about three pounds of oil to the cubic foot of wood) Washington red cedar. These blocks were 4 in. wide and 5 in. with the grain of the wood. The blocks were laid in rows at an angle of 45° with the curb. All of these pavements are in excellent condition at this time, and on parts of them the traffic is heavy. No provision was made for expansion, the blocks were driven as close together as could be with a sledge and the joints filled as far as could be with paving pitch. We have had some trouble caused by the blocks bulging. Most of this was where the blocks were not creosoted; in a few cases blocks bulged on other streets, but nothing serious. The specifications were then changed providing for the heartwood of the long leaf southern yellow pine, with the blocks 4 in. wide, 4 in. deep with the grain of the wood, and impregnated with ten pounds of the best quality of creosote oil. These blocks were laid in the manner above de-

scribed, except that a space of from 1 to 2 in. (according to the width of the streets) was left between the curb and the blocks for expansion. This space was filled with dry sand and covered over with heated paving pitch. The interstices were partly filled with fine, dry sand and the street surface rolled to a smooth surface before covering with heated paving pitch and top dressing with fine gravel or screenings. In no instance have we had any trouble on any of these streets from the blocks bulging. The surface of these streets is as smooth as a floor, and has a soft brown color that is restful to the eye. Under the heaviest traffic no wear is as yet noticeable and the streets are in perfect condition. The oldest is about three years old. It appears that the dirt on these pavements does not grind into such fine dust as it does on the asphalt and consequently is not as unsanitary nor annoying. The cost of cleaning is less than brick or asphalt, for the reason that we do not have to clean as often. We often hear complaints of the heat that comes from the asphalt on hot days. This does not seem to be common to the wood, but the one quality that seems to be pre-eminent is noiselessness. I think that people pay more attention to this quality, of late years, than they used to; in fact, they now often demand it, whereas, when I was a younger man, people would speak of it as desirable, but were not willing to be assessed anything extra on that account. We feel that the creosoted wood block pavement is a success from every point of view. We believe that, constructed of the material we are using (or other strong woods, like beech, tamarack, red or yellow fir), properly creosoted, using first-class quality of creosote without adulteration, that the pavement is more durable than asphalt and brick and nearly as durable as granite. It certainly has met with an enthusiastic reception in this city, as is testified to by the great demand for it. We have contracted for about three times as much of it this year as we have for asphalt. There is practically no demand for stone or brick in this city except for alleys.

We have not adopted the European method of spacing the blocks from a quarter to a half inch apart and filling them with portland cement grout, but I am not sure that their practice is not preferable. We have found up to this time that our present practice is good, and our engineer hesitates to depart from it, although I must say that when the blocks are driven so close together it is next to impossible to get any filled in the joints. This may cause swelling later, although I hardly think so.

We have thus far not followed the common European practice of making the surface of the concrete perfectly smooth and laying the blocks directly thereon, but have introduced the 1-in. cushion of sand. But if we are called upon to pave heavy traffic streets we will probably do so, as experience in both London and Paris has shown that the practice has been successful, as the Rue de Rivoli, over which passes 42,000 vehicles per day and King William St., the heaviest in London, are both paved with wood in that way. Few people understand the efficacy of creosoting; why the wood seems harder, tougher and more durable. It is simple. Wood dried to 10 per cent moisture has about double the power to resist crushing and abrasion that it has if very wet. In creosoting, the sap and moisture are removed and the heavy oil (creosote) which repels moisture becomes encysted in the fiber of the wood. When snow and rain lie on the pavement, they may get to some extent into the cells, but not to any great extent into the fiber, because they cannot displace the oil; hence the fiber remains dry, and, of course, retains its strength. The uncreosoted wood pavements wear doubly as much in wet weather as they do in dry weather. This is not true of the creosoted wood pavements for the reasons above given.

I might say a word in regard to cost. This would probably vary according to the distance the blocks would have to be freighted. The pavement laid with long leaf yellow pine blocks, 4 in. deep, treated with 10 lb. of the best quality of creosote oil per cubic foot of wood, laid on a concrete foundation complete, and guaranteed for from five to nine years, has cost us from \$2.10 to \$2.50 per square yard.

The Greenwich & Schuylerville (N. Y.) Electric R. R. is open for traffic. The company is having several electric locomotives built for hauling freight cars.

A system of electric haulage for canals, employing two overhead wires, will be tested on the canal at Tonowanda, N. Y. Philip Perew, of North Tonowanda, is the inventor of the system.

Power Plant Piping and Accessories.

BY WILLIAM D. ENNIS, M. E.

PART II.

EXHAUST PIPES.

Another system of piping with which the steam engineer is concerned is that comprising the exhaust mains and branches running from the exhaust outlets of engines, condensers and pumps to the heaters and condensers and by-passing the latter through a relief valve to the atmosphere. This system is of equal importance with that first considered; it is often fully as prolific of trouble and offers even greater facilities for economizing steam production through intelligent arrangement.

It is beyond the province of this paper to discuss the theories and efficiencies of condensing and heating apparatus; but, whatever system or systems may be selected, there is always opportunity for

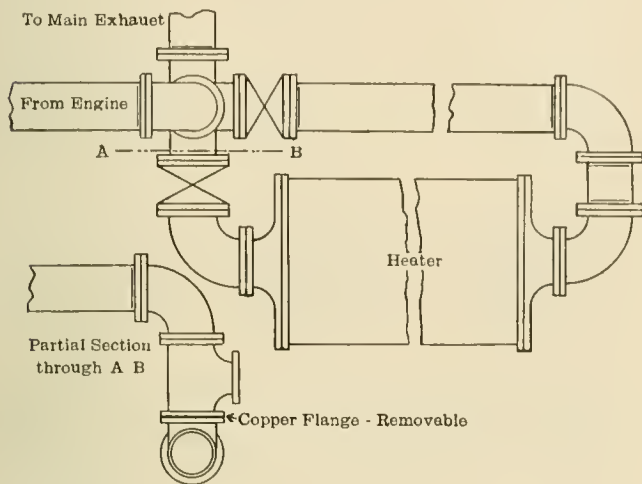


FIG. 14.

combining it and the piping so as to increase the productiveness, so to speak, of that part of the plant.

With a non-condensing engine, heating the feed water from its own exhaust, the combination is simple, a tubular or open heater being placed in the horizontal or vertical portions of the exhaust pipe. It is best that this should be by-passed, as shown in Fig. 14.

When two or more such engines are used the exhaust from one is

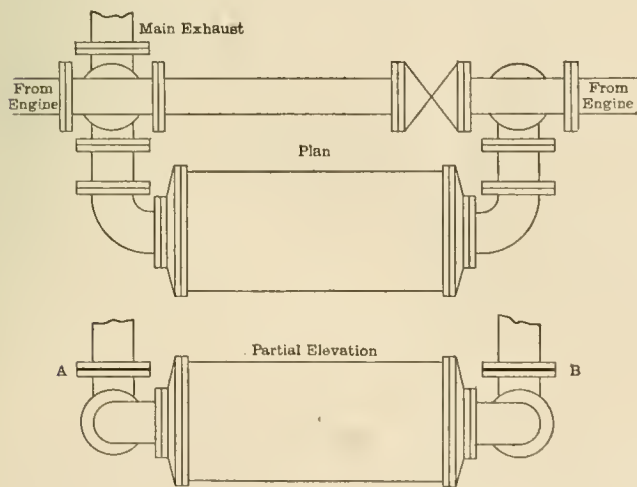


FIG. 15.

usually sufficient to heat all the feed water the boiler requires to or near the boiling point. If the boilers require more than this amount of feed, all the engines may supply exhaust steam for heating it, either separately or in a single heater. One way of arranging the latter is shown in Fig. 15.

With this construction, one or both of the exhaust can by pass the heater, and in case it becomes necessary to remove it, this can be quickly done by taking apart the flanges at A and B after which the engines can go on running.

With condensing engines, the exhaust pipe system increases in interest. Again the engine exhausts may pass through a feed water heater before complete condensation, or the exhausts from pumps and condenser alone may be sufficient for heating purpose. The latter is seldom the case. If the engine exhausts are used for heating a building it is advisable to place an oil separator between the engines and the heating pipes. Usually separate heaters are provided for main and auxiliary exhausts, and the latter are carried to the main free exhaust after passing through the heater. All valves on exhaust systems should be placed so as to be operated from the engine room floor. This necessitates their being set with vertical spindles, when the bodies are below the floor line. A cast iron stand

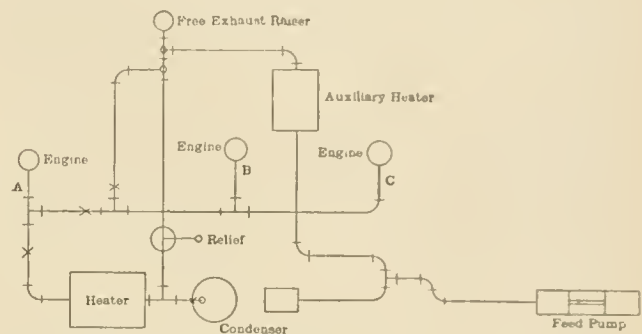


FIG. 16.

is bolted to the floor, and the valve spindle extended through it is operated from the top. It is best to use stands of the indicator pattern, in which a marker rises and falls along a scale fastened to the side of the stand, showing at all times the position of the gate.

It is absolutely necessary to have a free passage for the exhaust, independent of the condenser, and for this purpose an automatic relief valve should be placed on a by-pass around the condenser. This valve consists essentially of a disk bearing on a flat surface, the latter having in it an opening the size of the exhaust pipe. When the condenser is in operation, the vacuum under the disk holds it down, and the exhaust steam is condensed continuously. If for any reason, as a failure of water supply in the condenser, the pressure on the exhaust pipe increases, the relief valve opens, and the engine runs non-condensing. Upon starting condensation again, the disk falls and holds the vacuum. As pumps and condensers are not ordinarily planned to operate as condensing engines, their exhausts should be piped into the main exhaust, if at all, on the free side of the relief valve. Condenser pumps are sometimes connected with their own condensing chambers.

Fig. 16 shows diagrammatically an arrangement of exhaust connections in accordance with the foregoing principles.

The exhaust pipe A is from a 350-h. p. compound condensing engine. B and C connect to engines, which are planned to run either condensing or non-condensing. In laying out this plant, the data given were, first, the size and location of the three engines, with the diameters of their steam and exhaust pipes. The crowded condition of the basement made the arrangement of heater and condenser shown imperative. The main exhaust valves of the three engines are above the floor line. A 5-in. pipe runs downward from the low pressure cylinder of the right hand engine, turning at right angles to rest upon the floor level. This terminates in a 5 x 7 x 5-in. tee to which the exhaust from the middle engine is brought. From the 7-in. exhaust line thus created, connections are made with both the exhaust from the large engine and with the outboard free line. Both of these connections have valves, but as these valves will be only occasionally used, they are not arranged to be operated from above.

The 10-in. exhaust from the main engine, into which the smaller exhausts are carried, runs to the 10 x 12 x 7-in. tee to the heater, thence 12 in. to the condenser, with a side outlet through a relief valve to the atmosphere. The spindle on the exhaust inlet valve to the condenser extends through the floor. The injection and discharge pipes to and from the condenser both have valves, and the valve on the former is also operated from the floor above.

When a condenser of the injector type is used, it is placed vertically near the wall of the engine or pump room, and guyed to the walls or roof. The exhaust pipe from the engine runs upward to the condenser inlet, which is usually at the top, and the relief valve opens from the upper flange of the condenser. The injection pipe from the pump also enters near the top of the condenser, and the discharge pipe is led from the hot well at the foot.

Wrought iron pipe used for exhaust or low pressure steam may be made with either flanged or screwed joints, composition gaskets being used in the former case. Cast iron pipe for this purpose should be flanged.

Fig. 17 shows the arrangement of injector condensers for the electric power plant of the Boston Navy Yard.

The sizes of exhaust pipes are determined in the same way as explained for steam pipes, the permissible velocity being assumed at 4,000 ft. per minute instead of 6,000.

From a standpoint of economy, the only covering necessary on exhaust piping is from the engines and auxiliary apparatus to the heaters. Heaters also should be covered and all exhaust covering should be of good quality, put on by experienced mechanics. The entire exhaust system is frequently covered, to add to the workmanlike appearance of the plant.

The noise of an escaping exhaust, at least in cities, is a decided nuisance, and to obviate this and also to prevent the deposit of condensed steam on roofs and neighboring buildings, an exhaust head is usually placed on top of the vertical free exhaust. This muffles and partially condenses the escaping steam.

WATER PIPING.

The water piping in a power plant consists of injection and discharge connections for the condenser, pump suction, hot and cold feed water lines, individual boiler feed pipes, cold and hot water fire and washing service, etc.

Water piping for the condenser is of cast iron. The injection pipe is usually flanged, the joints being made with some form of rubber or composition gasket. As this line of pipe must hold a vacuum, it should be carefully made tight and tested at a hydrostatic pressure of not less than 30 lb. The injection inlet to the condenser should always have a valve, and it is preferable to have this valve arranged so that it can be operated from the engine room floor. It is well, also, to put a check valve on the discharge pipe. To protect the condenser from debris, floating billets, etc., which may be contained in the condensing water, a strainer should be placed on the injection pipe at its inlet, and it is preferable also to use a foot valve at this point. These are made in various forms, plain disk, multiple, shaft, and spring. Whatever form is used, the bearing parts should be of brass.

Should the condenser be stopped suddenly, it often happens that the foot valve closes, holding a column of water above it, and in case of a prolonged shut down, the pressure of this water is objectionable. A simple method of providing for its removal is to tap the injection pipe just above the foot valve and to run a small pipe from the opening thus made. The overflow valve on this pipe should have a long stem so as to be readily operated from the ground. If the suction well is very deep this long stem can be braced at the top of the uptake by iron straps bolted to the main pipe.

Injection pipes should have a vertical length for their inlets, and the foot valve should be placed within a foot or two of the bottom of the well.

Condenser discharge lines, which are subject to no pressure, are made up of bell and spigot pipe, caulked with hemp and lead. This construction admits of a slight variation in direction, and is therefore convenient where the pipe is placed underground. If the discharge is carried into a running stream, the outlet may be a horizontal pipe; but if into a well, the outlet should be vertical.

A hot well is sometimes placed in the discharge, so that hot feed water may be taken independently from this source before passing

to the heaters. A simple way of arranging this is shown in Fig. 18.

Either cold or hot water may be taken, respectively, from the hot well or main suction, by the pump or injector. The heater can be by-passed if desired. Where there is danger from high water, a check valve should be placed on the discharge pipe of the condenser.

The suction lines to the feed pumps and injectors are usually of galvanized iron, sometimes of cast iron. In the former case, they are put together with ordinary screwed joints, galvanized fittings also being used. They should run underground, outside the building, and they, as should all water and drip pipes, are preferably run in a trench inside the building. Trenches for pipe are built with 8-in. brick walls, and are covered with cast iron plates, properly drilled to allow connections to be made. The inside of

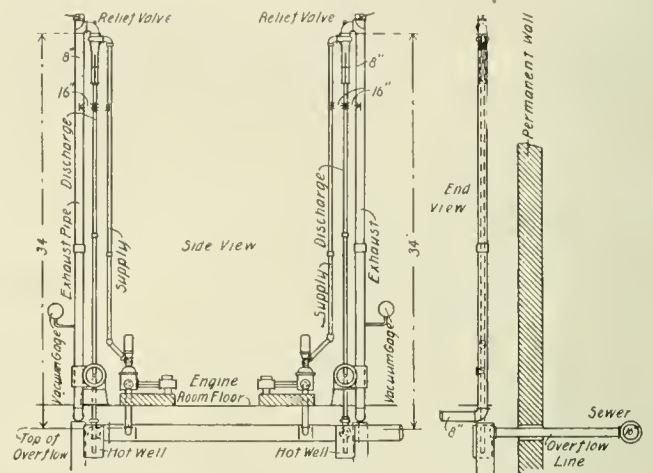


FIG. 17.

the trench should be smeared with portland cement on the sides and bottom. Avoid placing valves in trenches.

From the feed pump, wrought iron pipe carries the feed water to the heater—or, if cold water is used, direct to the boiler. It is customary in large plants to use both systems, so that the heater can be cut out of service, if necessary. Feed pipes for hot water should always be of brass, with brass valves and fittings. Very long runs are sometimes made of cast iron, as far as the economizers,

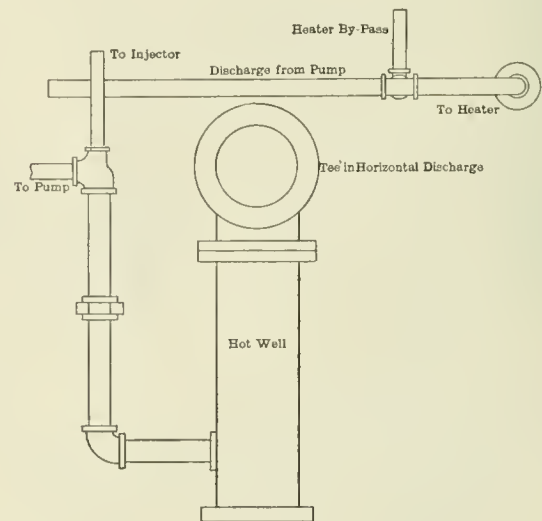


FIG. 18.

but this is only commendable in extreme cases. Brass pipe should be made up with screwed joints for all ordinary sizes; if larger than 4 in. in size, however, special brass flanges and brass flanged fittings should be used. A relief valve should be placed on the main feed line to guard against excessive pressure. It is of importance to make the feed system as direct and simple as possible, avoiding sharp bends, and in fact all bends that can be avoided, as every one adds to the work of the pump and increases

the amount of steam required by it. It is always bad practice to have brass and iron in contact with each other when connections may require breaking.

The main feed lines, running across the boiler fronts, branch out into the individual feed pipes. If an injector is used as an auxiliary to the pumps, it may be connected to the feed either on the main line or at each boiler feed. The cold water feed line, if any, can be connected in the latter way, or can branch off into individual cold feed pipes, entering the boiler independently. This practice seems to be an unjustifiable expense.

Individual branches to the boilers should be each provided with a check valve and stop valve, the latter arranged so as to operate from the boiler room floor.

In certain localities kerosene is used as a solvent in boilers, and where this is the case, the boiler lubricators should be attached to the individual feed pipes. Internal feed pipes, when used, are always furnished by the boiler maker.

Other water piping about the power plant consists of connections to faucets and fire hose. Hose should be mounted on racks, out of harm's way, and should be provided with quick opening valves.

Rules for determining the sizes of water pipes are plentiful, and recourse should be had to some good handbook in planning such parts of a plant. The injection and discharge inlets on the condenser will usually be found right for its rated capacity, but the length of pipe, number of bends, etc., should always be given careful consideration.

(To be continued.)

BRITISH METHODS OF TRAMWAY PROMOTION.

(From Our London Correspondent.)

It is quite probable that American street railway men have often difficulty in grasping the meaning of news items concerning the promotion of tramways in Great Britain because the procedure to secure charters and franchises is so different in the two countries.

In England and Scotland the main statute on the subject is the Tramways Act of 1870, which contained a clause empowering the municipality or other local authority to purchase the road after 21 years at a price to be found by deducting from the original cost an allowance for depreciation. This is the so-called "old iron" purchase clause, and its application practically paralyzed tramway building for years after this meaning of the act had been decided upon by the courts. Ireland has its own Tramway Act, with a less stringent purchase clause.

The second important statute is the Light Railways Act of 1896, which originally contemplated the building of light railways in agricultural and fishing districts where the traffic would not be sufficient to render a steam railway profitable. This act has been taken advantage of for the building of tramways in streets and roads.

It will be well to premise the description of the methods of promotion by a few words concerning the Board of Trade. The British Board of Trade is a permanent department of the government, entrusted with the powers to regulate shipping, railroads, tramways, electric lighting, etc., and has an army of officials. Its statutory powers are practically absolute, though if its acts are attacked the president of the Board, who is always a member of Parliament, and one of the Government of the day, must defend its action in Parliament.

When a company or a municipality wishes to build a tramway three methods are open:

1. It may promote a private bill in Parliament. Under the parliamentary standing orders this involves much work and expense. Elaborate plans and books of reference must be prepared long before the session of Parliament begins; notices must be served on all parties interested, including land owners whose property may be desired; long detailed notices must be advertised in the official gazettes and in local newspapers; the bill must be prepared and lodged in the private bill offices of both houses of Parliament; estimates of cost and copies of the documents must be filed with the Board of Trade and other departments concerned.

Next follows a preliminary inquiry to determine whether all

the parliamentary standing orders have been complied with, and a bill may be thrown out at this stage before receiving any consideration on its merits.

Passing this inquiry safely the bill is introduced in one house and read a first time; a few days later it is read a second time; occasionally there is opposition at the second reading and bill are sometimes, though rarely, thrown out at this stage. On second reading the bill is referred to a select committee of four or five members, which hears all evidence for and against the bill; promoters and objectors are represented by counsel and the fight may last for weeks. If the committee rejects the bill it is practically a final decision, as the house will not readily overturn a committee's findings. If the committee's report is favorable the bill is read a third time and sent to the other house, where it must run the same gauntlet. Bills sometimes fail of passage in the second house. After passing both houses the assent of the crown makes the bill an act.

All this, it can be readily seen, involves great expense, as the parliamentary fees are heavy, besides the engineering and legal expense incurred.

2. It may proceed by provisional order, a cheaper method, but seldom resorted to for large schemes. In this case the promoters apply to the Board of Trade for an order to construct the line. The Board holds an inquiry, hears all parties, and if it thinks proper grants an order, which is provisional until confirmed by Parliament. This order is similar in form to a private bill. The Board groups a number of these orders and then introduces a bill to confirm them.

3. It may apply for a Light Railway order. The Light Railways Act provides for three commissioners to whom application must be made for the construction of proposed light railways. The proposal is accompanied with plans and estimates and after notices are given to the parties affected the commissioners hold an inquiry and if, after hearing the evidence, they approve of the scheme, an order is issued and sent to the Board of Trade for confirmation. Objectors may be again heard before the Board, which either confirms or rejects the order. When confirmed by the Board the order has the effect of an act of Parliament.

One main ground of rejection is that the proposed line will compete with an existing steam railway. It is especially provided in the Light Railways Act that if a proposed light railway will materially affect an existing railroad the Board shall not confirm the order, but refer the promoters to Parliament. Such a case is hard upon the promoters, as they must then incur all the expense of promoting a private bill.

It is now clearly determined that when proposed tramway lines lie in the jurisdiction of more than one local authority they may be sanctioned as light railways, but if all in one jurisdiction the promoters must proceed by private bill.

A number of light railways are now under construction under orders which provide for longer tenures than would be the case under the Tramways Act and with a provision that if the local authorities buy the lines, the price shall not be the "old iron" value, but the value as a going concern.

In any case a company can scarcely hope to get a bill or order which is strongly opposed by the local authorities.

PULLMAN CO. WITHDRAWS FROM STREET RAILWAY FIELD.

It was last month announced that Pullman's Palace Car Co. had decided to abandon its street car shops. It is understood that this department has not been profitable during the last five years, and the company considered that the space and equipment could be used to best advantage by increasing the capacity of the other departments, which are now overtaxed. A new building, 140 x 192 ft., is in course of erection, and it, with the old street car shops, will be used exclusively for the repair of railroad coaches.

The Report of the Board of Directors of the American Society of Civil Engineers for the year 1899 shows a substantial growth in the society's membership, and a very satisfactory condition in its financial affairs. The net increase in membership during the year was 103. The total number of applications received was 259.

BOSTON TRANSIT COMMISSION.

The Boston Transit Commission on January 25th made its fifth annual report, covering the year ending Aug. 15, 1899, and from it we take some interesting data. Up to that date the net cost of the subway was \$4,141,900, and the total cost was estimated at not to exceed \$4,200,000. The net cost has since been reduced \$616,000 by a credit given by the city for certain property taken by the Commission and released to the city, it not having been needed in the construction of the subway.

In 1897 the utmost limit of capacity of the Tremont St. surface tracks was 200 cars each way per hour, and the rate of progress was often not more than two miles per hour. In October, 1898, the number of cars passing in the subway at the hours of greatest traffic was 282 per hour, the speed, including stops, being from seven to eight miles per hour.

At the date of this report the subway as a whole has been in use a little over 11 months. Statistics for the full year cannot, therefore, be given. It is, however, believed to be a safe estimate that the use of the subway for the first 11 months has been at the rate of at least 50,000,000 passengers per year. The Boston Elevated and the Lynn & Boston together operate in Boston and vicinity over 400 miles of track, reckoned as single track, and in the year 1897 to 1898 carried in round numbers 200,000,000 passengers. The trackage in the subway is one-eighth of this total trackage (5 miles out of 400), and yet it appears as above that of the total number of passengers carried on all the 400 miles of track of these two great roads, about one out of four passes through some portion of the subway.

The traffic at the Park St. Station was expected to be, and is, greater than that at any other station within the subway. The number of people who pass up and down the stairways to this station is about twice as great as that using the Scollay Sq. Station, which is the next largest in point of traffic. The Park St. Station, moreover, is used as the general transfer station for the subway. This transfer traffic does not use the stairways, but it increases the use of the platforms by about 42 per cent. From statistics furnished by the elevated railway company, it appears that during the first 11 months of the operation of the subway as a whole the passenger traffic on the two island platforms at this station, which platforms have together an area of 15,197 sq. ft., a little over one-third of an acre, has been at the rate of 27,400,000 per year. In amount of passenger traffic the Park St. Station ranks among the largest in the world.

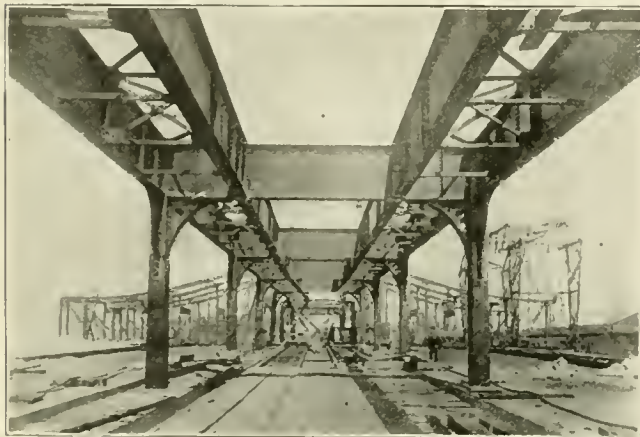
St. Louis Union Station.....	8,000,000
Grand Central Station, New York.....	14,000,000
South Union Station, Boston.....	21,000,000
North Union Station, Boston.....	23,108,384
Broad St. Station, North London R. R.....	27,000,000
Park St. Station, Boston Subway.....	27,400,000
Waterloo Station, London.....	28,659,118
St. Lazare Station, Western Ry., Paris.....	43,062,688
Liverpool St. Station, Great Eastern R. R., London	44,377,000

At first there was well-grounded complaint as to crowding, hustling and confusion on the easterly side of the westerly platform between 4:30 and 6 p. m. This side of the platform at the



CAR INDICATOR AT PARK ST. STATION.

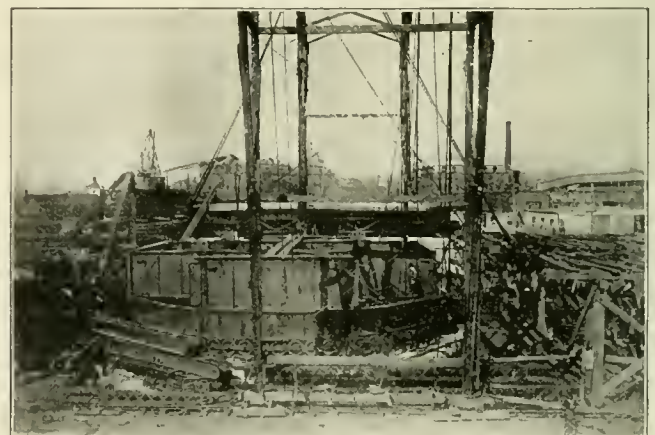
time of maximum traffic was served by about 108 cars per hour. They ran on more than 20 different routes, and came to the station platform without fixed order. The passengers did not know what cars were coming nor where they were to stop. They crowded to the edge of the platform in order to get the first view of the incoming car, and those whose car had not arrived blocked the way of those attempting to get on board. The conclusion was reached that the only satisfactory remedy lay in the use of indicators showing before the arrival of each car to what line it belonged, and the point in the platform opposite to which it would stop. Electrically



ELEVATED STRUCTURE ON CHARLESTOWN BRIDGE.

Had it been permissible to lay out the station without limitations as to its size and shape, it could have been so planned as to accommodate the traffic more conveniently; but in spite of the enormous amount of traffic and the limited space available for handling it, the business is now being conducted without serious crowding or discomfort. The limit of capacity has not been reached. There has never been any complaint of crowding on the easterly platform, nor on the westerly side of the westerly platform.

Other great stations with the total number of passengers per annum are:



TURNTABLE OF DRAW SPAN.

illuminated indicators were, at the request of the commission, installed by the Elevated Railway Co., and have been operated during the hours of largest outgoing traffic, namely, from 3 to 6 o'clock in the afternoon.

When they are in operation, a passenger can wait in the central part of the platform till his car is announced, and he then has half a minute to walk to the berth. As shown in the illustration, the indicators have the names of the routes on which the cars run arranged in parallel columns. At one side of the name of each route is a set of five pigeon holes, each with an incandescent lamp, which,

when lighted, displays a figure from 1 to 5, indicating the berth at which the car will arrive.

Counts of traffic taken in Tremont St. in December, 1894, and in December, 1898, the latter date being three months after the surface tracks had been removed showed that the vehicle traffic, exclusive of cars, had increased 29.4 per cent, the number of persons in vehicles, exclusive of cars, had increased 36.2 per cent, the number of pedestrians had increased 10.6 per cent, and the total of persons in vehicles and on foot had increased 12.2 per cent.

Analyses of the air in various parts of the subway show from 7.8 to 9.5 parts of carbonic acid gas in 10,000 volumes. On the



DRAWSPAN OF CHARLESTOWN BRIDGE.

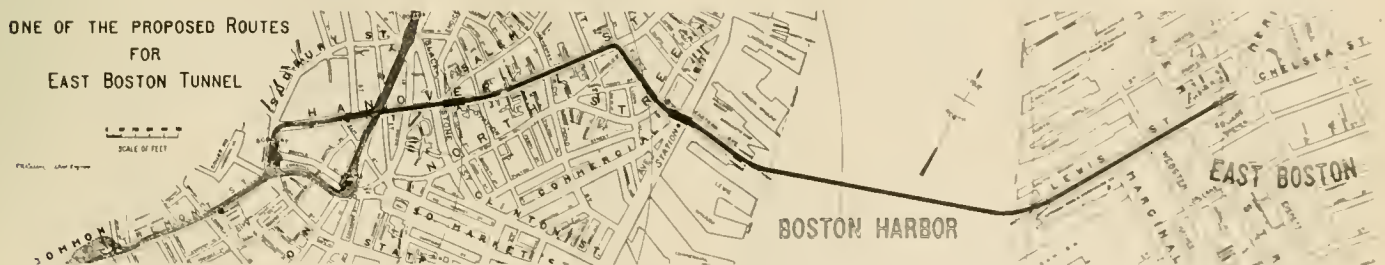
street in the central part of the city at about the same time of the year the proportion of carbon dioxide was from 4.5 to 5.9 parts in 10,000; while in various public halls and theaters it was found to be from 10 to 49 parts in 10,000.

During the year the engineering department has been engaged in making borings and preparing plans and drawings for the tunnel under Boston Harbor, which is to connect East Boston and the subway.

The act providing for the Boston Subway required the Transit Commission to build a new bridge over the Charles River and in 1897 the Boston Elevated Ry. was authorized to construct its tracks over this bridge. The permit from the secretary of war authorizing the new bridge required the removal of the old Charles River bridge, which work has been contracted for.

Work on the Charlestown bridge was begun in August, 1896, and was under way for a little more than three years. The drawspan was first moved by hand July 6, 1899; on Aug. 8, 1899, it was operated by electric motors.

The bridge with its approaches has a total length of 1,920 ft., 1,000 ft. being over water. It is of steel on stone piers. The width is



100 ft., which is divided into two footways 10 ft. wide, two roadways 29 ft. wide, and a central space for street car tracks 22 ft. wide. The central space may be used by teams except so far as the posts of the elevated railway structure act as a barrier. The fixed spans are 85 ft. each, and the draw span 240 ft. The draw has a clear height of 23 ft. above mean high water; it rests on a central pier. The circular track on which the span turns is 54 ft. in diameter. The weight of the draw span is 1,200 tons. The A. & P. Roberts Co. furnish the steel for eight of the fixed spans, and the Pennsylvania Steel Co. that for the other two fixed spans and for the draw.

The grades for the approaches of this bridge do not exceed 3 per cent.

The Boston Transit Commission consists of George G. Crocker, chairman; Charles S. Dalton, Thomas J. Gargan, George F. Swan, Horace G. Allen, B. Leighton Bell is secretary, and Howard A. Carson, chief engineer. William Jackson is chief engineer for the Charlestown Bridge.

ECONOMIC RAILWAYS FOR COUNTRY DISTRICTS.

From a paper by E. E. Russell Treatman, associate editor of Engineering News, read before the Illinois Society of Engineers and Surveyors.

Where cheap railways for light traffic are to be built, and especially when they are to be operated as independent enterprises, it is important that good engineering skill, good business judgment and good executive ability should be combined in their promotion. Great pains must be taken to adopt the most advantageous location for securing traffic and for operation, while in construction the lowest possible cost must be aimed at. Care must be exercised, however, that the construction is not of such a cheap and flimsy character as to impair the operating capacity of the road at moderate speeds (with due regard to the expected train loads), or to impose heavy maintenance expenses.

About ten years ago, an interesting paper on "The Cheapest Railway in the World" was presented to the American Society of Civil Engineers, by Mr. Arthur Pew. The conditions were to build the very cheapest road that could be built, very little money being available. The line was Dublin to Wrightsville, Ga., 19 miles, passing through moderately rough country and crossing two rivers and several smaller streams. Convict labor was employed, clearing the forest for a width sufficient for the roadbed, then doing the grading, and then clearing the right of way and making ties from the trees. The contract price for this labor was \$1 per day per man. The grading was light, averaging about 4,000 cu. yd. per mile, and cost about 9 cents per cu. yd. The ties cost about 10 cents each. The cost for the first 11 1/2 miles, all ready for the rails, was \$1,005 per mile for clearing, grubbing, grading, ditching, ties and trestles. Adding the expenses for right of way and for engineering, the average cost was \$1,164 per mile. With the 19 miles all built and ready for traffic, with track, stations, water tanks, etc., the cost was \$3,441 per mile. It is to be noted that the company did not make the mistake of trying to economize in the engineering, and Mr. Pew stated it was generally considered that the care with which the location was made was an important element in assuring the construction of the road. Another reason for the low cost was that there were no middlemen to divide the profit. The management did not pride themselves so much on building a cheap road as on doing so much good work at such small expense.

Mr. Pew informs me that he has since built other roads even more cheaply, owing to the following conditions: (1) A smoother country; (2) the lower price of rails; and (3) the use of lighter rails. The

very cheapest road that has come under his observation (and which was built under his supervision), cost about \$2,300 per mile, all ready for the rolling stock.

Railways of this character have been built in the South Atlantic states, in broken and undulating country, at a cost of \$2,500 to \$3,000 per mile, the cheaper ones being mainly for hauling lumber. The maximum grades are from 2 to 2.6 per cent in the direction of the heaviest traffic, and 2.75 to 3.25 per cent in the opposite direction, while the curves are from 6 to 10 degrees. Earthwork is kept as light as possible, and rock cuts are avoided when practicable by

shifting the location. The width at sub-grade is usually 12 ft. in cuts and 10 ft. on banks. The grading is done by small local contractors or by men employed by the railway company and directed by a good foreman. State convicts are also employed. The contractors usually bid on the work at about 6 to 9 cents per cu. yd. for aggregate excavation and filling, without taking haul, waste or borrow into account. The grading on the lighter lines costs about \$100 to \$200. On a heavier line, with elevations of 200 ft. in 1 3/4 miles, and 300 ft. in 3 miles, with some extensive cuts and fills, and some rock work, the cost was \$650 per mile for grading, with a total of \$900 per mile for grading, pipe drainage, trestles, etc. Wooden box culverts are used in light fills, and pipe culverts in larger fills, while for creeks and small streams the grade is kept as low as possible and low trestles are put in. For spans of 30 to 45 ft., the abutments consist of double trestle bents on cribs, these cribs having sheet piling inside and outside.

The engineers for such railways are usually employed by the week or month to locate the line, establish grades, furnish plans for trestles, etc. They sometimes set the center stakes only, but on heavy work or on work done by contract they usually stake out the work in the ordinary way.

For lines of this character the ordinary standard gage should be adopted, although there are some cases where narrow-gage lines have been used with fair success, though they involve break of bulk for all freight. As a rule, little is to be gained by the adoption of a narrow gage, but if it is adopted, then the gage should be really narrow, say 24 in., and in no case exceeding 36 in. In Maine there are seven lines of 24-in. gage, aggregating 150 miles in length, the longest being 44 miles and the shortest 4 miles in length.

This paper would not be complete without some reference to the electric railways for country districts, although these are built mainly for passenger traffic, and accommodate freight traffic as a side issue. The Philadelphia & Westchester Electric Ry. is 20 miles long, and passes from the city's suburbs through a rich farming country. The grades are 4 to 6 per cent, some of them 3,500 ft. long. The track consists of 58-lb. T-rails on ties 7 ft. long, 5 x 7 in., spaced 2 ft. c. to c. For carrying milk and farm produce, there are double-truck cars 36 ft. long in the body and 46 ft. over the vestibuled platforms. This road cost about \$23,000 per mile, exclusive of buildings and power plant.

The Dayton & Western Traction Co., extending 25 miles from Dayton, O., to Eaton, passes through a number of small villages and towns in a farming district, in which carriages and wagons were the only means of transportation until this line was built. The track is laid at the side of the National Turnpike Road, and in 22 miles there is but one curve. The maximum grade is 4 per cent, and there are also grades of 3.85 per cent for 2,600 ft., and 3.5 per cent for 1,700 ft. on a long grade six miles in length. There are 19 steel bridges of 10 to 154 ft. span; all built alongside the county highway bridges on independent abutments. One is a through truss bridge, all the others are deck plate girder bridges. The track is laid with 70-lb. T-rails, with girder rails in the streets of Dayton and Eaton, all rails being 60 ft. long. The ties are 7 ft. 6 in. long, 5 x 7 in. section, about 80 per cent being white oak and 20 per cent chestnut. The gravel ballast is 6 in. deep under the ties. The passing sidings are 200 ft. long, and there are two railway grade crossings, both fitted with derailing devices. The power plant comprises two Buckeye tandem compound engines of 250 h. p. each coupled directly to a Siemens & Halske dynamo of 250 kw. There are also two Babcock & Wilcox water tube boilers of 250 h. p. Double truck cars are used, and the traffic includes passengers, packages, light freight and general freight.

These electric railways are usually built wholly or mainly along existing roads, and the earthworks are therefore very light. Wooden trestles, occasional steel or stone bridges (when highway bridges are of insufficient strength), subways under steam railways, and the necessary power houses, are the principal structures. These electric railways, however, represent a considerably higher cost than the cheap style of railways above noted, for while they have usually but little earthwork, yet the poles and wires represent a considerable expense, and a power plant is a necessity and its first cost is large. Such a plant, too, is often worked uneconomically under the conditions of service, although the economy may be greater in cases where the plant can be utilized for lighting and for general power purposes, as well as for railway service. A low estimate for a line of this character is \$12,000 per mile. The cost of the Dayton &

Western Electric Ry., already mentioned, was about \$16,000 per mile, all complete. This includes the grading, track, overhead work, power plant, buildings, etc., in fact for the road complete and ready for traffic, but exclusive of rolling stock.

For purposes of comparison, it may be noted that a double track electric line substantially built for fast traffic and having its own right of way, masonry culverts, and a third of a mile of trestle, cost about \$31,500 per mile.

Where conditions are such that it is essential to reach the very lowest point of first cost, the steam railway has a more favorable showing, and this is especially the case where the line is built across country. There is, however, a third and intermediate character of railway that may be adopted to advantage where the existing highway affords an easy route with a small amount of grading, bridging and trestling. In this case the line could be built practically the same as the light electric railways, but without poles, wires, or power plant. The power would be furnished by gasoline, oil or other engines, with suitable gearing and connections, mounted in a car and driving one of the trucks or axles. In such a line, probably the very lowest figure for construction could be reached, while the cost of rolling stock and its operation would be materially less than for ordinary steam locomotives and cars.

Appended to this paper is a general estimate of cost per mile for a light country electric railway five miles in length, with a limited amount of traffic:

80 tons of 50-lb. rails, at \$35.....	\$2,800
360 angle bar joints, at 85 cents	306
2,640 ties, at 35 cents.....	924
30 kegs of spikes, at \$5.10.....	153
360 rail joint bonds	144
Miscellaneous material	150
Grading	300
Tracklaying, surfacing and bonding	1,320
Teaming and incidental expenses and labor.....	300
45 cedar poles, at \$2.40.....	108
45 pole arms, at \$2.00	90
Overhead wire and material	445
Labor	200
Special work	300

Total cost of construction per mile.....	\$7,540
Power plant, at \$10,000.....	2,000
Power station and car house, at \$5,000.....	1,000
Total cost per mile	\$10,540

AUTOMOBILES VS. STREET RAILWAYS.

In a paper on the advantages of automobiles, read before the English Automobile Club, Mr. R. E. Crompton, a prominent electrical engineer of unquestionable standing in the profession, makes the startling statement "that a line of motor omnibuses running at an average rate of 10 miles an hour, following each other in the same direction at intervals of 100 ft., would be able to transport past a given point no less than 14,080 passengers per hour, whereas the maximum capacity of an electric tramway is stated by experienced tramway managers not to exceed 3,000 passengers per hour; and the Metropolitan Ry. of London, worked to its maximum capacity, cannot carry more than 10,000 passengers per hour in one direction."

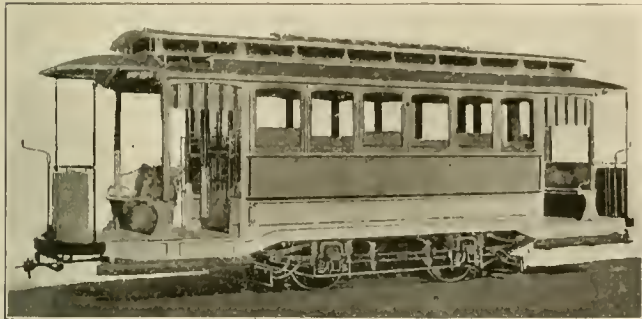
We cannot tell where the gentleman obtained his figures, but can see no very good reason—and the paper does not enlighten us upon the subject—why street cars of the same carrying capacity as the above mentioned motor omnibuses could not be run at an average speed of 10 miles an hour and 100 ft. apart, if the possible traffic in any particular locality would warrant such a service, and if in addition, as is pointed out in another column of this issue, the tram cars could be operated much more cheaply, we cannot conceive just where the advantage of the automobile 'busses comes in.

A conductor on the Toronto (Ont.) Ry. has been granted \$1,200 damages in a suit against the company for injuries received by being struck by a wagon as he was standing on the running board of an open car while in the discharge of his duties.

CALIFORNIA TYPE CARS.

The accompanying illustration shows one of a lot of cars built by the J. G. Brill Co. for shipment to Geneva, Switzerland; it is quite similar to a number built at the same time for the Redlands Electric Light & Power Co., Redlands, Cal. The Geneva car is a modification of the California type; among the changes may be noted the single reversible seat on each platform and the omission of the bulkhead. The car is 15 ft. 5½ in. long in the body, 35 ft. 7½ in. long over the dashes, a trifle over 5 ft. wide at the sills. The truck is the Brill No. 21 B, with a wheel base of 6 ft., and 30 in. wheels; the gage is 1 m. (39.37 in.). There are two motors, and the weight complete is 8,450 lb.

The seats inside are longitudinal, of spring cane, and the platform seats cherry and maple slats. The inside finish is of white ash with birch veneer headlinings; the blinds are cherry and maple slats. The platforms of these cars are protected at the sides by curtains in the usual way. In front of the seat, however, a curtain of the old fashioned type not mounted on a roller is fitted to come



CALIFORNIA TYPE CAR FOR SWITZERLAND.

down to the dasher. This leaves the whole front of the car open so that in bad weather the forward seat will be practically unused. These changes seem to be ill-advised.

The Redlands car is 13 ft. 6 in. long in the body and 28 ft. 7 in. over the dashers. Though considerably shorter than the Geneva cars, this car having bulkheads and two seats on each platform accommodates 10 more persons on the platform seats, while the interior seating capacity is only two less. The wheel base of this car is 7 ft. 6 in. The introduction of the bulkhead with sash dropping between the backs of the platform seats enables one seat on each platform to be completely enclosed in case of stormy weather, and from an American standpoint, therefore, this car is much better suited for an all round winter and summer service than the other.

There is little reason to doubt that when the California type once gains a foothold in Europe it will become quite as popular there as it has on the Pacific Coast in the United States. The monetary advantages of having all the passengers on the lower deck will no doubt influence the railway companies more strongly than the prejudices of the people. That they must have open cars on the other side is a well recognized fact, and to dispose of the open seats on the top of the car is too costly a proceeding for the tramway companies to tolerate.

ANNUAL REPORT OF OTTAWA ELECTRIC RY.

At the last annual meeting of the shareholders of the Ottawa (Ont.) Electric Railway Co., Pres. T. Ahearn submitted the annual report of the company for the year ending Dec. 31, 1899. In transmitting his statement, he called attention to the good state of repair in which everything connected with the system has been kept, and also made the following statement: "In order to provide against the disablement which an accident to the power house would probably cause, a duplicate power plant, consisting of a set of horizontal water wheels of 1,800 h. p. capacity, directly connected to a generator of a similar capacity, is now being installed and will be ready for operation within a few weeks. The new plant will be housed in fire-proof buildings.

"In September last a contract was made for the building of a 4½-mile extension to the company's lines from Holland Ave.,

in Hintonburgh, to Britannia on the Bay, the only safe beach for bathing in the neighborhood of Ottawa. The line is double tracked, with 72 lb. rail. A Sunday car service was inaugurated on the entire system on July 23d last."

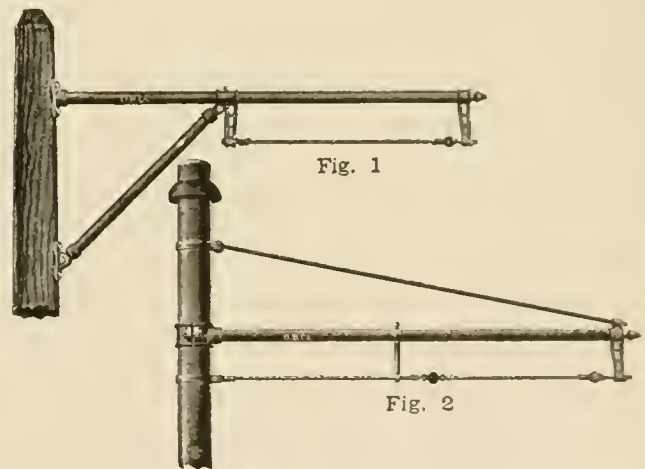
The financial report for the year is as follows:

	13 Mon	13 Mon	13 Mon	13 Mon	13 Mon	13 Mon	13 Mon	13 Mon	13 Mon
	end g 31st	end g 31st	end g 31st	end g 31st	end g 31st	end g 31st	end g 31st	end g 31st	end g 31st
	May 1897	May 1897	May 1897	May 1897	May 1897	May 1897	May 1897	May 1897	May 1897
GROSS RECEIPTS	\$2,668 77	\$1,102 50	\$1,068 70	\$1,032 36	\$1,017 98	\$1,110 30	\$1,223 61	\$1,311 80	\$1,245 54 4
TOTAL EXPENSES	45,199 51	30,771 25	31,324 84	178,335 97	123,983 09	144,361 71	37,041 74	156,158 94	178,462 60
NET PROFIT	26,499 19	39,850 48	47,159 58	11,653 59	154,192 50	97,748 61	77,320 65	1,152 86	45,992 94
PASSENGERS CARRIED	1,526,405	7,364,504	2,797,293	4,130,094	12,461,175	4,583,238	4,769,707	5,123,928	5,933,429
PERCENTAGE OF OPERATING EXPENSES TO RECEIPTS									177

FLEXIBLE POLE BRACKETS.

A demand has long been felt for a suitable pole bracket combining strength and perfect flexibility, as the old type of a rigid pole bracket has in many cases proved unsuitable on account of the constant pounding effect of the trolley wheel in passing under the hanger. To meet this demand for a flexible support for the trolley wire the Richmond flexible pole brackets have been placed on the market by the Ohio Brass Co., of Mansfield, O.

These brackets are furnished in styles designated respectively as "A" and "B"; style A is supported from beneath with a brace arm (see Fig. 1), while style "B" is suspended from above by means of an iron rod support (see Fig. 2). Both styles are furnished for use



RICHMOND FLEXIBLE BRACKETS.

with iron and wood poles and also arranged for single and double suspension. These brackets are made exclusively of malleable iron castings of the best quality and either standard weight of wrought iron, gas and water pipe or, in some cases, of structural steel tubing. The design is such as to secure the utmost strength in all parts, at the same time preserving a symmetrical form, so that when the brackets are set up they present a very neat appearance.

These brackets are proving popular, and are now in use on many of the most important systems throughout the country; among these may be mentioned the Michigan Traction Co., Kalamazoo, Mich.; the Chicago, Harvard & Geneva Lake Ry., Chicago, Ill.; the Saratoga Traction Co., Saratoga Springs, N. Y.; the Syracuse (N. Y.), Lakeside & Baldwinsville Railway Co.; the Compania de Ferrocarriles del Distrito Federal de Mexico, City of Mexico.

The Oakland (Cal.) Transit Co. has been petitioned by its employes to raise wages from 20 cents to 21 cents an hour.

CORRESPONDENCE

A Plea for Equity.

Editor "Review": The following was suggested by reading in the "Street Railway Review" the remarks of Mr. G. T. Rogers, at the late convention held in Ithica, N. Y. He referred to the treatment and success of employes. His words are well worthy of being repeated, but it would be superfluous, as expressions so clean and talented as those were, must have made an impression on those who read or were fortunate enough to have heard them, which was so deep, that to refer to them is to call them back. Since reading the able address referred to, the writer (a working man) has been thinking of men and their relative positions, and in this light sends these lines, hoping that a closer and more perfect knowledge may be had between the men who give the orders and those who execute them, and that this may help to open the way for a still greater success. Let me say that in this instance the term manhood does not imply either blue overalls or a high collar, nor, in fact, any particular uniform, but the term will be used simply in its best and highest sense, regardless of position or apparel. As men, we are not all good, nor all bad, but are so placed in this world that we form a certain average. It is concerning this average I would write.

There are characteristics in each individual which neither education, financial standing, or position change, and a trouble seems to be that one person is not willing to accept from others what he practices himself. To illustrate: Does it not seem strange that the more greed a man has in his nature the less he wants to see it in those around him? If he should occupy a position of authority his greed is only measured by his zeal in striving to make those under him particularly generous in his service, even to the extent of forgetting that his motives are seen about as plainly as his face. "Like begets like." The manager or superintendent whose character is selfish, with very few exceptions will have careless, lazy men to work under him. If there is not a spirit of justice on the one side it will not be shown on the other. To expect any other result is folly. It is a case of cause and effect, and is as legitimate as one link following another in a chain. On the other hand, what is more justly provoking or disgusting than to see a man who has received all that could be done for him by an employer, remain unfaithful and lazy, even to the extent of thinking that because he may have been favored he has an assumed right to imagine that he is indispensable and makes his kind treatment a license to trample on forbearance. In either condition this spirit is liable to pass the limit and so recoil upon itself. Should we not try to learn the lesson that "whatsoever a man soweth that shall he also reap."

It is to be regretted that the sentiment of distrust has taken possession of mankind and made every man suspicious of his fellow. This tendency is degrading. There is probably nothing so productive of crime and dishonor as to place a man in a position where he is continually compelled to realize that he is looked upon as dishonest. Should this occur in such a relation as employer and employe on a street railway system it makes a gap which nothing on earth can bridge.

Employes may receive many tokens of kindness or respect as a body or singly, but there remains a condition of feeling that is not spoken and could not be expressed in language. It must not be mentioned, particularly by the workman, as he learns in a sense to feel dependent on his employer to feed the little ones at home. So he retires within himself and becomes a sort of man-machine. It is impossible to conceive how there can be any feeling of interest in favor of the person or company from whom he draws a salary. The service becomes a compulsion and a study how the least can be done to hold a position and draw the pay. There is also a dangerous sentiment which is falsely called socialism; on the contrary it is anarchism and is productive of very much harm, not only to workmen themselves, but to the community where they live. One particular tendency of this sentiment is to assume that all accumulated wealth is a robbery of workmen and a crime; this is wrong. And a spirit of hate and envy is also engendered by this false theory.

We will admit that there are crimes committed in the name

of business at which a highway man might blush with shame. But to indiscriminately charge that all success in business is robbery is as lamentable as it is false. It is a fact not to be questioned that many of the wealthy men are among the best in the Union. An exhibition of ability and ambition is not measured simply by ability to make money. On the contrary, where the mental caliber is large and natural impulses are high, success will surely crown the effort. There is a vast difference between simply scheming to get money, and being filled with a noble impulse to be, and make the world, better. Less capable men do themselves a great injustice by attempting to lower the standard of the best. The watchword of every American should be "Upward," not "Downward."

We cannot afford to retrograde in any degree from our high position among the nations. Fellow workmen, let us be true, rather than allow jealousy to control our thoughts. It is quite natural that persons holding inferior places should to some extent look to superiors for a pattern. Custom has made it almost a law and officials should not so far forget themselves in pushing affairs entrusted to them that equity is in any case forgotten or placed on file. But, remember they are dealing with men exactly like themselves, who, although they may not remind them, are taking note and are very quick to read between lines and see the motives that govern all notices which may be posted. And where injustice is intended, a reward will surely be meted out in some way. It is quite possible that a president or general manager may issue an order in the best of faith that all under him shall have good wages and just treatment, and yet have his orders basely misrepresented by some person in office under him who is incompetent and who seeks to shield himself by treachery and unjust actions, thereby defeating plans and bringing discord where peace and full success would have reigned.

"Then let us pray that come it may,

As come is will for a' that.

That sense and worth o'er all the earth,

May bear the gree and a' that

For a' that and a' that,

It's coming yet for a' that

That man to man the world o'er

Shall brothers be for a' that."

ONE OF THE MEN.

TWO OPINIONS ON ICE SKATING FACILITIES.

Concerning the advisability of furnishing places along street railway lines where ice skating can be enjoyed during suitable weather, and the increased traffic that comes from the skaters, J. P. E. Clark, general manager of the Binghamton (N. Y.) Railroad Co., writes as follows:

"We have had no experience in maintaining an ice skating rink and have never considered the question seriously for the reason that we have two rivers that intersect our city, besides numerous small ponds and lakes in close proximity to the town, affording unlimited resources to those desiring to indulge in the winter pastime. However, we carry a great many passengers to and from the various bodies of water where the sport is indulged in, as is evinced by the large number of people who carry skates while riding upon our cars. I will state unreservedly that if the natural facilities for skating were not so numerous in this vicinity we should provide skating facilities, as I am positive it would prove an excellent stimulant for street railway traffic."

A company in New England serving a large lake at the end of one of its branches writes, under date of January 23d:

"Our first skating was on December 30th, and since that date we have had skating on 17 days, and the receipts have been much greater than the expenditures. We have to pay the ice company \$75 for the season for the privilege of using the ice for skating. We maintain some arc lights on the lake, and our other expenses are for clearing the lake of snow, which this season has been very small, owing to our not having over 2 in. during the winter. If we have much snow the expense of removing it from the lake would very rapidly decrease the profits. We make no charge for entrance on the ice."

The Duluth (Minn.) Street Railway Co. has for several seasons rented an abandoned car house to outside parties, who utilize it as a public ice rink. The company carries banners advertising the place, free of cost, on its cars.

OPERATING COMPANIES IN ST. LOUIS.

From time to time during the last year we have published notes concerning the consolidation of the street railways of St. Louis, the final result of which was to reduce the number of operating companies to three, or, more properly, two, as the Fourth Street & Arsenal R. R. is not now operating.

The most extensive of these is the St. Louis Transit Co., which began operating the properties of the United Railways Co., under a lease, on September 1st last; this company operates all the street railroads in the city of St. Louis, with the exception of the St. Louis & Suburban Ry. and the Fourth Street & Arsenal R. R. (not in operation).

When the St. Louis Transit Co. took charge of these properties the mileage was as follows:

	Electric.	Cable.	Total.
Union Depot	75.87		75.87
Lindell	75.11		75.11
Missouri R. R.....	16.61	9.60	26.21
People's Ry		9.50	9.50
National Ry.....	62.97	14.62	77.59
Southern Electric Ry.....	22.50		22.50
Jefferson Avenue Ry.....	6.70		6.70
Total	250.76	33.72	293.48

The Lindell had also built 12.1 miles and the National 2 miles not yet in operation, and if to this is added the track now under construction by the St. Louis Transit Co., 22 miles, the total trackage of the company is 329.58 miles. During the coming season the cable roads are to be changed for overhead electric operation, and within the next two years the company expects to increase its mileage.

The officers and operating staff of the St. Louis Transit Co. are: President, Edwards Whitaker; vice-president, Murray Carleton; general manager, Jilson J. Coleman; superintendents, G. W. Baumhoff, G. W. Hunter, Joe S. Minary, Jas. F. Davidson, John Mahoney; secretary and treasurer, James Adkins; auditor, Frank R. Henry; purchasing agent, J. Boyle Price; chief engineer, W. Jens; master mechanic, F. S. Drake; superintendent of overhead lines, John J. Lichter; engineer of power stations, S. G. Hill.

The lines are divided into five divisions, each under a superintendent. The divisions are: Lindell, including the lines formerly operated by that company; G. W. Baumhoff, superintendent. Southern, including the Southern Electric and the southern lines of the Union Depot; G. W. Hunter, superintendent. Northern, including the northern lines of the Union Depot, the Cass Avenue, the Northern Central, the Citizens and the Union; Joe S. Minary, superintendent. Central, including the Missouri and the Jefferson Avenue; Jas. F. Davidson, superintendent. Eastern, including the St. Louis Traction Co., the St. Louis R. R., the Baden & St. Louis and the Southwestern; John Mahoney, superintendent.

"The Suburban" operates the St. Louis & Suburban Electric Ry., the St. Louis & Meramec River R. R., and the St. Louis & Kirkwood R. R., and is closely allied to, and will operate, when completed, the Brentwood, Clayton & St. Louis R. R., which is to build this year.

The officers and staff of the St. Louis & Suburban are: President, Chas. H. Turner; vice-president, Samuel M. Kennard; general manager, Thomas M. Jenkins; secretary and treasurer, Thomas C. Kimber; chief of departments, W. C. Jenkins; auditor, L. C. Shipherd; division superintendents, Jas. A. McCabe, D. R. Redden, and Chas. J. Crane; master mechanic, G. J. Smith; engineer of maintenance of way, Chas. S. Butts; superintendent of lines, Nathan Smith; superintendent of power stations, H. W. Tingley.

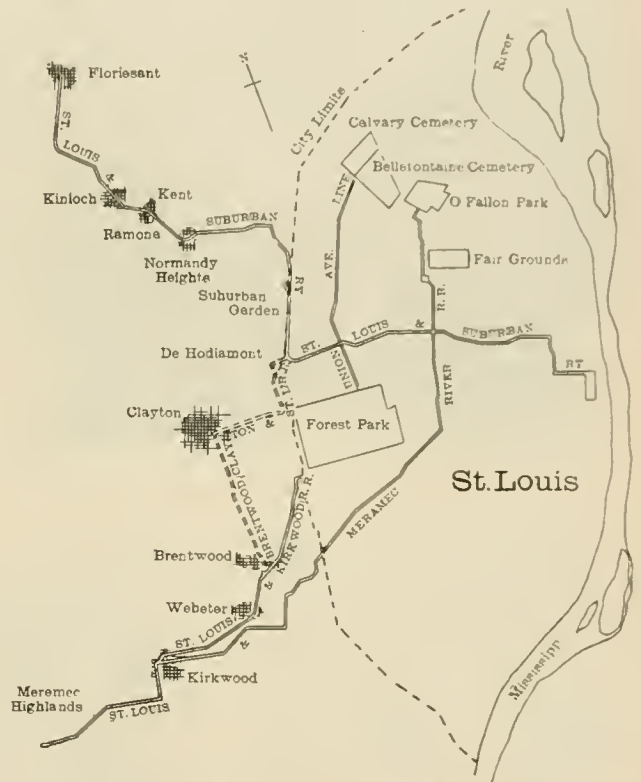
The officers of the St. Louis & Meramec are the same, with the exception of the vice-president, J. B. Chase. The St. Louis & Kirkwood has the same officers, excepting the president, James P. Dawson. Hunt Turner is president of the Brentwood, Clayton & St. Louis R. R., otherwise the officers are the same.

The Suburban system comprises a total of 91.68 miles (measured as single track), and the territory covered is shown in the accompanying map. The St. Louis & Suburban proper has a loop for a down-town terminus and extends beyond the city limits to the towns Normandy Heights, Ramona, Carsonville, Kinloch and Florissant. The St. Louis & Meramec road connects Meramec

Highlands and Kirkwood, and from Kirkwood extends to and through the city, passing the Fair Grounds (St. Louis race course) and terminating at O'Fallon Park. The St. Louis & Kirkwood extends from Kirkwood to the city limits of St. Louis. The northern portion of the St. Louis & Meramec River road was built in 1899. An addition to the St. Louis & Suburban road (the Union Ave line), extending from the Forest Park to two large cemeteries in the northern part of the city is almost completed, the greater portion of the work having been done last year. The Brentwood, Clayton & St. Louis road (13 miles) is to be built during the coming year, and, as will be seen from the map, will make a valuable addition to the property.

The management is now extending every effort to improve the physical condition of the road and its equipment and increase the economy of operation. We understand that the cost of operating for 1899 was about 25 per cent less than for the preceding year, and further reductions are expected.

The track is laid with Cambria and Johnson rails, weighing from 40 to 60 lb. per yd., laid on 6 x 8-in. oak ties, spaced 2 ft. c



MAP OF ST. LOUIS & SUBURBAN SYSTEM.

to c. The trolley wires are No. 0 and No. 00, and over a considerable portion of the route are carried on iron poles.

The rolling stock comprises 24 convertible and 130 closed cars, which were made by the St. Louis Car Co.; they are all mounted on maximum traction trucks and equipped with G. E. 1200, G. E. 57, and Westinghouse No. 38 motors. Electric heaters made by the Consolidated Car Heating Co. are used. The company operates two power stations. One is at DeHodiamont Station, and is a brick building 232 x 129 ft.; its equipment comprises five Hamilton-Corliss (Hooven, Owens & Rentschler Co.) engines aggregating 6,000 h. p., belt connected to 14, and direct connected to G. E. generators, having a total rated capacity of 2,950 kw., and 18 boilers of 250 h. p. each. The second station is at Brentwood: it is 72 x 60 ft. equipped with three engines (Porter-Allen and St. Louis Corliss), aggregating 1,500 h. p., three Westinghouse generators of a total capacity of 725 kw. and eight 200-h. p. boilers. Current is generated at from 565 to 575 volts.

Car houses are located at DeHodiamont, Benton, and Brentwood, having capacities of 85, 85 and 15 cars, respectively; all are brick buildings. The shops are at DeHodiamont.

READERS who note errors in our "Directory of Street Railways" will confer a favor by sending us corrections.

LONDON (ONT.) STREET RAILWAY REVERSES.

As a result of the recent strike, the report of the London (Ont.) Street Railway Co. for the past year, shows, as compared with the year previous, a decrease in gross revenues amounting to \$53,864.19. All shareholders were present at the 25th annual meeting of the company, held in London, January 24th, on which occasion the following report was rendered by Pres. H. A. Everett:



IN A MICA VEIN.

"Your directors beg to submit statement of the past year's business, showing gross revenue of \$59,947.58, as against \$113,811.75 for the previous year. Operating expenses were \$66,872.10, as against \$65,665.23, an increase of 1.8 per cent. It is notable that the revenue increased during the first quarter of the year (when no strike was on) 10.2 per cent."

In previous issues of the "Review" we have given accounts of the strike which began May 22d, and culminated in a serious riot on July 8, 1890. The earnings of the company have long since returned to a normal figure, and show satisfactory increases over the



TRAIN LOAD OF MICA.

earnings of a year ago. The line is now operated with favorable prospects, and it has been decided to double track a portion of the system. At the meeting in London, January 24th, the old board of directors was re-elected. The board chose officers as follows: H. A. Everett, president; Mr. Smallman, vice president; Mr. Carr, general manager and secretary-treasurer, and Messrs. Moore, Wasson, Spencer and Broderick, directors.

PREPARING MICA FOR COMMERCE.

Mica, popularly called isinglass, is the name given to a group of minerals characterized by highly perfect cleavage, so that they readily separate into very thin leaves, more or less elastic. The different grades vary widely in composition and range in color from pale brown or yellow to green or black. This material is found in various parts of the world, but is mined in largest quantities in India, although good deposits are found in the United States



MOUTH OF ST. ANTHONY MINE.

and in Canada. The mineral is usually discovered in veins commencing at the surface of the earth and running down diagonally between lime rock walls, the vein occasionally spreading out into pockets. The mining operations are simple, although the mines are often found in remote and mountainous regions, necessitating long hauls in wagons. A vein is worked by drilling holes with steam drills and blasting away sections at a time, the chunks of mica being raised to the surface by derricks and packed in jute bags for shipment. North Carolina furnishes a goodly quantity of this material, it being one of the occupations of the mountain farmers of that state to "go prospecting" between crops. In fact, in some sections of the state mica forms the principal circulating medium between the farmers and the storekeepers. When the former require supplies they pay for them in mica, which is found in small quantities on the hill-side farms, and dry groceries, meat and clothing are quoted at so many pounds of mica.



SAMPLES OF CANADIAN MICA.
For British Section, Paris Exposition.

One of the largest dealers in this material in the world is the W. H. Sills Mica Co., and all the various processes of cutting, trimming and molding mica for its many commercial uses, are carried out at this establishment, located at 64 Michigan Ave., Chicago. This business was founded in 1885 by W. H. Sills, who is still at the head of the concern, so that he has been furnishing

mica to the trade for 15 years. In 1897, Clarence B. Wisner became interested in the company as its secretary and treasurer, having in charge the financial management of the concern. The company has a factory at Ottawa, Can., and owns a rich mica mine at Gracefield, Que., views of which are shown herewith. In addition to the supply received from its own deposits, it has agencies in several parts of the world, through which large quantities of the foreign product are purchased.

The first step in preparing the material to fill the requirements of the electrical industries is the splitting of the clunks into the thinnest sections possible. When the last sub-division is made, the pieces are little thicker than tissue paper. These are spread over a specially treated cloth to a depth of perhaps an eighth of an inch and are glued to the cloth and to each other by a composition paste. This makes a flexible sheet of insulating material, and in this form, with the addition of a layer of paper, it is used in the winding of armatures, etc. In making commutator segments and rings, alternating layers of mica and cloth are placed in a powerful hydraulic press, from which they come in the form of compact but pliable sheets, capable of being cut and molded into the various shapes employed in the construction of electrical machinery. The products of the W. H. Sills Mica Co. are sold under the trade name of "Micabeston."

In one of the accompanying views is shown a shipment of mica of which the company is justly proud, as it is probably the largest single shipment of this material ever made. The total weight of this consignment was 400,000 lb., requiring nine freight cars, running as a special train to carry it from the company's St. Anthony mine, at Gracefield, to Ottawa.

Two of the illustrations herewith show samples of mica prepared for exhibit at the Paris Exposition.

LOW FARE BILL FOR WASHINGTON, D. C.

A bill regulating the operating conditions of street railways in the District of Columbia was introduced last month in the House of Representatives, and will shortly be brought up for action.

The bill provides that the rate of fare for a single ride for a



LARGE ORDER OF MICA RINGS FOR UNION TRACTION CO. PHILADELPHIA.

continuous trip any distance in one direction over any of the street railway routes in the city of Washington, shall be five cents, and the passenger shall also be entitled to a transfer ticket, good for a ride over any other line or route operated or controlled by the same company, provided that such transfer is presented on the next regular car of such other route within 15 minutes after the passenger has left the first car. It is also provided that there shall be kept on sale on all street cars in service, between the hours of 5:45 a. m. and 8 p. m. of each day, tickets to be sold in strips or packages of eight tickets for 25 cents, each of which tickets shall be accepted the same as a 5-cent cash fare, between the hours named, and such ticket shall carry the same transfer privileges as a cash fare. In addition, the street railway companies must keep on sale on their cars in service between the hours of 8 p. m. and 5:45 a. m., tickets to be sold in strips or packages of six tickets for 25 cents, such tickets to be good only during the hours last named and to entitle the passenger to a transfer as in the other cases.

The bill orders that all street cars owned and operated in the city of Washington shall be properly vestibuled to protect the motorman from unreasonable exposure to the weather, and a failure on the part of any company to so protect the motorman shall be punished by a fine of \$50 per day for each car unfitted with vestibules. All lines in the city must run cars in both directions after midnight at intervals of 15 minutes until 5:45 a. m.

The act is to take effect Mar. 1, 1900, and the failure of any company to comply with the provisions as to rates of fare, will cause a forfeiture of its charter and franchises.



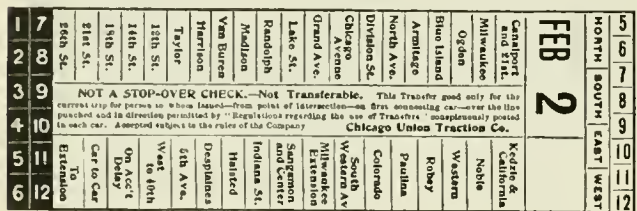
SAMPLES OF UNITED STATES MICA.
For Mines and Mining Section, Paris Exposition.

The Supreme Court of New York has decided that the New York, Westchester & Connecticut Traction Co., has no rights in East Chester and Bronxville, and can, therefore, not prevent the Union Railway Co. from completing its road from Mount Vernon to White Plains.

NEW TRANSFERS FOR CHICAGO UNION TRACTION CO.

On February 1st the Chicago Union Traction Co. commenced using a new transfer ticket that is something of a departure in its line. Prior to the consolidation of the North and West Chicago companies each of these systems had been employing a number of different forms of transfer tickets and after the merger no change was made in this respect. The complicated arrangement of the lines and the number of interesting routes, required the giving of from 200,000 to 250,000 transfers a day, or about 50 per cent of all the passengers using the cars of the Union Traction Co. The system in force necessitated the keeping of 10 or 12 separate plates and required the attention of a large force of clerks to oversee the printing, and distribution of each kind to the proper line. The checking up after the tickets had been turned in to the receiver was also an enormous task, as in each bunch returned by each conductor would be several of the different forms, requiring a great deal of work to sort and trace each form back to the issuing conductor.

The new tickets, one of which is shown herewith reduced in size, are 5 x 1 1/4 in., and will greatly simplify the labor of the transfer department, as well as reducing the work of the conductor. But two plates will be needed for the entire system owned by the



TRANSFER FOR WEST SIDE LINES.

Chicago Union Traction Co., one for all the West Side lines and one for the North Side lines. The ticket shown is the form for the West Side. The North Side ticket is the same in principle, but has a different set of transfer points. On each ticket is printed the names of all the routes, although transfers are not given from each route to all the others. In each car is posted a notice setting forth the lines to which transfers will be given from that car, and from what routes they will be accepted, and on the ticket itself is printed a notice calling the attention of the passenger to these regulations; this does away with the necessity of printing a long list of the possible transfer points on each ticket. The conductor giving the transfer stamps his badge number in the blank space in the lower right hand corner next to the date, and designates the line on which he is running by a double punch at the proper name, and the line to which the passenger wishes to transfer by a single punch mark. The stamping and double punching can be done at the barn before he takes his car out. Each conductor is provided with a self-inking rubber stamp on the end of his lead pencil for stamping his badge number.

The time of day is designated in the usual manner by punching shaded figures at the left for p. m. time and the light column at right for a. m. The day of the month is printed when the original impression is made. Tickets must be used on the first connecting car, but are good for an hour after time punched. Transfers are not given on transfers except at two or three specially designated points.

When the ticket is intended to be good in either direction on the intersecting line, no direction is indicated, but when it is to be used in one direction only, the conductor punches out one of the words, North, South, East or West, as the case requires.

In one of the columns of names will be noticed the words, "On Account Delay," "Car to Car," and "To Extension." These are punched with a single punch mark in addition to the other punches in special cases only. For instance, if a line is blocked and it is desired to transfer passengers to a nearby parallel line, the words "On Account Delay" are punched out. If a car cannot finish a trip and passengers are to be changed to a following car, a mark at "Car to Car" is made. "To Extension" is used when it is neces-

sary for passengers to walk around some obstruction on the track or break in the overhead work.

Before turning the transfers collected for the day into the office, the conductor stamps on the back of each his badge number and places a rubber band around the bundle. The number turned in must agree with the number entered on his trip sheets.

From this explanation, it will be seen what a saving in the work of printing and checking has been effected, as there are but two forms, and each ticket bears its own complete record of line from which and to which it is given, badge number of issuing and receiving conductor, and whether or not it has been issued for some special cause. It is thought, also, that the posting of the possible transfer points in each car will be a convenience to the public, as it will enable a passenger to decide the best way to reach his destination for a single fare.

ANOTHER 100 MILE LINE.

The latest "gigantic electric line," as it is termed by the daily press, to make its appearance, runs—on paper—from Tiffin, O., to Sandusky, O., and will be over 100 miles in length. After leaving Tiffin the road will pass through Old Fort, Fremont, Port Clinton and Toledo, thence along the shore of Lake Erie to Sandusky, by way of Lakeside and Marblehead. The Tiffin, Toledo & Sandusky Electric Railway Co. has been organized with a capital stock of \$3,000,000, to build the road, and the capitalists interested are said to include S. B. Hege, of the Baltimore & Ohio R. R., Washington, D. C.; R. W. Brown and Richard Young, of Washington, D. C.; S. B. Calef, of Middletown, Conn.; H. S. Frye, of Windsor, Conn., and F. A. Anderson, of Alexandria, Va.

RULES FOR CONDUCTORS.

The following rules for the guidance of conductors were issued last month by Supt. John N. Akarman, of the Worcester (Mass.) Consolidated Street Railway Co.:

"On and after this date conductors will be required to strictly observe the following rules: Remain on the rear platform when not collecting fares. Keep the car doors shut. Do not turn the signs until the car reaches the end of the route. Do not push in the front fender or pull out the rear fender until the car reaches the end of the route. See that every passenger gets a seat whenever there is any vacant space by asking those seated to make room. Do not talk to passengers, except to answer questions, then be polite, and make no unnecessary conversation. Keep a sharp lookout for passengers; see everybody who may wish to ride. Do not start your car from the inside; step to the platform, so you can see that everything is safe, before you give the bell to start. Collect your fare as soon as the passenger has had time to enter the car and take a seat. Ring up each fare separately, as collecting fares from several passengers and then ringing them all in at once is not allowed. Be on the rear platform when leaving the ends of the route, so you can see anyone who may wish to ride.

"Any conductor reported for failure to comply with the above will be suspended for two days for the first offense and discharged for continued neglect of duty."

REYNOLDSVILLE TRACTION CO.

E. A. Ferrin, president of the Reynoldsville (Pa.) Traction Co., writes us that surveys for the line have been completed and maps, profiles, plans and specifications are being prepared by F. H. Loomis, of Brooklyn, N. Y., for Vandegrift & Co., of Philadelphia. The company will be ready to receive bids for material at an early date.

AN EXTRA MAN DURING RUSH HOURS.

A bill has been introduced in the New York Legislature requiring street railway companies operating in New York City to employ three persons, a gripman, or motorman, a fare collector and a conductor, on all cars exceeding 30 ft. in length, during rush hours. The duty of the conductor is to stay on the rear platform to stop and start the car, and he is prohibited from collecting fares or going inside the car.

PLANT FOR MAKING TERRA COTTA CONDUITS.

The first plant in this country to make conduits for electric wires from terra cotta, or baked clay, was the establishment owned by the Potomac Terra Cotta Co., and located at Terra Cotta, a station on the Baltimore & Ohio R. R., about four miles from Washington, D. C. The company was organized about 25 years ago, and for a long time was engaged exclusively in the making of sewer pipe, of which it was and still is one of the largest producers. About 12 years ago the company turned its attention to developing earthen or clay electric conductor conduits, and finding the deposits of clay upon which its plant was built was adapted to this



PLANT OF POTOMAC TERRA COTTA CO.

class of work, it commenced at once to turn out terra cotta ducts in large quantities. Its products are called the "Mason," after Mr. George Mason, the general manager, and differ materially from other conduits both in the nature of clay from which they are made and in their shape. The principal feature, and one on which letters patent were obtained, is the arrangement of small openings and iron dowels fitting into them, securing perfect registration and alignment of the ducts in the process of laying, and preventing joints from becoming displaced by ramming concrete or in other ways. The dowel pins are about 1/2 in. in diameter, and are made with a barb on one side, which prevents them from settling too far into the openings. When the conduits come from the kiln they are glazed inside as well as out, and offer little resistance to the wires when the latter are drawn into place, and hence there is no danger of damaging the cable sheath.

One claim of superiority is that of absolute vitrification, due to the use of a clay that vitrifies at a high temperature, rendering it



2-DUCT AND 4-DUCT CONDUITS.

non-absorbent, while it is practically indestructible by the elements when properly baked. The ducts are made in standard lengths of 30 in., which size has been found the most suitable to insure perfect vitrification and glazing, is most easily handled, least liable to breakage in handling, and consequently the most economical. One, two and four-duct sections are the usual patterns made.

The processes of mining and preparing the material from which these products are formed, are interesting, and while not com-

plicated, require great care and skill at every stage to obtain satisfactory results.

The clay deposits, the supply at the disposal of the company being seemingly inexhaustible, are found in irregular veins, located from a few to several feet below the surface, and usually in a hard and dry condition. The earth is broken from the face of the vein with picks and wedges and shoveled into carts which take it to a hopper at the side of the main building and dump it directly into the first grinding mill. In their passage through this, the lumps of clay are reduced in size and are then taken by a belt conveyor to a second mill and through crushing rolls, from which the material comes as a fine powder. This is carried, again by a belt conveyor, to the basement, where it is thoroughly soaked and allowed to "temper" for from five to seven days. After this period the clay is again passed through a grinding mill, when it is ready to be molded into the various shapes, in a vertical steam press, which forces the material into suitable dies. When the molds have dried sufficiently in a drying room heated by steam, the sections are ready to be burned or baked in kilns, which are circular in shape and from 22 ft. to 30 ft. in diameter. The fire is started gradually and increased until the contents of the kiln are brought to a white heat, and is kept at this point from five to seven days, when the fire is removed, the kiln sealed up and the contents allowed to cool, which process takes several days. Just before the firing about a wheelbarrow load of salt is thrown into each kiln, and the fumes from this, uniting with the heated clay, causes the glazed surface which is characteristic of these conduits.

ENTRY OF INTERURBAN LINES INTO COLUMBUS, O.

There are a number of interurban electric lines whose promoters wish to secure an entry into the city of Columbus, O., with termini in the central part of the city where the streets are already occupied by the tracks of the Columbus Street Railway Co. Robert E. Sheldon, president of the Columbus Street Ry., recently took advantage of a mass meeting of citizens to make an address outlining the policy of his company. He stated that his company would enter into agreements with interurban roads for handling their cars upon terms mutually satisfactory.

In Dayton the City Ry. has made contracts with three interurban lines for track rights; the compensation paid the City Ry. is 3 cents for each passenger carried over its lines by the interurban. As yet the Dayton & Western Traction Co. is the only one actually operating under such an agreement; it runs over two miles of the urban company's tracks. Concerning this, D. B. Corwin, president of the City Ry., says:

"We have found the arrangement entirely satisfactory to the city company, as we receive from six to seven hundred dollars per month from the D. & W. Traction Co. for the use of our tracks and power, and this is almost all new business, as we find that very few, if any, local passengers use the interurban company's cars. The Traction company has placed in its cars registers on which are registered all passengers carried over any part of our lines and this register is solely used for registering passengers carried on our lines, and is open to the inspection of our employes at all times, and the plan has proved entirely satisfactory. We furnish simply power and tracks. The employes operating the cars are the employes of the D. & W. Traction Co."

FIRE AT MUNCIE, IND.

On January 22d, the power house, shops, barns and offices of the Union Traction Co., at Muncie, Ind., were totally destroyed by fire, with their contents, including engines, dynamos and boilers and 16 cars. The loss is partially covered by insurance. The service was temporarily resumed with horse cars until other arrangements can be made. It is charged that the fire was of incendiary origin and this view is rendered more probable by reason of the discovery that brick dust had been placed in the bearings of a new generator temporarily installed by the street railway company in a local power plant.

A movement is on foot looking to a consolidation of the three street railway companies centering at Kutztown, Pa.

TRAMWAY CONGRESS AT PARIS.

We have just received from Mr. F. Nonnenberg, secretary of the Union Internationale Permanente de Tramways, the announcements relative to the International Tramway Congress, which is to be held at Paris, Sept. 10-13, 1900. The Minister of Commerce, Industry, Posts and Telegraphs has placed the organization of the congress, under the auspices of the Union Internationale Permanente de Tramways, in the hands of a commission of 17 members under the presidency of Mr. Leon Janssen, of Brussels; Mr. J. M. Roach, president of the American Street Railway Association, is a member of this commission. Mr. Nonnenberg is secretary general of the commission and Mr. Albert Janssen is secretary.

The members of the congress will be:

1. The members of the Union Internationale Permanente de Tramways.

2. Companies and individuals who apply for admission and are accepted by the bureau of the commission.

Companies who wish to be represented abroad should apply to Mr. F. Nonnenberg, 85 Rue Potagere, Brussels, giving name of company, name of delegate, title or profession of delegate and the complete postoffice address. Individuals making application should give name, title or position, and address. A fee of 20 fr. (\$4) is required.

This will be the 11th meeting of the International Tramway Union, the last one having been held at Geneva in 1898.

The following reports will be presented:

"Tariffs of Urban Tramways," by Mr. Gerbn, of Cologne.

"Results of the Adoption of Electric Traction," by Mr. Pirch, of Barmen-Elberfeld Tramway.

"Relative Advantages of Narrow and of Standard Gages for Electric Railways," by Mr. Gunderloch, of Elberfeld.

"Design of Central Stations," by Mr. d'Hoop, of Brussels.

"Systems of Distributing Current," by Mr. Van Vloten, of Brussels.

"The Falk Cast-Welded Joint," by Mr. Fischer-Dick, of Berlin.

"Storage Batteries," by Messrs. Broca and Johannet, of Paris.

"Heating Cars," by Mr. C. de Burlet, of Brussels.

"Exploitation of Branch and Feeder Lines," by Mr. Ziffer, of Vienna.

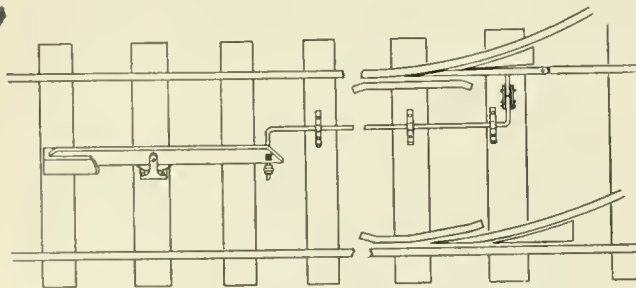
"Adoption of Standard Ratings for Electric Motors and Generators," by Mr. Macloskie, of Tours.

"Brakes for Tramways Using Mechanical Traction," by Mr. Monmerque, of Paris.

American street railway men who contemplate attending the Exposition would do well to time their visits so as to be present during this congress, as we believe that they would receive a warm welcome from their European brethren.

NEW STREET RAILWAY SWITCH.

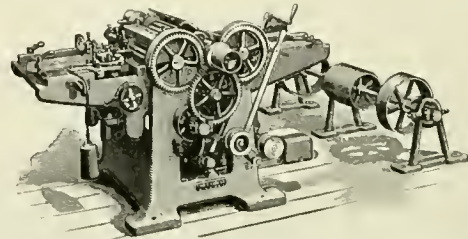
William E. Sleight, of Lansing, Mich., has invented a switch apparatus for use on street railways which is designed for setting switches without stopping the cars. The device is reported to have been in use, experimentally, on the Lansing Street Ry., and to have given satisfaction.



The method of operation will be readily understood from the accompanying sketch. A rocker bar is mounted on suitable bearings at a point about 40 ft. from the switch, and so arranged that one end will be depressed when it is struck by a movable foot lever on the car and actuated by the motorman. An arrangement of bell cranks and levers connects the rocker bar with the switch point.

NEW PLANER AND MATCHER.

The accompanying illustration shows one of the latest designs in woodworking machinery which has been developed by the Egan Co., of 322 to 342 West Front St., Cincinnati. This company makes everything in the machinery line that is used in the manufacture of wood, and exerts every effort to keep fully abreast of the natural evolution that goes on steadily in the mechanical world. The Government requested the Egan Co. to exhibit at the Paris Exposition, and the company is going to make a display that will uphold the prestige of America for high-grade machinery.



No. 8 EGAN PLANER AND MATCHER.

The No. 8 planer and matcher shown herewith is designed for small mills, and is capable of doing both light and heavy work. It planes one side up to 2 1/4 in. wide and up to 6 in. thick, and matches up to 12 in. wide; being fitted with adjustable pressure bars and slotted cylinders, it is particularly adapted for molding, casing, base boards, etc. The details have all been worked out to insure durability and convenience in operation.

TORONTO (ONT.) RAILWAY CO.

The eighth annual report of Pres. Wm. Mackenzie, of the Toronto (Ont.) Railway Co., for the year ending Dec. 31, 1899, was submitted to the stockholders on January 17th. The results of

COMPARATIVE STATEMENT	1890	1898	1897	1896	1895	1894	1893	1892
GROSS EARNINGS	\$1,335,542.44	\$1,210,618.24	\$1,077,612.53	\$907,173.20	\$993,800.88	\$956,770.24	\$900,232.59	\$830,008.49
OPERATING EXPENSES	650,374.55	578,857.26	525,801.25	507,700.31	489,914.76	517,797.53	537,597.15	590,333.26
NET EARNINGS	685,167.89	631,760.98	551,811.28	489,472.89	503,886.04	440,603.21	362,635.44	239,675.23
PASSENGERS CARRIED	31,826,040	28,770,388	25,921,314	23,537,011	23,353,222	22,004,338	21,215,010	19,122,022
TRANSFERS	10,538,220	9,287,230	4,169,000	2,354,883	2,257,572	2,453,422	1,477,147	5,592,208
PERCENTAGE OF OPERATING EXPENSES TO EARNINGS	48.8	47.4	48.8	50.9	49.3	54.0	59.97	71.9

the operation of the road for the last eight years are shown in the accompanying table.

During the year the rolling stock was increased by 80 cars and 2 electric sweepers built in the company's shops; 20 open cars are now building. Two new car sheds each with capacity for 100 cars have been built, and a brass foundry erected and equipped.

During the year the company paid taxes as follows: Percentage on earnings to city, \$111,426; pavement charges, \$64,000; city taxes on poles, rails and wires, \$2,641; taxes on real estate, \$9,366; provincial taxes, \$4,748; total, \$192,181. This is over 14.4 per cent of the gross earnings and over 28.1 per cent of the net earnings. Dividends of 4 per cent were paid on the capital stock of \$6,000,000.

One of the strong arguments in favor of another bridge over the East River between New York and Brooklyn, is the fact that on foggy mornings, when the ferries are always delayed, the usual ferry passengers all rush for the cars on the bridge, sometimes in this way demoralizing the service on that structure as well.

NEW YORK RAPID TRANSIT ROAD.

Nov. 14, 1899, the Rapid Transit Commissioners of New York City advertised for bids on the construction, equipment and operation for a term of 50 years (with right to a lease for a further term of 25 years) of an underground rapid transit road in New York City over the following route:

Section I.—From the City Hall through Center St., Elm St., LaFayette Place, Fourth Ave. to the Grand Central Station, west in 42d St. to Broadway and thence to 59th St.

Section II.—North through Broadway Boulevard to 103d St., where the route divides, extending on the west side in Broadway Boulevard to 137th St., and on the east side from the 103d St. junction to Central Park, under the corner of the park to Lenox Ave. and out Lenox Ave. to 135th St.

Section III.—On the west side from 137th St. along 11th Ave. to Ft. George; and on the east side from 135th St. east under the Harlem River to Melrose Ave.

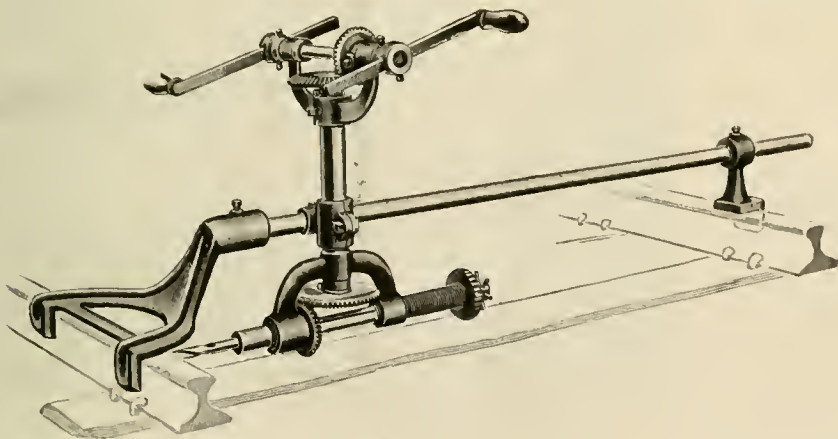
Section IV.—On the west side from Ft. George along the Harlem River to Kingsbridge; and on the east side, out Westchester Ave. and Boston Road to Bronx Park.

January 15th the bids were opened and it was found there were only two bidders, Andrew Onderdonk, whose bid for the whole was \$30,300,000, and John B. McDonald. Mr. McDonald's bid was as follows:

Section I.	\$15,000,000
Sections I and II.	26,000,000
Sections I, II and III.	32,000,000
Sections I, II, III and IV.	35,000,000

On January 16th the board awarded Mr. McDonald the contract subject to his complying with the terms of the contract and depositing \$1,000,000 in approved securities, and giving bonds for \$1,000,000 to secure the construction, operation and payment of rentals, and for \$5,000,000 to secure the construction and equipment.

The following are interesting statistics concerning the enterprise: Length in all sections of the tunnel, as surveyed, 109,570 ft., nearly 21 miles; total excavation of earth, 1,700,228 cu. yd.; earth to be filled back, 773,093 cu. yd.; rock excavated, 921,128 cu. yd.; rock



THE BURNHAM TRACK DRILL.

tunneled, 368,606 cu. yd.; steel used in structures, 65,044 net tons; cast iron used, 7,901 net tons; concrete, 489,122 cu. yd.; brick, 18,519 cu. yd.; waterproofing, 775,795 yd.; vault lights, 6,640 sq. yd.; local stations, 43; express stations, 5; station elevators, 10; lineal feet of track, 305,380; lineal feet of track underground, 245,514; lineal feet of track elevated, 59,766.

John B. McDonald was born in Cork, Ireland, in 1846, coming to this country when 15 years old. He is widely known as a contractor, having done work for the New Jersey Central, the Canadian Pacific, the Boston & Hoosic Tunnel, the Delaware, Lackawanna & Western, the West Shore and the Baltimore & Ohio railroads. For the last named road he built the Belt Line Tunnel.

The last trip of the steam dummy formerly used on the Lakeview line of the Birmingham (Ala.) Railway & Electric Co., was made on February 1st. The first trolley car on this line was run the same day.

THE MILWAUKEE SITUATION.

When we went to press last month the city council of Milwaukee had passed the street railway ordinance and while a formal acceptance had not been filed, the company was acting under it; the court had under advisement the question of punishing for contempt the city officials who had ignored its orders.

January 17th, Judge Ludwig held that Mayor Rose, the city clerk and the 24 aldermen who voted for the franchise were in contempt, but suspended further proceedings on this question till after the motion to dissolve the injunctions had been decided.

The following day the Supreme Court issued an alternative writ of prohibition, citing Judge Ludwig to show cause why he should go further in the contempt proceedings.

January 19th, the trial of the injunction cases on their merits was begun, and on January 29th Judge Ludwig dissolved both the Schwartzburg and the Paine injunctions. On the same day the Milwaukee Electric Railway & Light Co. filed its acceptance of the ordinance.

A third injunction to prevent the acceptance of the ordinance, secured by J. G. Trentlage in behalf of himself and other abutting owners, was still in force, however. The plaintiff wished to dismiss this suit but the court would not hear him for that purpose, and another abutting owner, the Linden Land Co., was substituted as plaintiff. February 2d, the Supreme Court ordered Judge Ludwig to show cause why he should not be restrained from proceeding with the Trentlage case.

Pending the decision of the Supreme Court, the new ordinance is now in effect.

The street railway company was convinced that the opponents of the ordinance intended to keep a few injunction suits always pending, and to secure a short respite on January 26th got an injunction restraining all citizens, property owners, etc., from suing the company.

BURNHAM TRACK DRILL.

The accompanying illustration shows a machine for drilling rails which has some improvements over the ordinary drills used for this purpose. The frame consists of a bar or piece of pipe having at one end a Y-shaped casting with two depending lugs, and at the other a casting with a single lug; both of these pieces are readily adjustable for different gages. The drill has two extension cranks, enabling the leverage to be adjusted to the work. The two cranks are used for heavy work, the gearing being arranged as shown in the illustration, and giving the ratio of 1 to 1 between the crank and the drill. For light work the top yoke is removed and one of the cranks placed on the vertical shaft; this change makes the gear ratio 2 to 1, and enables such work as drilling holes for bond wires on electric roads to be done with convenience and dispatch.

The machine weighs 85 lb. and is designed to be amply strong in all parts. It is made by the George Burnham Co., of 21 Herman St., Worcester, Mass.

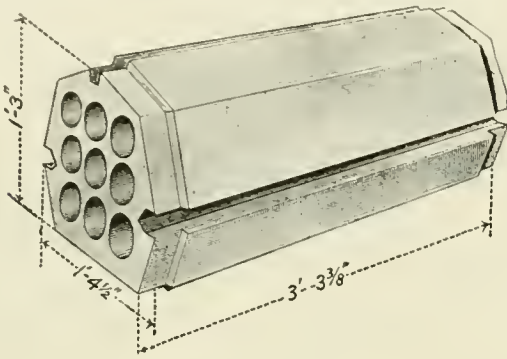
NEW ORLEANS GRAPHIC DIRECTORY.

We have received from the New Orleans & Carrollton Railroad Co. a copy of an advertising folder which is one of the best we have seen. The sheet is about 15 in. square; on one side are the schedules on which cars are run on all the lines operated by the company, and on the other side is the graphical directory. This is a map of the city showing the company's lines and the location of public buildings and principal points of interest, with an index. The sheet folds to 2 1/2 x 5 in., vest-pocket size.

Suit has been commenced to wind up the affairs of the Chesterfield Transit Co. This was not a railway, as might be supposed from the name, but a scheme for transporting ground coal from Virginian fields to the seaboard by means of a pipe line.

CEMENT CONDUIT DUCTS.

The National Telephone Co., of London, Eng., in all its underground work is now using ducts made of cement, experiments in Sweden having shown them to be perfectly satisfactory. The company has itself engaged in the manufacture of the ducts; it has used blocks with as few as 3 and as many as 30 ducts. The sections are in general of the type shown in the illustration, which is taken from the Electrician. In the trench the sections of conduit are placed with the ends resting on bearers which serve to bring them to the proper level for the joints. The alinement is kept true



NINE-WAY CONDUIT.

by means of iron bars 1 in. square laid in the three grooves, the bars being of such length that only one joint comes on any one section. The joint is wrapped with a strip of canvas steeped in boiling pitch and applied while hot; there are two layers of the sacking on the top of the joint. The circumferential groove made by the junction of the recessed ends is then filled flush with neat cement after cement grout has been run in between the bearer and the packing along the lower side of the joint. The longitudinal grooves are also filled with neat cement.

Sections with only three ducts have spigot and socket ends and no canvas binding at the joints; iron bars for alinement, but no bearing blocks are used.

FIRE PROOF PAINT.

The Frank S. De Ronde Co., of 54 John St., New York City, is making a specialty of its "Lythite" cold water paints for the use of street railway companies, which are well adapted for coating walls of car barns, repair shops, power houses, etc. These coatings are strictly fireproof, come in powder form and simply require mixing with water, when they are ready for use. They come in white and colors. The white gives a very brilliant surface and the "pole green," for trolley poles, gives a fine, glossy, durable finish that retains its color under all climatic conditions and changes in temperature.

This company has a branch store and warehouse at 48 N. Fourth St., Philadelphia, where it handles all its own lines, which include "Lythite," waterproof lining paper, roofing, varnishes, pipe covering, deadening felt, insulating papers, preservative paint, waterproof flooring, etc., and also all the products made by the Standard Paint Co., its Philadelphia branch acting as general distributing agent for P. & B. compounds, armature varnish, tape, rubberoid motor cloth, etc., in Pennsylvania, southern New Jersey and Delaware.

SPRINGFIELD STRIKE CONTINUES.

The strike of the street railway employes at Springfield, Ill., which was begun Nov. 10, 1899, continues. January 19th for the fifth time explosives were placed on the tracks and a car damaged. This last explosion occurred on one of the main streets of the city within one square of the police station.

President Jarvis offered to put the strikers back at work, but they hold out for a recognition of the union, which the company refuses to grant.

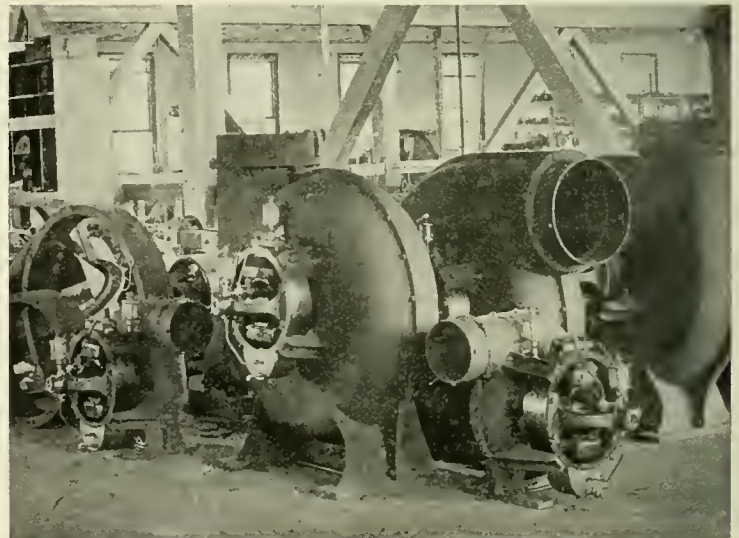
CINCINNATI, NEWPORT & COVINGTON.

Mr. James C. Ernst, president of the Cincinnati, Newport & Covington Railway Co., sends us the following condensed statement of the company for December, 1899, and the year 1899. The ratio of expenses to earnings for the year was 52.3 per cent, while the same ratio for the first six months of 1899, as published in our issue of August last, p. 566, was 56.7 per cent.

	DECEMBER.		FOR THE YEAR.	
	1899	1898	1899	1898
Gross receipts	\$61,021.15	\$54,144.34	\$713,385.55	\$681,672.27
Operating expenses	23,816.92	24,511.30	286,233.98	342,119.36
Net earnings	37,204.23	29,633.04	427,151.57	339,552.91
Tolls, taxes, damages, etc.	12,139.68	21,395.67	147,362.64	136,116.30
Net profit	25,064.55	8,237.37	279,788.93	203,436.61
Ratio of expenses to earnings:				
With tolls	.5119	.5852	.5232	.6126
Without tolls	.3902	.4527	.4012	.5018

ELECTRICAL DEPARTMENT OF STURTEVANT CO.

The B. F. Sturtevant Co. has made a large addition to its works to better accommodate the electrical department of the business, which has developed with the use of electricity for driving auxiliary apparatus. Just as in the 70's the demand for its blowers to be engine driven led the company to take up the design and manufacture of special engines for direct attachment to the blowers, the use of motors in place of the engines led to the development of the electrical department which now covers over 20,000 sq. ft. of the shops. Prominent among the company's late products is an elec-



ERECTING FLOOR, WORKS OF B. F. STURTEVANT CO.

tric fan of the propeller type having the motor entirely enclosed.

The accompanying illustration is from a view of one corner of the erecting floor at the Sturtevant works and shows a variety of motor driven fans. The product of the company includes fans up to 15 ft. in diameter, a line of electric motors and generators ranging in size from 1-6 h. p. to 125 h. p., and a line of engines covering the same range of capacity.

March 1st, the Collins Park & Belt line, Atlanta, Ga., will inaugurate a 15-minute service on its river line, putting on 10 new cars.

There has been considerable complaint in Minneapolis and St. Paul in regard to high steps with which the street cars are equipped, the distance from the ground to the first step being 19 inches. A change is to be made by the company by lowering the car bodies and adding another step to the car.

HANDLING LONG RAILS.

Mr. S. P. Baird, Asso. Mem. Am. Soc. C. E., has kindly sent us the photographs from which the accompanying engravings were made and a description of the method of handling long rails which was employed by the Portsmouth (O.) Street Railroad & Light Co., of which he is superintendent.

The rails are 7-in., 70-lb., T-section in 60-ft. lengths and six men unloaded 80 of them in a day besides putting up and taking down



UNLOADING LONG RAILS.

the gin poles, and also loading the rails on wagons. The rails were hauled by ordinary short coupled, two horse, lumber wagons, the rail being first laid on its side, then raised up at one end by the six men and the wagon backed under until it supported from 1-3 to 2-5 of the weight of the rail; the chain was then passed several times around the rail and the rear axle, the team hauling about half the rail on the wagon and dragging the remainder. Of the total of over 500 handled in this manner there was not a rail injured. In unloading from the wagons the driver merely unhooked his chain from around the rail and drove the wagon out from under the rail, thus requiring no help in unloading.



UNLOADING LONG RAILS.

The apparatus required comprised two pair of tongs, similar to ice hooks, two poles 6 in. square by 12 ft. long, two pair of double blocks large enough to carry 7/8-in. rope, and five guy lines as shown in the illustration.

Another point in connection with this method of handling long rails, which is worth considering is the reduced liability of injuring any of the workmen. In the entire season's work at Portsmouth there was not a man injured by this system.

READERS who note errors in our "Directory of Street Railways" will confer a favor by sending us corrections.

ORDER CONCERNING TRANSFERS.

The Chicago City Railway Co., in order to put a stop to the abuse of transfers on its lines, has issued the following:

SPECIAL NOTICE TO TRAINMEN
CONCERNING TRANSFERS.

When a passenger to whom a transfer has been issued, disposes of that transfer and remains on the car, the conductor will deny him the right of further transportation, unless he pays another cash fare, and will STOP his car and eject him from it.

When newsboys board the cars and sell papers to persons who have not yet paid their fare, and with the paper give a transfer, or sell or give a transfer without the paper, the conductor shall decline to accept such transfer in payment of fare.

Do not allow newsboys on your cars when it is possible to keep them off without using violence.

When it becomes necessary to eject a person from a car, STOP THE CAR TO A STANDSTILL, do not put any one off a moving car, call the motorman or gripman to your assistance and get the offender off without injuring or tearing of clothing.

The ejection of a person from a car is a serious matter UNLESS WE ARE RIGHT, consequently the conductor must know from his own observation that the person tendering transfer is not entitled to passage therefor before he takes action, and when possible procure names and addresses of passengers as witnesses. If the conductor is in doubt as to the absolute certainty of the attempted fraud, allow it to pass and neither say nor do anything concerning it.

Conductors taking any action whatever under these instructions will make immediate and full report of it.

ROBT. McCULLOCH,

General Manager.

Feb. 5, 1900.

HEATING BY EXHAUST STEAM.

The American District Steam Co. of Lockport, N. Y., undertakes by contract and guarantees to place in successful operation in connection with a central power station, a plant for supplying neighboring stores, offices, residences, churches, theaters and public buildings with heat, utilizing exhaust steam by means of an underground system of mains. In comparing its exhaust steam method with hot water circulating systems, the company makes the following statement:

"Several attempts have been made during the past 10 or 12 years to install successful heat distributing plants, using hot water, the most notable of which was that of the Boston (Mass.) Heating Co., which, about the year 1887, put down pipes to convey hot water for heating over quite a large district in the heart of the city of Boston. More than half a million dollars was expended in this venture. Its customers were satisfied with the heat, but the expense of the service precluded all possibility of profit. Another serious and unlooked for difficulty was developed as the experiment proceeded. At the end of a year and a half or less it was found that the return pipes were in a precarious condition, and leaks developed all along the line, and an examination showed that these lines were beyond repair, and as a consequence, at the end of two years, the company had to abandon its plant.

"We are not prepared to explain fully this destruction of pipes used to return the water to the station, but certain it is that between the distilled water and the iron pipes a chemical action takes place that is destructive to the metal."

MORE WIRE THIEVES.

A particularly bold theft of trolley wire was made one night recently at Darby, Pa., from the Philadelphia, Morton & Swarthmore Street Ry., a new road not yet in operation. About 2,500 ft. of the wire was cut down, and to prevent themselves from being seen while at work, the thieves broke all the incandescent light globes for some distance along the road.

Three boys were caught last month by the Cincinnati & Miami Valley Traction Co. officials, and convicted for stealing copper bonds. The boys when captured had \$200 worth of bonds in a bag.

James Price, colored, was arraigned in the police court at Atlantic City, N. J., on February 2d, charged with stealing \$100 worth of copper wire from one of the trolley lines.

PERSONAL.

MR. EUGENE CHAMBERLAIN has been made superintendent of equipment of the Brooklyn Rapid Transit Co.

MR. C. D. SHEPARD, on February 15th, resigned as superintendent of the Palmer (Mass.) & Monson Electric Ry.

MR. JAMES ATKINSON and his wife have just returned from a trip through Cuba, where they had a very pleasant time.

MR. S. T. NORVEL, president and general manager of the Superior Rapid Transit Railway Co., of West Superior, Wis., was a "Review" caller last month.

MR. A. E. LANG, president of the Toledo Traction Co., has been very successful in securing subscriptions to the Toledo Centennial fund.

MR. L. D. ROSS has returned from his trip abroad and may be addressed the next few weeks, care the Elpaso Club, Colorado Springs, Col.

MR. F. N. MANN, JR., was last month elected vice-president of the United Traction Co., of Albany, N. Y., in place of Mr. Charles Clemmshaw, resigned.

MR. FREDERICK H. TIDMAN, receiver for the Oswego (N. Y.) Traction Co., has transferred the property to the company by direction of the courts.

MR. CHARLES ALDINGTON, a representative of the London Central Ry., one of the underground lines, has been in Chicago making a study of the transportation systems.

MR. JAMES W. BROWN has been appointed manager of the Rome (N. Y.) City Electric Ry. He has had charge of the reconstruction of the line during the past summer.

MR. ROBERT BLACK, for many years roadmaster of the Manhattan Elevated, of New York, has resigned to become general superintendent of the Dressel Railway Lamp Works.

MR. CHARLES H. SMITH, general superintendent of the Lebanon (Pa.) Valley Street Ry., has been appointed to a responsible position with the Edison Illuminating Co., of that city.

MR. GEO. M. KUEMMERLEIN, superintendent of transportation of the Milwaukee Electric Railway & Light Co., has assumed in addition, the duties of superintendent of the Racine division.

MR. CHARLES BLIZARD, formerly manager of the New York office of the Electric Storage Battery Co., is now manager of the sales department of that company, with office at Philadelphia.

PRES. JOHN B. PARSONS, of the Union Traction Co., Philadelphia, has received a handsomely engrossed resolution from the men expressing their appreciation of his action in increasing wages.

MR. E. W. GOSS, of Middletown, Conn., will hereafter manage both the Middletown Street Ry. and the Milford (Mass.), Holliston & Framingham Street R. R., spending part of his time in each city.

MR. CHARLES H. CHAPMAN, on February 1st, assumed the duties of assistant superintendent of the Middletown (Conn.) Street Railway Co., and will have full charge of the road in the absence of Mr. E. W. Goss.

MR. WILLIAM ELMER, JR., of the Pennsylvania R. R., with headquarters at Altoona, Pa., has been appointed superintendent of the Atlantic City (N. J.) Street Ry., which is owned by the Pennsylvania Railroad Co.

MR. C. E. FLYNN, who has for three years been general manager of the Carbondale (Pa.) Traction Co., resigned on February

1st to become general manager of the Easton Consolidated Electric Co., at Easton, Pa. His work at Carbondale has been attended with great success and won deserved praise from both the company and its patrons. Easton offers a larger field to Mr. Flynn, which he enters with the best wishes of his former associates.

MR. T. K. GLENN, formerly secretary and assistant treasurer of the Atlanta (Ga.) Railway & Power Co., has been elected first vice-president of the company. Mr. A. J. Chapman, former auditor, has been made secretary and assistant treasurer.

MR. JOHN Q. BROWN, at one time assistant engineer of the Columbus (O.) Street Ry., and more recently acting manager of the Columbus Electric Co., has accepted a position with the San Antonio (Tex.) Street Railway Co.

MESSRS. LAWTON C. BONNEY AND CHARLES L. BONNEY, treasurer and vice-president, respectively, of the Chicago General Ry., have resigned those offices; both remain on the board of directors, and Mr. C. L. Bonney will continue as general counsel for the company.

MR. R. A. HARMAN, succeeds Mr. Charles L. Pack as vice-president of the Cleveland Electric Railway Co., and the office of secretary which he has formerly held, will be filled by Fred S. Borton, until now assistant secretary.

MR. JOHN T. WHEELER, formerly in the purchasing department of the Grand Rapids & Indiana Railway Co., at Grand Rapids, Mich., has been appointed purchasing agent of the Sargent Co., of Chicago, with office at 675 Old Colony Building.

MR. IRA A. McCORMACK has tendered his resignation as vice-president and managing director of the Syracuse (N. Y.) Rapid Transit Co., to take effect April 1st, and will then assume the duties of general superintendent of the Cleveland (O.) Electric Railway Co.

HON. MARTIN A. KNAPP, chairman of the Interstate Commerce Commission, Washington, on January 30th addressed the faculty and students of Purdue University, LaFayette, Ind., on the subject, "The Interstate Commerce Laws and Their Relation to the Public."

MR. C. E. HOOVEN, secretary of the Cincinnati & Hamilton Electric Street Railway Co. since its organization, last month presented his resignation in order to accept the office of treasurer and general manager of the Cincinnati, Lawrenceburg & Aurora R. R., a new line in course of construction.

MR. H. J. SOMERSET, superintendent of the Winnipeg (Manitoba) Street Railway Co., resigned that position on February 1st, and has left for Perth, West Australia, where he will manage the new electric railway system. Mr. Somerset was presented with an address and a handsome watch charm by the employees.

MR. IRVING P. LORD, president and counsel of the Waupaca Electric Light & Railway Co., of Waupaca, Wis., is largely responsible for having his city selected for the place to hold the next convention of the Northwestern Electrical Association. A report of the recent meeting of this society will be found elsewhere in this issue.

MR. H. J. CLARK, as announced last month, has been appointed chief engineer and superintendent of the Syracuse (N. Y.) Rapid Transit Co., and in addition will take charge of the transportation department. Mr. M. J. French, jr., has been made engineer of maintenance of way of the system, and T. C. Cherry has been appointed track superintendent.

GEN. WILLIAM A. BANCROFT, president of the Boston Elevated Ry., on January 26th delivered a lecture on the "Boston Elevated Railway," before the Men's League of the Second Congregational Church, at North Chelmsford. The amount paid to the public by this company, in taxes and other contributions, amounts to about 12 per cent of the gross receipts.

MR. G. T. ROGERS, who is well known to the street railway men of the country as president of the Binghamton (N. Y.) Railroad Co., and president of the New York State Street Railway Association, has become interested in the firm of Ellingwood & Cunningham, bankers and brokers, 41 and 43 Wall St., New York. Mr. Rogers will be a special partner only, and will remain at the head of the Binghamton Railroad Co., which he is conducting with such marked success.

MR. CHARLES H. SMITH, the retiring superintendent of the Troy (N. Y.) City Ry., now consolidated with the United Traction Co., of Albany, was given a testimonial banquet and reception on the evening of January 16th, by his former employes. Mr. Chas. Clemmshaw, formerly president, and Mr. Joseph J. Hagen, secretary and treasurer, also shared the honors of the occasion. Mr. Smith was presented with a gold watch, and Mr. Clemmshaw and Mr. Hagen with gold-headed umbrellas.

ELECTIONS.

THE DAYTON (O.), SPRINGFIELD & URBAN ELECTRIC RAILWAY CO. has elected the following officers: President, John H. Harshman; vice-president, Frederick Colburn; secretary, John G. Webb. Mr. Colburn, the retiring president, refused re-election.

THE COLUMBUS (O.) RAILWAY CO., at a recent meeting elected the following board of directors: Robert E. Sheldon, E. K. Stewart, Clarence M. Clark, George W. Sinks and Theodore Rhoads. The executive committee consists of Robert E. Sheldon, E. K. Stewart and G. W. Sinks. The officers remain the same.

THE NEW ORLEANS CITY R. R. re-elected the old board of directors on February 5th, and on the same day the following officers were re-elected by the board: President, R. M. Walmsley; vice-president, Albert Baldwin; secretary and treasurer, A. H. Ford; general manager, C. D. Wyman; surgeon, Dr. R. W. Walmsley; attorneys, Dengree, Blair & Dengree, and Lawrence O'Donnell.

THE WEST CHESTER (PA.) STREET RAILWAY CO., at its annual meeting, made one or two changes in its list of officers and directors: The officials as elected are: President, Joseph S. Harris; board of directors, R. T. Cornwell, A. G. McCausland, M. H. Matlack, J. Carroll Hayes. Mr. William M. Hayes retires from the presidential chair, which he has occupied for several years. He was not a candidate for re-election.

THE WASHINGTON (D. C.) TRACTION & ELECTRIC CO., last month voted to increase the number of directors from 10 to 20 members. The new directors are: John Joy Edson, S. W. Woodward, Albert A. Wilson, George H. Harris, and E. Southard Parker, all of Washington; G. B. N. Harvey, of New York, editor of the North American Review; Luther Kountze, of the New York banking firm of that name; John N. Dennis, New York, and Charles D. Dickey, of the banking firm of Brown Bros., Baltimore.

THE BROOKLYN RAPID TRANSIT CO. made a number of changes in its directorate at its annual meeting last month. The following directors were elected: Clinton L. Rossiter, Timothy S. Williams, Henry Seibert, John G. Jenkins, Horace C. Du Val, David H. Valentine, Anthony N. Brady, August Belmont, H. H. Porter, E. H. Herriman, Walter G. Oakman, Anson R. Flower, Frederic P. Olcott. The last six are new men, and they succeeded John M. Keiley, Seth L. Keeney, William C. Bryant, John Englis, Charles D. Meneely and Theodore F. Jackson. All of the directors retired were Brooklyn men.

READERS who note errors in our "Directory of Street Railways" will confer a favor by sending us corrections.

The Oakland (Cal.), San Leandro & Hayward Electric Railway Co. pays its conductors and motormen, 19 cents for the first year, 20 cents for the second, 21 cents for the third year, and 22 cents thereafter.

OBITUARY.

MR. JOHN McLEOD, receiver of the New Albany (Ind.) Street Ry., died January 22d, at Louisville, Ky.

MR. FRANK TRYON, JR., superintendent of the Huntington (N. Y.) Street R. R., died last month, at the age of 20 years.

MR. W. K. McALLISTER, formerly of Camden, N. J., superintendent of the Atlantic City (N. J.) Ry., died suddenly last month.

MR. EDWARD A. DURBIN, brother of Mr. C. K. Durbin, superintendent of the Denver (Col.) City Tramway, died January 22d. He was president and secretary of the E. A. Durbin Surgical & Dental Supply Co.

MR. JOHN QUINCY ADAMS HOYT, who was one of the promoters of the elevated railway system of New York, and prominent in business in Chicago and New York, died in the latter city, January 12th, aged 73 years.

MR. GEORGE C. HERSCHELL, treasurer of the Armitage-Herschell Co., North Tonawanda, N. Y., died on January 11th after an illness of four days. He was taken ill with a severe cold, which was followed by complications, causing his death.

Mr. HERBERT A. REEVES, of the Manville Covering Co., of Chicago, died last month, in California, after a short illness. Mr. Reeves formerly had charge of the western branch of the H. W. Johns Co. for over eight years, and when the Manville Covering Co. became the Western representative of that concern in April last, he was continued as manager of the business.

NEW PUBLICATIONS.

"UNIVERSITY OF TENNESSEE RECORD" for 1899 contains a number of valuable papers on technical subjects written by professors and graduates of the University of Tennessee, at Knoxville. The leading article is a description of the application of electric power in the shops of the university.

"THE COLLEGE QUARTERLY" is a new publication issued every three months by the students of the Working Men's College, at Melbourne, Australia. It is intended to be the official organ of this school, and contains articles on the value of a technical education, announcements and general college news. All the typesetting, press work, etc., is done by the students.

THE MULHALL-HARPER COMPARATIVE STATISTICAL TABLES AND CHARTS OF THE COMMERCE OF THE WORLD have been compiled by William Harper, chief of the Bureau of Information of the Philadelphia Commercial Museum, and published by the museum in a 6 x 9 in. pamphlet of about 50 pages. The charts are printed in colors, and give the comparisons sought in a very vivid manner.

THE CORNICE WORK MANUAL is an exposition of cornice work in all its branches, compiled from the files of the American Artisan, by Sidney P. Johnson, and published by the American Artisan Press, Chicago. This work has been issued in book form to meet a wide demand for a practical treatise on the working of sheet metal for architectural purposes; it is the first book on the subject published in 20 years and cannot fail of a hearty reception by the trade.

"CONDENSERS," by F. R. Low, has recently been issued by the Power Publishing Co., of New York. It is a reprint of a series of lectures and articles upon this subject which have appeared in the columns of Power, and comprises 80 pages. After a general discussion of the principles underlying all condensing apparatus, the author takes up the various types of jet condensers, surface condensers, injector or siphon condensers, and exhaust steam induction condensers, and concludes with a chapter on condenser capacities which comprises various rules and data for designing such apparatus. Tables of data concerning the principal makes of condensers increase the value of the work, which well deserves a

place in the library of every engineer. The book is bound in paper; price, 50 cents.

"PICTORIAL HISTORY OF THE LOCOMOTIVE" is the title of a collection of line drawings showing the evolution of the modern steam locomotive, commencing with the earliest model of Cugnot, of France, built in 1771, and illustrating the developments made by Watt, Murdock, Wm. Symington, Oliver Evans, Trevethick, Murray, Hedley, Stephenson and Hackworth, and the leading types built by more recent designers, including M. W. Baldwin, of Philadelphia; Rogers, Ketchum & Grosvenor, of Patterson, N. J.; William Norris and Garrett & Eastwick, of Philadelphia, and others. The collection was made by William Wright, and is now published in book form, with valuable data, by the Chicago Pneumatic Tool Co., Monadnock Block, Chicago.

LOW FARES IN SAN FRANCISCO.

On December 11th, last, two orders were introduced in the Board of Supervisors of San Francisco, in reference to street railway fares, one calling for the sale of 8 tickets for 25 cents for the use of school children between the ages of 5 and 17 years, when going to or returning from school and available between the hours of 8 a. m. and 5 p. m., but not on Saturdays, Sundays and legal holidays, and the second order providing for the sale of tickets at the rate of 7 tickets for 25 cents, available between 6 and 8 a. m. and 5 and 7 p. m. on each and every day except Sundays. Any person, company or corporation operating street car lines in San Francisco and neglecting or refusing to comply with either of the orders to be deemed guilty of a misdemeanor, and on conviction to be punished by a fine of not less than \$100 and not more than \$500, or imprisonment in the county jail for not more than six months, or by both such fine and imprisonment.

The orders were passed to print and referred to the judiciary committee. Several meetings of the judiciary committee were held. The only railway companies to make an appearance were the San Francisco & San Mateo Electric Ry., represented by Mr. W. Clayton, its secretary, the Presidio & Ferries Ry., represented by Mr. Geo. A. Newhall, its president, and the Sutter Street Ry., represented by its secretary, Mr. A. K. Stevens. All but the first meeting of this committee was attended by a large number of conductors and motormen from all the roads in the city. The men made their own fight, realizing that reduced fares would inevitably result in lower wages. They introduced a petition containing 4,000 signatures of street car employes, protesting against the reduction, and this probably had more weight with the judiciary committee than any argument advanced by the railway companies themselves.

Finally, the passage of the orders was indefinitely postponed in committee by two votes to one, mainly on the grounds that the reduction would probably lead to a lower scale of wages for street car employes.

On January 8th the new charter took effect, and the mayor, in his address, suggested that the new board take the question up again, and it is probable the controversy will be renewed.

REPORT OF MAINE RAILROAD COMMISSIONERS.

The 41st annual report of the Railroad Commissioners of the State of Maine, just issued, contains a financial report from each street and steam railroad in the state for the year ending June 30, 1899. There are 20 street railway companies doing business in Maine, and these operate 240 miles of track. The total receipts for all roads for the year named were \$1,090,418; operating expenses, \$686,420; net earnings, \$403,998; passengers carried, 18,496,374.

A scheme for the consolidation of the Monongahela (Pa.) Street Railway Co., the Wilkesburg & East Pittsburg Railway Co., and the Wilmerding & East Pittsburg Railway Co., is under way.

A car belonging to the Peoples Electric Street Railway Co., of Rochester, Pa., on January 25th ran away down a steep grade, left the tracks at the foot and crashed into the front of a barber shop, killing a boy who was playing in front of the building.

CHICAGO UNION TRACTION CO.

The Chicago Union Traction Co. will publish no complete report until the end of its fiscal year, June 30th. The gross earnings for the seven months this company has controlled the property and for the corresponding months of the previous year are:

	1899-1900.	1898-9.	Increase.
July	\$653,811.60	\$612,392.19	\$41,483.41
August	672,049.55	612,764.02	59,285.53
September	633,253.80	605,900.28	27,353.52
October	679,039.80	623,194.15	55,845.65
November	608,836.45	563,710.43	45,126.02
December	621,614.90	587,979.11	33,635.79
January	587,020.70	531,657.71	55,362.90

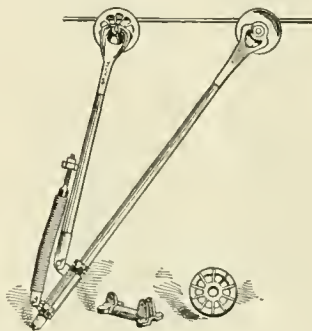
Seven months ..\$4,455,626.80 \$4,137,534.89 \$318,091.91
 Percentage increase seven months..... 7.68

CLEVELAND CITY RY. ASKS EXTENSIONS.

The Cleveland City Ry., generally known in Cleveland as the Little Consolidated, on January 22d made a proposition to the city which has only recently been given to the public. The principal points are: The company asks that its franchises be extended so that they will all expire in 1925, instead of at various dates between 1908 and 1918; it will assume the duty of paving 16 ft. of the streets where it has double tracks; it will pay 17½ per cent (one-half the city's share) of the cost of abolishing certain grade crossings, and contribute in cash a sum sufficient to make its total cash payments \$200,000; beginning with 1908 the company will pay the city 2 per cent of its gross receipts for the first five years, 3 per cent for the second five years, 4 per cent for the third five years and 5 per cent for the remainder of the term; the fare to be 5 cents cash or 6 tickets for 25 cents.

ICE-CUTTING TROLLEY WHEEL.

A device for removing ice and sleet from the trolley wire is shown herewith. The essential features are a ribbed skeleton wheel of ordinary size carried on a short arm, which is so mounted on the main trolley pole as to cause this sleet cutting skeleton wheel to travel a little in advance of the regular trolley wheel, thus securing good electrical contact for the latter. A two-part clamp is permanently attached to the trolley pole, and is provided with a swiveled socket and lug, so that the short arm with its wheel can be readily adjusted in case of a storm; it is carried when not in



use under the car seat. A spiral spring serves to hold the cutting wheel firmly against the wire, as shown in the engraving.

The wheel is cast in two parts, with staggered ribs on the inner surfaces, and is provided with openings to allow the ice to escape. This wheel is attached to a harp in the ordinary manner, which in turn is securely fastened to the short arm, which may be of wood or metal, and does not add materially to the weight of the pole. The device is the invention of P. H. Gilbert, Scranton, Pa.

IMPORTANT TAX DECISION.

The Court of Appeals of Ontario has rendered an important decision in which it is held that the roadbed of a street railway is not for the exclusive use of the railway and is therefore not assessable for taxation.

The Boston Elevated Ry. has secured locations in Brookline for four new lines which will enable it to take passengers from the Newton line and carry them to practically any part of the metropolitan district for 5 cents. The Boston & Worcester road was a rival applicant for locations in Brookline.

ECHOES FROM THE TRADE

READERS who note errors in our "Directory of Street Railways" will confer a favor by sending us corrections.

THE BARNEY & SMITH CAR CO. has recently completed its cars for the Dayton, Springfield & Urbana (O.) interurban line.

SARGENT & LUNDY, Monadnock Block, Chicago, are mechanical and electrical engineers for the Union Traction Co. of Indiana, whose system is described on page 66 of this issue.

THE CO-PARTNERSHIP of Gates & Randolph, of Chicago, was dissolved on January 23d, and W. E. Mack has been appointed to close up the business and will pay all bills and receive all money due the firm.

THE NATIONAL CARBON CO., of Cleveland, O., is out with a wall calendar bearing a view of the company's works, and calling attention to its various products. A lighting schedule appears on the sheet for each month.

ANOTHER SHIPMENT of supplies for the Sao Paulo (Brazil) Tramway, Light & Power Co. was made on January 19th. The Lorain Steel Co. had sent a lot of special work and the Walworth Manufacturing Co., pipe and bracket fittings.

THE PARTRIDGE CARBON WORKS, of Sandusky, O., emphasizes the fact that Partridge carbons are "always on top" with a calendar for 1900, on which is a large view of Niagara Falls, with Partridge motor brushes floating on the water.

THE LEADING ARTICLE in Graphite for January is on the protection of galvanized ironwork and the relative value for this purpose of Dixon's silica-graphite paint and red lead. Some strong testimonials from users of paints for exposed iron work are given.

THE DUFF MANUFACTURING CO., of Allegheny, Pa., has been successful in suits brought against a number of jack makers, for infringement of patents, and now owns well sustained ground patents for jacks of all styles made on the general principle embodied.

THE CLING-SURFACE MANUFACTURING CO. has recently issued an interesting folder showing nine half-tone illustrations of power plants where this popular compound is in use, each view is accompanied by a strong letter of recommendation from the engineer in charge.

THE CHICAGO PNEUMATIC TOOL CO., Monadnock Block, Chicago, has published a second edition of its catalog No. 6, containing reproductions from photographs showing its various pneumatic riveters, hammers and drills each doing the work for which it was designed.

THE CENTRAL ELECTRIC CO. reports an increased trade in all lines of electrical goods. Two classes of articles for which the demand has been particularly strong are circular looms and electro carbons, and the company has laid in large supplies of both lines and is prepared to fill all orders promptly.

M'KEE, FULLER & CO., of Catasauqua, Pa., owners of the Lehigh Car, Wheel & Axle Works, report an increasing demand for their products, which include car wheels, both steel tired and cast iron with chilled tread, for all kinds of railway service, axles, hammered or rolled, of both iron and steel, also all kinds of cars for freight or mining purposes.

THE ARMITAGE-HERSCHELL CO., of North Tonawanda, N. Y., is fully prepared to meet the early spring demand for its park attractions, consisting of riding galleries, mountain valley rail-

ways and other amusement novelties. The same policy will be pursued by this company as in the past, of furnishing goods that are thoroughly first class, both as to material and workmanship.

THE FIRM OF Littlefield & Meyersburg, of Chicago, has been dissolved. Mr. Andrew S. Littlefield has been appointed Western selling agent of the Lorain Steel Co., of Lorain, O., and Johnstown, Pa., and will be pleased to receive inquiries and orders for girder and high T-rails, track special work, du Pont truck and electric motors. He will have offices in the Monadnock Block, Chicago.

THE STANLEY ELECTRIC MANUFACTURING CO. has been organized to take over the property at Pittsfield, Mass., of a company with the same name. The Stanley plant, which was recently purchased by the John A. Roebling's Sons Co. will be greatly extended, and the business carried on, on a much larger scale than formerly. The new company is composed of officials of the Roebling company.

THE AMERICAN STEEL & WIRE CO. has published a balance sheet showing profits for the year 1899 to be \$13,362,529. Of this \$1,000,000 has been written off for depreciation, and deducting 7 per cent on the \$40,000,000 of preferred stock leaves \$9,362,529, which is 18.7 per cent on the common stock. A dividend of 7 per cent on the common stock was declared on January 29th, payable in quarterly installments.

THE SIEGRIST LUBRICATOR CO., of St. Louis, advises us that the McCormick Harvesting Machine Co., of Chicago, Ill., after a personal inspection of the Siegrist automatic oiling system at the power house of the Metropolitan West Side Elevated Railway Co., of Chicago, and a thorough investigation of all other oiling devices has awarded the Siegrist Lubricator Co. the contract to equip its two new power houses with the latter's automatic oiling system.

THE BURT MANUFACTURING CO., of Akron, O. has recently received an order for four 90-gallon Cross oil filters from the Metropolitan Electric Supply Co., of London, England, one of the largest electrical concerns in the British Empire. The British Government has also been a large buyer of these goods during the past year. Among home orders received by the Burt company recently is a large duplicate order for filters from Thos. A. Edison.

THE GATES & MACK CO. has opened an automobile emporium at 394 and 396 Wabash Ave., Chicago, where a number of Waverly electric carriages, steam locomotives, Haynes-Apperson automobiles, gasoline and other styles of motor vehicles are on exhibition. Visitors will be made cordially welcome. J. Holt Gates & Co., at 15 Monadnock Block, are carrying on the railway generator business of the Triumph Electric Co., of Cincinnati, O., and the alternating current business of the Warren Electric Co., of Sandusky, O.

E. W. SELKIRK, 849 North Kedzie Ave., Chicago, is serving many street railways in a very important matter, which has troubled the smaller roads a great deal. He is an experienced car painter, and has a trained force of assistants. Such medium sized roads as cannot afford to operate a paint shop of their own the year round, are obliged to call in local painters once or twice a year, and while such may be first class in painting houses and buildings, every railway man knows what an entirely different proposition car painting is. It is not so much in the first appearance when the work is finished that local painters fail, as in the knowledge of what to use and how to apply it for the severe service on cars. Mr. Selkirk already serves a fine line of roads around Chicago, whose cars he keeps protected and presentable. Managers can secure this work

by the day, or by contract by the year; also furnishing their own material if so desired.

ARRANGEMENTS FOR THE CONSOLIDATION of the following electric car lighting and equipment companies were made on January 25th: Electric Axle Light & Power Co., Columbian Electric Car Lighting & Brake Co., American Railway Electric Co., United Electric Co., Lindstrom Brake Co., and Railway Triplex Ticket Co. The new company is incorporated under the law of New Jersey, with a capital stock of \$16,000,000, and will be known as the Consolidated Railway, Electric Lighting & Equipment Co. Isaac L. Rice is president.

ADAM COOK'S SONS, of New York, have received the following letter from Chas. E. Waddell, superintendent of the street railway lines at Asheville, N. C., which speaks for itself: "In reply to your inquiry about the result of the Albany grease, will repeat that I told you I was no stranger to Albany grease and liked it very much; the grease was put in one of the motors on its arrival and the boxes have only required replenishing about every 15 days, and I find that it effects a great saving in lubricants, at the same time giving satisfaction."

THE CLING SURFACE MANUFACTURING CO., of Buffalo, N. Y., has just been incorporated under the laws of the state of New York, retaining the same name as heretofore, with Albert B. Young as president and general manager and Wm. D. Young, vice-president and secretary. The past year has been the most prosperous in the history of the company and the demand for "Cling-Surface" is reported to be increasing steadily. The company has now three branches, one each in Boston, New York and Chicago, with others just opening in St. Louis and New Orleans, while the well-known importing house of W. J. Moxham & Co., of Sidney, Australia, has ordered a large shipment of "Cling-Surface" with the exclusive right to handle it in Australia.

THE SCARRITT FURNITURE CO., of St. Louis, is now filling an order for 2,800 Scarritt reversible-back rattan covered double seats to be placed in 140 cars built for the St. Louis Transit Co. by the St. Louis and the Laclede car companies. Within the past few months the Scarritt company has received a great many smaller orders for both steam and street railways. There are two features of the Scarritt seat which particularly commend it to passengers, the resilient cushions and the three-ply veneer covering rear of the seat back and effectually preventing the person occupying the seat from being discommoded by the knees of the person in the seat behind. This discomfort is one that is too often met with in cars not equipped with this company's seats.

THE B. F. STURTEVANT CO., of Boston, is receiving daily testimonial letters from its customers expressing satisfaction with the apparatus which it has supplied. One from the Frost & Wood Co., of Smith's Falls, Ont., in reference to a Sturtevant exhaust head reads: "Allow us to add that we have never paid with greater satisfaction an account for an article of this description, than we paid for your steam exhaust head. It has given us great satisfaction, and we would not be without it for several times what it cost. It should prove invaluable to steam users in a cold climate. Previous to using this we were greatly bothered with an accumulation of ice from the exhaust spray. This has now been entirely overcome."

STRIKE AT TROY, N. Y.

On January 21st about 250 men employed on the Troy division of the United Traction Co., operating the street railways in Albany and Troy, went out on a strike, causing a total suspension of traffic on the Troy lines.

A settlement was effected January 29th on the following basis: Committees of employes always to be heard touching any grievance. Employes of the Troy division to be allowed to ride free on showing their badges. Wages to be 20 cents an hour for regular car crews and 18½ cents for other trainmen. In cases of suspension, an appeal is to lie to the executive committee of the company. The wage scale is a compromise.

FOREIGN FACTS.

The Light Railways Act of 1896 will expire in 1901.

A system of electric trams may be built at Karachi, India.

The Madras (India) Electric Tramways will probably be purchased by the city corporation.

The new electric tramway system on the Woodside route at Aberdeen was opened recently.

Speed indicators are to be placed on the cars of the Dublin (Ireland) United Tramways.

The Rockdale (Eng.) Corporation has asked Parliament for permission to build 18 miles of new electric lines.

Tramways for Warrington, England, have been proposed and the Town Council is applying for powers.

The Yarmouth (Eng.) Town Council wishes to purchase 800 tons of steel rails and other tramway supplies.

The St. Helens Tramways, of St. Helens, Lancashire, England, will borrow £45,000 to spend in tramway extensions.

The Garston (Eng.) & District Tramways Co. has been formed to build an electric tramway in the village of Garston and vicinity.

Automobile buses have made their appearance in London. They run from Kennington to Victoria, and carry 12 passengers inside and 14 outside.

Experiments are being carried on at Antwerp, Belgium, to determine the economy of equipping railroad lines centering in that city with electricity.

Tramways at Berlin report having considerable trouble with snow and ice last month, and had to employ 1,000 extra men to get the lines into running order.

The Acton (Eng.) City Council objects to the plans of the London United Tramways Co. for tramway extensions in the district, on the ground that the streets are too narrow.

The Manchester (Eng.) & Liverpool Electric Express Ry. has been organized to build electric tramways 34 miles in length between the two cities named in title.

There has been a hitch in the negotiations for an electric railway to run from Manchester (Eng.) to Liverpool, owing to the attitude of the Irlam District Council.

A concession has been asked for by La Societa delle Tramvie Ferrovie Elettriche de Roma, of Rome, Italy, for an electric railway to run between Taranto, Manduria and Lecce, Italy.

District Councils of Guisely, Horsforth, Rawdon and Yeadon, England, have opened negotiations with the Leeds Corporation looking to the extensions of the electric tramways in those districts.

Press dispatches from Berlin announce that the Berlin Elevated Railroad Co. intends to provide Berlin with an electric elevated railway similar to that in operation in Chicago. The cost will be 43,000,000 marks.

It is proposed to build a continuous line of electric railways to connect the states of Tabasco, Yucatan, Chiapas and Campeche, in Mexico, with the railroad system of Central Mexico. The states through which the line will run, will be asked to give subsidies, in addition to the \$6,000,000 said to have been promised by the federal government, to defray the cost, which is estimated will be about \$14,000,000. The road will be known as the Southern National & International, and, if built, will be about 400 miles long.

CHARLES J. MAYER. A. H. ENGLUND.

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HALF FARES.

Ice on the trolley wire badly crippled the service of the Rochester (N. Y.) Railway Co. for a day last month.

The snow and sleet storm on February 3d compelled the Lake Street Elevated, Chicago, to suspend traffic at 11 p. m.

The Rome (N. Y.) City Electric Ry. last year operated at a gross loss of \$5.48; fixed charges increased this amount, making the net loss, \$614.

Three motormen on the Cleveland Electric Ry. were arrested last month for violating the speed ordinance, and were fined \$5 each and costs.

The Negaumee (Mich.) & Ishpeming Street Railway & Electric Lighting Co. has declared its first dividend; it is at the rate of 4 per cent per annum.

Owing to the smallpox scare in Missouri, the electric cars running from Independence to Kansas City, and the cars in Kansas City are being thoroughly fumigated.

On January 30th, a runaway car on the Dayton (O.) & Xenia Traction Co. jumped the track and was hurled several feet. Two passengers were killed and four injured.

The Union Traction Co., of Philadelphia, voluntarily increased the pay of motormen and conductors from 16 2-3 cents per hour to 18 cents per hour, to take effect February 1st.

Mayor Hayes, of Baltimore, has drafted a bill for the Legislature providing for the appointment of a franchise commission, which is to keep the state advised as to the rights of corporate bodies, especially street railway companies, and is to have super-

vision of the rates of fare charged by street railways. The mayor has stated he will favor a bill providing for six tickets for a quarter.

Through errors of clerks in the tax office, the street railway companies of Chicago were assessed for 1900, several hundred thousand dollars more than they should have been.

Sam Jones, the evangelist, has been invited to speak at a park owned by the street railway company at Columbus, O. Other noted revivalists will hold services at the park from time to time.

The Birmingham (Ala.) Railway & Electric Co. will at once rebuild its car shops and barn recently destroyed by fire. J. M. Morgan & Co., local contractors, will construct the new buildings.

All the trainmen on the Cedar Falls division of the Waterloo (Ia.) & Cedar Falls Rapid Transit Co. went on strike last month, when the company appointed a new superintendent for the division.

A contract for the erection of new car barns and repair shops at Bowling Green, O., has been given to James Turnbull, of Toledo, by the Toledo, Fremont & Bowling Green Electric Ry. This will cost about \$5,500.

During the intensely cold weather at the beginning of this month the Toledo (O.) Traction Co., at its own expense, established stations along its lines where its employes could stop and obtain hot coffee and sandwiches.

The receiver of the Duluth (Minn.) Street Railway Co. has filed his statement concerning the company for the quarter ending Dec. 31, 1899. It shows receipts from all sources of \$73,376.38, and total disbursements, including fixed charges, of \$95,016.76, which, with the surplus of \$31,612.59 carried forward from the previous quarter, leaves a surplus of \$9,072.21. Among the disbursements are no-

ticed the following items: Strike, \$330.90; bridge tolls, \$2,712.22; accidents, \$1,122.18; fuel, \$6,433.59; legal, \$165; detective service, \$887.92.

In response to a petition from its employes, the Elgin (Ill.), Carpentersville & Aurora Railway Co. has increased wages of regular motormen to \$1.75 per day, regular conductors to \$1.05 per day, and extras to \$1.55 per day.

The Ft. Wayne (Ind.) Traction Co. has issued laboring men's ticket books of 100 rides for \$3.50, good between the hours of 6 and 7 a. m. and 5:30 and 6:30 p. m., and citizens' ticket books of 100 rides for \$4., good at all hours.

The Central Labor Union, of Louisville, Ky., has undertaken to strengthen the position of the street railway employes' union, by resolving that no member of any labor organization should ride on a street car not manned by a union crew.

A company has been formed to generate electricity at the falls of the River Cellina and River Piave, Italy, and transmit the same to Venice. The prime movers in the enterprise are Counts N. and A. Papadopoli, of Venice, and Commendatore Giuseppe Da Zara, of Padua.

The mail cars which have heretofore run on the North Side cable lines of Chicago are to be replaced in the near future by handsome cars on the electric lines which it is expected will make a great improvement in the local mail transportation between the post office and the sub-stations.

The Union Traction Co., of Philadelphia, pays a car tax of \$50 for each car it owns, and in addition \$50 for each car that crosses city bridges over the Schuylkill River. The company, January 27th, sent a check for \$82,500 to the collector of taxes, covering the licenses on 1,500 regular cars and 155 bridge cars for 1900.

Mrs. Mary T. Leiter has filed a petition for an accounting by the Metropolitan Street Railway Co., of Washington, in which she is a stockholder. The control of the Metropolitan was acquired by the Washington Traction & Electric Co. last year, and the petitioner asks that the relations between the two companies be made public.

The United Traction Co., of Albany, N. Y., has taken up all passes on the lines formerly owned by the Troy City Ry., and not even policemen will be allowed to ride free. The Albany Ry. never issued passes. A new rule has also gone into effect on the entire system prohibiting passengers from riding on the front platforms of closed cars.

The Union Traction Co., of Anderson, Ind., has purchased 160 acres of ground near Fortville and will probably lay out a pleasure park. The property is said to contain large deposits of good gravel. It is also stated the company is negotiating for the purchase of a prominent corner lot in the city and will erect a building for depot and other purposes.

Ninety-four employes of the Worcester (Mass.) Consolidated Street Railway Co., that have served the company for five years or more, received an increase of 10 per cent in their wages commencing January 17th. The increase is from 20 cents to 22 cents per hour. The car crews work from nine hours to nine hours and twenty minutes a day.

Complaints have been made against the Metropolitan and Third Avenue roads and the Manhattan Elevated, of New York City, for violation of the ordinance requiring all cars to be heated when the temperature is below 40° F. Inspectors of the Board of Health found an occasional car on each of the systems that was not heated according to requirements.

A head-end collision occurred on January 19th between two cars on the Lockport division of the International Traction Co., of Buffalo, N. Y.; the time was 10:30 a. m., the cars being invisible because of a dense fog. All four of the men constituting the crews

were injured, one of the motormen perhaps fatally; in addition to these, a passenger was slightly injured.

The conductor on a car belonging to the Second Avenue Traction Co., of Pittsburg, was held up at the point of a revolver on the night of January 25th. He had gone ahead of the car to inspect a steam road crossing, as required by the rules of the company, when a burly negro stepped from the shadow and demanded money. The conductor called for help and succeeded in frightening the highwayman away.

The McKeesport (Pa.) City Council has been asked for a certain right of way by the McKeesport, Duquesne & Wilmerding Street Ry. The Council will pass the ordinance providing the company will give 33 tickets for a dollar, a tax of \$25 a year per car for the first five years, and \$50 a year thereafter, a bonus of \$5,000, and will promise to clean and repair the streets through which its tracks run.

Mayor Hayes, of Baltimore, has written the United Railways & Electric Co., stating that the treasury officials are greatly annoyed by the constantly recurring bills for car fare charged against the city by its employes who use the street cars in riding to and from work at distant points. He suggests that the company honor tickets prepared and issued by the city, and which could be paid for by the city at the end of every quarter, or at any time agreed upon.

An ordinance has been introduced in the city council at Louisville, Ky., making it unlawful to employ any motorman who has not had three weeks' training on cars in the city. For employing one not trained, the employer is subject to a fine of \$10 to \$20 for each offense, and the employed motorman is to be fined from \$5 to \$10. The avowed object of the framer of the bill is to prevent the importation of green men should there be a strike on the local lines.

Under a contract made last month between the Metropolitan Street Ry., of Kansas City, Mo., and the Kansas City & Leavenworth Electric Ry., passengers will be transferred from the cars of either road, to the cars of the other without extra expense, and the two companies will build a joint depot in Kansas City, Kan. As transfer arrangements have been made with the local system in Leavenworth, it is possible to ride from any point in Leavenworth to any point in Kansas City for one fare—but this is not a 5-cent fare.

Slippery rails were given as the cause of a slight accident, January 20th, on the Druid Hill Ave. line of the United Railways & Electric Co., Baltimore. A north bound car and a west bound car had stopped at the near crossing of two intersecting streets to discharge passengers, and both started forward at the same moment, the condition of the rails preventing either motorman from stopping after he had seen the other's action. The north bound car was struck in the center and thrown over on its side. No one was seriously injured.

It is believed that miscreants deliberately threw open a switch on the Detroit Rapid Ry. last month, with the intention of causing a wreck. A car running from Detroit to Mt. Clemens at high speed struck the switch and was hurled against a tree at the side of the track, injuring several passengers, but killing no one. Some time ago, near this same point, it was discovered that someone had thrown a heavy wire over the trolley wire, and attached the other end to a trolley pole, grounding the line in such a way as to make it very difficult to discover the trouble.

The Metropolitan Street Railway Co., of Kansas City, has been carrying letter carriers on its cars for six months without receiving compensation for the service owing to the delay on the part of the postal authorities in signing a contract. In former years the United States Government has paid the company \$3,000 a year for transportation for the carriers, but the system having been greatly extended and the number of carriers increased, at the expiration of the contract last year the company asked \$4,000 for the service. No contract was concluded, however, and carriers have been riding free ever since, through the courtesy of the company.

NEWS NOTES.

ALBANY, N. Y.—It is reported that the United Traction Co. will purchase 25 new open cars and 35 box cars. Improvements of the Troy car house and power house and the tracks of the Troy division will be effected. R. C. Truyn, Albany, president.

ALLENTOWN, PA.—The Lehigh Valley Traction Co. (A. F. Walter, secretary,) has purchased the Bethlehem & Nazareth Passenger Ry. (10 miles long) and the Bethlehem electric light plant.

AMSTERDAM, N. Y. Preliminary surveys are being made for the proposed line to connect Amsterdam with Saratoga and Ballston. A. B. Paine, of New York, is at the head of the engineering corps.

ASTABULA, O.—The Fairport & Youngstown Railway Co., of Astabula, has been incorporated with a capital stock of \$30,000 to build an interurban road. J. McCrea, R. F. Smith and C. T. Brookes are among the promoters.

ATLANTA, GA.—The Collins Park & Belt Railroad Co. has purchased land on which a new car house will be erected. The car house will accommodate 25 cars, and a portion of the building will be reserved for repair shops. Address A. M. Atkinson.

BEAVER FALLS, PA.—Harry W. Reeves, of Beaver Falls, H. C. Eagle, Henry Fitzpatrick and Charles H. A. Deems are promoting a line to be constructed between Vanport, Pa., and East Liverpool, O. Charters have been applied for in both states, and when grants shall have been secured construction will begin without delay.

BELVIDERE, ILL.—It is reported that the Belvidere electric plant has been purchased by Edwin Magill of the Sycamore & DeKalb Street Railway Co. (De Kalb) and two others. Improvements will be made in the plant and a railway perhaps extended from De Kalb to Belvidere.

BLOOMINGTON, IND.—Contracts will be awarded in the early summer for the construction of the Columbus, Bloomington & Terre Haute Ry. Surveys for the line, which will be 91 miles long, have been completed, and competitive bids will soon be in order. Edwin S. Brodix, Bloomington, president.

CATONSVILLE, MD.—The Baltimore, Halethorpe & St. Denis Railway Co. has secured a franchise to build a railway from Catonsville to a point near St. Denis. A bond of \$10,000 has been filed with the county commissioners as an earnest that the construction of the line will be commenced in one year and completed in two years. Oregon R. Benson, Catonsville, president.

CHARLOTTE, MICH.—W. P. Engel, for the past five years in control of the Charlotte Electric Railway Co., has sold the line to Hugh A. Holmes, of Detroit, and John C. Farrer, of Brighton, for \$40,000. The new owners have filed articles of incorporation, and will be known as the Charlotte General Electric Co., with a capital of \$50,000.

CHICAGO, ILL.—The South Side Elevated R. R. will within six weeks order 30 new passenger coaches or make arrangements for building them itself.

CLEVELAND, O.—An extension of the Cleveland, Berea, Elyria & Oberlin Railway Co.'s line will be constructed from Elyria to Amherst, and later to Wellington. When the extensions shall be built the railway will aggregate 65 miles. It is also reported that a new power house will be built at Elyria. F. T. Pomeroy, manager. Office, Cleveland.

CLINTON, MASS.—The Railroad Commissioners have approved of an increase of \$100,000 in the capital stock of the Clinton & Hudson Street Railway Co. for the purpose of building and equipping the proposed railway. Alexander S. Paton, of Leominster, W. R. Dame, of Clinton, and William H. Tybee, Worcester, directors.

COLUMBUS, O.—The Lancaster & Newark Traction Co., of Columbus, has been incorporated by E. Rowles, F. S. Monnette, E. Kibler, W. D. Guilbert and S. B. Campbell.

DANIELSON, CONN.—The Providence & Danielson Railway Co., with a capital stock of \$300,000, has been incorporated to build an electric line between the cities named in its title. F. P. Owen, Geo. W. Prentice and Joel Hay are promoters of the enterprise.

DAYTON, O.—The Dayton & Xenia Traction Co. will issue 1,000 bonds of \$300 each. The proceeds will be used for the purchase of new equipment. C. J. Ferneding, president.

DAYTON, O.—The Dayton & Troy Street Railway Co. has been incorporated with a capital stock of \$30,000 by J. M. Wilson, W. L. Caten, R. L. Worrell, L. G. Reynolds and Thomas B. Herrman, and will build a line between Dayton and Troy.

DAYTON, O.—It is reported that the Dayton & Western Traction Co. is considering the improvement of its rolling stock. Cars equipped with four 35-h. p. motors and automatic air brakes are wanted. Purchases to amount to \$12,000 will be made. Y. Winters, president.

DE KALB, ILL.—The Sycamore & De Kalb Electric Railway Co. has obtained a franchise and will construct an interurban line within two years. Address Edwin Magill, De Kalb.

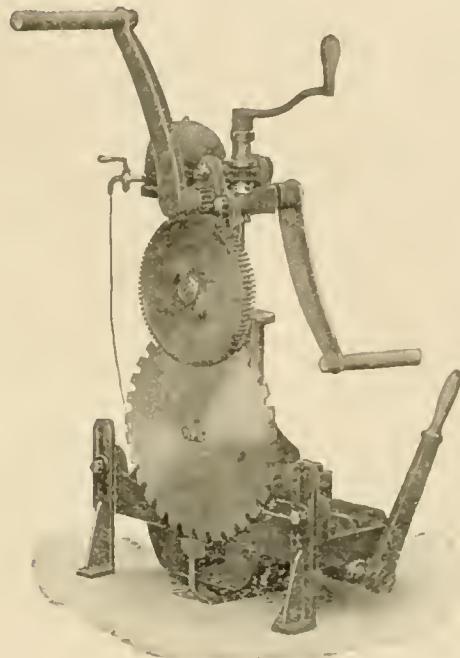
DETROIT, MICH.—The Rochester & St. Clair Railway Co. has been incorporated with a capital of \$150,000, by F. C. Andrews and E. H. Parker, of Detroit, and J. R. Whiting, of St. Clair.

DETROIT, MICH.—A third rail interurban line from Detroit to Ann Arbor via Belleville and Ypsilanti is projected. Rights of way between Detroit and Belleville have been obtained, and the projectors have applied for further grants. Address Milton Carmichael, Detroit.

TERRE HAUTE, IND.—The sale of the Brazil (Ind.) Rapid Transit Ry. to the Terre Haute Street Railway Co. is reported. It is said that the purchase price was \$50,000, and that the line will be improved and new equipment purchased. Supt. C. B. Kidder, of the Terre Haute company, may be addressed.

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DOVER, DEL.—The Delaware Electric Railway Co. has been granted permission to construct a line from Dover to Woodland Beach. Address John D. Hawkins. It is also stated that the council has accepted the \$10,000 bond of the Delaware General Electric Railway Co. to begin the construction of the projected line through Dover within nine months.

DOYLESTOWN, PA.—Judge Yerkes has issued a decree for the sale of the Bucks County Ry., operating between Doylestown and Willow Grove. The Doylestown Trust Co. has been acting as receiver for the railway company. The sale will take place at the Philadelphia Bourse March 14th, and the property, including rolling stock, machinery, etc., will be sold to the highest bidder.

EAGLE PASS, TEX.—A company has been organized and stock subscribed by capitalists of Eagle Pass for the construction of a 15-mile tramway from Nava to Zaragoza, Coahuila, Mexico.

ELKTON, MD.—It is stated that Senator Crothers will introduce a bill in the Senate to have the \$58,000 standing to the credit of Cecil County transferred to the Elkton & Chesapeake City Electric Railway Co. A line to connect Elkton and Chesapeake City will be constructed if the transfer be effected.

FALL RIVER, MASS.—The Fall River, Myricks & Middleboro Air Line Street Railway Co. has been organized with a capital stock of \$50,000 to build an interurban line in southern Massachusetts. The directors are Byron B. Grinnell, Frank A. Rouse and Albert M. Field, of Taunton, Mass., and Silas P. Richmond, N. W. Davis, G. M. Nichols and Charles A. Briggs, of Freetown.

FINDLAY, O.—The Findlay Street Railway Co. is considering the question of installing a heating system to enable it to sell steam heat to offices and residences near the power station. Chas. Smith, superintendent, will be glad to receive information as to the cost of building and operating such a plant.

FOND DU LAC, WIS.—W. E. Cole, secretary of the Fond du Lac Street Railway & Light Co., has purchased suburban property which will be improved for a park. The railway will be extended to connect with the park.

FORT WORTH, TEX.—Col. J. T. Voss, president of the Glenwood & Polytechnic College Street Railway Co. and Pres. G. Van Ginkel, of the Dallas Consolidated Street Railway, project an electric line to be built between Dallas and Fort Worth, 30 miles distant. Construction will soon begin. Some of the equipment is already ordered.

FRANKLIN, PA.—Hon. W. H. Forbes is reported to have consummated the long pending sale of the Franklin electric railway to the Citizens' Traction Co., Oil City. The line will be extended to Oil City and Rocky Grove, in the spring.

GALESBURG, ILL.—The franchise contest in Galesburg is ended, the Galesburg & Monmouth Rapid Transit Co. accepting the franchise ordinance as finally passed by the council. A bond of \$10,000 will be filed by the company to assure the construction of the line during the present year. Fred Seacord, president.

GLOUCESTER, MASS.—The Gloucester Street Railway, the Gloucester, Essex & Beverly, the Rockport Street Ry. and the Gloucester & Rockport Street Rys. have been merged into one corporation known as the Gloucester Street Railway Co. Address W. A. Larrabee, Essex.

GRAND RAPIDS, MICH.—Ben S. Hanchette, of the Grand Rapids Consolidated Street Railway Co., is said to be associated with Messrs. Strong, Campbell, Law and Barrett, of Detroit, in promoting the line that will be constructed between Grand Rapids and Holland, in the spring. The Grand Rapids, Holland & Lake Michigan Rapid Railway Co. has been formed with a capital of \$500,000. Mr. Hanchette is en route for Detroit to confer with the other promoters concerning the purchase of material.

GREENVILLE, S. C.—The Greenville Traction Co. is considering the building of a new car house. J. H. Dawes, manager.

HAMILTON, ONT.—The Hamilton Radial electric railway will be extended to Oakville. This line is operated by the Cataract Power Co. Address John Patterson, Hamilton.

HEMPSTEAD, N. Y.—The New York & Nassau County Railway Co., capitalized at \$500,000, has been incorporated at Albany, and will build a seven-mile electric line from Hempstead to the village of Queens. It is understood that the company is backed by New York & Queens County R. R., the New York & North Shore R. R. companies and the Whitney-Elkins-Widener syndicate.

HOLLAND, MICH.—A recent fire destroyed the entire rolling stock, comprising 11 cars and a freight motor and the car barn of the Holland & Lake Michigan Electric Railway Co. The loss is estimated to approximate \$40,000. M. J. Kinch, superintendent.

HOOSICK FALLS, N. Y.—The Bennington & Hoosick Valley Electric Railway Co. will erect a new power house. G. E. Green, president.

HUNTINGTON, IND.—An electric line to be built between Huntington and Portland is being promoted by Mayor Z. T. Dungan, City Attorney J. Fred France, Isaac F. Beard of Huntington, and others. Bonds for \$500,000 will be issued to provide for construction and equipment.

ITHACA, N. Y.—The Ithaca Street Railway Co. is in the market for a good sized merry-go-round, either new or second hand, with a good organ. This company would also like to correspond with the manufacturers and agents of penny and nickel-in-the-slot machines, and vending machines, with a view to purchasing. J. A. Mortimer, secretary.

JEFFERSONVILLE, IND.—The Jeffersonville City & Suburban Railway Co. has been incorporated with a capital stock of \$25,000. The directors are Thos. W. Scott, Charles W. McGuire, Oscar C. Barth, Robert W. Morris, Henry F. Elosse, Earl S. Gwin and Harry W. Heath.

KANSAS CITY, MO.—The East Side Electric Railway Co. is the market for to new or second hand open summer cars. The cars should be in serviceable condition, have single trucks and be equipped with two motors or should have trucks on which could be mounted two motors. The company desires to know the price f. o. b. point of shipment. Terms will be cash. Address W. O. Hands, manager.

JACKSONVILLE, FLA.—The Jacksonville Street Railway Co. and a new company of which Walter C. Nelson and George W. Riggs, of Chicago, are the principal stockholders, are competing before the council for the street railway rights in Jacksonville. It is said that the council will probably favor the Jacksonville Street Railway Co. D. F. Jack, Savannah, Ga., president.

JOPLIN, MO.—F. W. Brees, of Macon, Mo., is promoting a line in Joplin, which he may later extend to Galena, Baxter and neighboring towns. J. F. Schaber represents Mr. Brees. A franchise will be applied for.

KNOXVILLE, PA.—A charter has been issued to the Summit Street Railway Co. to build a line in Knoxville. William Grimm, R. R. Grimes and C. D. Lockwood, directors.

LA CROSSE, WIS.—The La Crosse Street Railway Co. is considering the extension of its system within the city. Peter Valier, manager.

LANCASTER, PA.—The Lancaster, Mechanicsburg & New Holland Electric Railway Co. has been granted a charter and will proceed to construct a 14-mile line. The company has a capital stock of \$150,000. William B. Given, Columbia, president.

LENOX, MASS.—It is understood that an electric third rail extension will be made by the New York, New Haven & Hartford R. R. from Pittsfield through Lenox, Lee and Stockbridge to Great Barrington. The project is in opposition to that of the Pittsfield Electric Street Railway Co. to extend its lines to Lenox. N. H. Heft, electrical engineer of the N. Y., N. H. & H. may be addressed at Hartford.

LEWISBURG, PA.—J. W. Zellers, of Lewisburg, is reported to be seeking a franchise for an electric line to be built through Hughesville, Picture Rocks and other towns to Eaglesmere and ultimately to Wilkesbarre.

LIMA, N. Y.—The property of the Lima & Honeoye Falls Electric Light & Railroad Co. was recently sold at receiver's sale, bid in for \$35,000 by Frank Williams of Buffalo, representing capitalists of that city. C. T. Whiting will remain as superintendent.

MARQUETTE, MICH.—The papers announce that the Marquette City & Presque Isle Railway Co. will float bonds for \$70,000, half of which sum, it is said, will be used for the construction of new lines. F. O. Clark, president.

MECHANICSVILLE, MD.—The Washington, Mechanicsville, Leonardtown & Point Lookout Electric Railway Co. has been incorporated by Messrs. Comly R. Jones and Frank R. Tenney, of Philadelphia, and John T. Ballenger, Giles F. Dyer, B. Harris Camalier and Jos. F. Morgan of Maryland. The capital stock is \$1,000,000. A line will be built from Washington to Point Lookout via Mechanicsville and Leonardtown.

MESSENA, N. Y.—It is reported that the Massena Electric Street Railway Co. will increase its capital stock from \$100,000 to \$125,000, and that the line will be built without further delay.

MILAN, MICH.—Albert A. Graves, of Ypsilanti, is a new contestant in the field for a franchise to build a line from Ypsilanti to Milan and Dundee.

MILLVILLE, N. J.—It is reported that the Millville Traction Co. has applied for permission to extend its line to Vineland. G. B. Langley, president.

MOBILE, ALA.—A franchise for a belt line railway around the city of Mobile has been applied for. Messrs. D. R. Burgess, J. C. Rich or George Ober may be addressed.

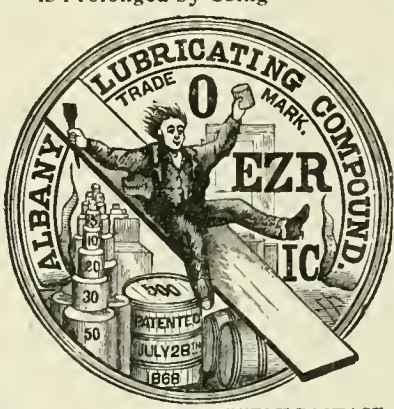
NEWARK, N. J.—Col. E. L. Price, of Newark, is preparing a bill to be introduced in the Legislature, authorizing the construction of an elevated railway from Jersey City to Newark and adjacent towns.

NEW ALBANY, IND.—Louis Hartman, of New Albany, has been appointed receiver of the New Albany Railway Co. He succeeds John McLeod who died January 24th.

NEW PLATZ, N. Y.—The New Platz & Poughkeepsie Traction Co., capitalized at \$100,000, has been incorporated to operate a nine-mile railway in Ulster county. The directors include William L. Suplee and Harry J. Verner, Philadelphia, and Charles W. Dayton and Oliver S. Carter, New York.

NEW BRUNSWICK, N. J.—A meeting to consider the consolidation of the Brunswick Traction Co., of New Brunswick, the New York & Philadelphia Traction Co. and the New Brunswick City Railway Co. to complete a trolley system from Jersey City to Philadelphia will be held in New Brunswick February 10th. G. Krueger is president of the Brunswick Traction Co.

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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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VOL. X. MARCH 15, 1900. NO. 3

The announcement by the management of the Chattanooga Rapid Transit Co. that it will build a line up Lookout Mountain and institute a carriage service through Chickamauga Park is one that should be welcomed by all tourists who intend making a visit to Chattanooga, and the example of this company will doubtless be followed by others where the surroundings are such as to render such a policy practicable.

It is gratifying to note that managers are at last exerting themselves to follow up copper bond thieves and push the case against them to conviction and punishment. In doing this we believe they have not fully realized, nor brought to the attention of the court, the consequential damages which result from these depredations. It by no means covers the whole loss when the engineer has testified to what an equal number of new bonds can be purchased for and installed. There is the very serious loss of power and the incidental annoyance to passengers who may also suffer pecuniary loss through inability to operate the car on time or even at all.

Every manager who suffers from stolen bonds owes it to himself and the fraternity to relentlessly follow up and secure the conviction of the bond thief.

The transportation of freight on street railway lines is now attracting attention in Massachusetts, particularly between Brockton and Boston, application having been made for the incorporation of a company for hauling freight which shall have power to use the tracks of the street railway companies. It is not believed that the Legislature will authorize such a condemnation of the property of existing companies and the solution adopted will probably be the passage of an act permitting the street railways to carry freight where the service is demanded by the public. The street railways

would gladly accept such powers, though the passenger traffic has been so satisfactory that they have not cared to take the initiative.

Legislators both city and state are constantly misled into undoubtedly an honest though none the less mistaken belief as to the results to be obtained from a compulsorily lowered rate of fare. They assume that a reduction of one or two cents per fare cannot fail to procure more net revenue to a company. Even where they make comparisons they do not do it logically and ignore the local conditions which are alike in scarcely any two cities. Without reflection one would think that what is done in Washington certainly could be duplicated in Baltimore, on account of the close proximity of the two cities.

On another page we quote from the address of General Manager House, of the United Railway & Electric Co., of Baltimore, before the legislative committee. It is a remarkably concise and convincing proof, in which figures tell the story, of why Baltimore is not Washington.

The work of the United States Patent Office is greatly hampered by reason of the inadequate space assigned to it, and the condition of affairs is steadily becoming worse as the business of the office increases, and more storage room must be found for documents and records by encroaching on the working space. Already in some departments the weight of papers has become such that further storage on the floors is forbidden by the building inspectors, and the records which constitute the title to valuable manufacturing properties are stacked in halls and passageways, where they are exposed and sure to be destroyed in case of accidental fire.

Up to Jan. 1, 1899, the number of patents granted was 693,979 and the number of trade marks, labels, etc., registered 41,422. Last year 25,527 patents were granted and 2,260 trade marks registered. This accumulation has resulted in crowding the halls originally intended for models with record matter, rendering exhibitions of the models practically impossible and has forced different departments of the office to be separated and located on different floors with great increase in the labor of routine business.

In no respect is the Patent Office more cramped than for money and space for its Scientific and Law Libraries. Less than \$1,500 was this year available for the Scientific Library and nothing whatever for the Law Library. To permit these departments to grow as they should competent judges say that at least \$6,000 per annum should be made available for the purchase of books.

The American Society of Mechanical Engineers at its Washington meeting in May last resolved to urge upon Congress the necessity for action which will provide safe storage for valuable records, make a suitable provision for the library upon which the efficiency and accuracy of all the bureau's work is dependent, and secure adequate office room for the force. Every one who is interested in this reform, and none can be more so than the electrical manufacturers, should do his share in bringing the matter before Congress by personal letters to the member from his district and the senators from his state.

There can be no greater folly than to expect public benefits to flow from the "competition" of transportation and other public service companies. If the enterprises are in fact competing ones the result must be either consolidation or the driving of one of the competitors into insolvency; the latter contingency means ruin for the solvent company and in the end, consolidation.

Gen. John McNulta, who won an enviable reputation as a financier and administrator of large properties, said the basic doctrine of all receiverships is that "a solvent corporation cannot successfully compete with an insolvent corporation in the hands of a solvent receivership." When asked how he could afford to make the rate of 2½ cents from 63d St. to South Chicago over the Calumet road, of which he was receiver, he said:

"It is as plain as day. See here. This reduction affects only one-tenth of our traffic. It affects nine-tenths of the traffic of our competitor. He is a solvent corporation and must pay fixed charges. We are an insolvent corporation in the hands of a solvent receivership. We have no fixed charges to worry us. We can afford to suffer a small loss on 10 per cent of our total traffic. Our competitor cannot. He cannot afford to come to our 2½-cent fare because it would reduce 90 per cent of his income just one-half. If he does not come to our fare he will lose his traffic and we will

gain it. In the end he will be willing to consider a fair offer for his property. That will mean a consolidation of all the now competing lines south of 63d St."

That the work of the American Street Railway Association is appreciated by the street railway men of this country is shown by the large number who make it a point to attend the annual conventions, though identified with non-member companies. As the membership is vested in companies, not individuals, the expense to any one road is small, as it may send as many representatives as it desires. That the Association has proved itself of great value to the street railway interests of the country is without question. That at no time since its organization has there existed a greater need for its work is equally true. It deserves and should receive the moral and financial support of every street railway in this country. The strength and influence of association work are measured largely by numbers. In these days the large bodies and undertakings are the influential ones.

The management of the association has decided to lend a helping hand to membership to the several hundred smaller roads to some of whom the first year's payment of dues and initiation might seem burdensome. The secretary announces the decision to waive the initiation fee of \$25 for the next few months making the entire cost for new members only the regular \$25 yearly dues.

It is greatly to be hoped a large number will take advantage of this opportunity and send in their applications promptly. "Now is the time to subscribe."

Last month we took a hasty glance at conditions prevailing to a greater or less extent on every road in the country; some were found to be greatly handicapped by a diversity of rolling stock and allied appliances. In no respect, however, did there appear to be a greater lack of uniformity than in the cars, and the question forces itself upon every thinking manager as to how much longer this thing will continue and what is going to be the practical remedy.

Men who are capable of developing such magnificent properties and operating them successfully certainly will find a way to eradicate the existing evils which confront us. Some have already started in to standardize their rolling stock, and where a few years ago it was deemed essential to letter each car permanently with its street or avenue or route, making it impractical for use on other lines of the same company, now the only prominent lettering is the name of the company, and revolving or movable signs are placed to indicate the route. This has naturally led to a greater uniformity of color in the car painting and the passenger no longer watches for a red or blue car, but for the sign board which indicates its destination. The advantage of this is apparent in the greater number of available cars for service at all times. It is precisely this same theory which has not been carried out in car building. The improvements recommended by the car builders, however, are by no means responsible for the great variety of rolling stock, which variety as we mentioned last month is not confined to different cities only, but is to be found among the several companies in the same city.

Managers have been largely to blame for this. They have insisted on making their own specifications, even where the one doing so had had no special experience or qualifications for so important a decision. Some men, moreover, seem determined to stamp their own individuality on everything they can, and with some of these individuality proved nothing more nor less than being different from other people. A car which has no greater excuse for its unusual dimensions and construction than that it is different from others, has a very doubtful claim to improvement, and yet hundreds of cars have been built along precisely just such lines with the inevitable result that the time came when somebody devoutly wished that he or somebody else had done differently.

The following has often been the case: The car builder who is called in to bid on an order is confronted first of all with a set of plans and specifications which represent the ideas of the manager. As like as not the former is not asked if he approves of the plans, or could suggest any changes, for to do so would be to admit they were not perfect (which of course they are!); and besides might give the car builder a chance to work in some scheme to his own advantage. The builder quickly sizes up the situation and reasons that while these cars are not what they might be, or even ought to be, that the buyers know what they want, are determined to

have it so, and have the money to pay for what they want, hence why should he jeopardize his chances of securing the order by volunteering a lot of advice which however sound and good is almost sure to be unwelcome and rejected?

We do not mean to be understood as saying that all managers, or even the majority, buy cars in the manner described; at the same time scores of them have done so, and we can point to the cars in evidence thereof.

Is there any good reason why the car builders and managers cannot get together and agree upon a certain standardization in car construction and dimensions? This does not necessarily mean that we should all agree to say a 24 ft. car for city use, for in many places the 30 ft. and more, are deemed best suited to the work. But is there any good, sensible reason why the general work on a 30-ft. car should not be equally applicable to the car intended for Cleveland as the one for Chicago or Omaha?

Steam roads have already found a standardization for all kinds of rolling stock from four-wheel cabooses to longest sleepers, and have effected a saving of thousands of dollars. There are many old style cars still in use, but as fast as they are rebuilt they are brought into line as far as possible. With the street railway the problem is vastly more simple and can be put into operation with comparatively little trouble. It is not contemplated in this suggestion, that all the cars in the country should hereafter be cast in the same mold like so many bullets, but that the American Street Railway Association ought to take up vigorously the question of standardizing rolling stock. This would still leave to each buyer the opportunity to carry out his own artistic ideas of exterior color and interior finish; the desired symmetrical curvature of grab handles or the texture of window curtains. But is there any reason to prevent the standardization of what are really the vital parts of the car; and when this has been agreed upon why go on experimenting? Or, if experiments are still desirable and necessary, let some one experiment for the benefit of the association, at the association's expense, and not have a harvest of failures where a smaller example would amply suffice. For example, if a car builder had a generally accepted standard of car decks to go by, he could buy material and make up parts, or if he had a little spare time—which none of them have just now—he could as safely go ahead and stock up on 24-ft. and 30-ft. decks, as he can now lay in nails and screws and floor lumber.

Under such conditions the car builders could do a great deal of their work to much better advantage, and even if buyers did not noticeably benefit in the way of direct saving in price, they certainly would gain something in time of delivery under ordinary conditions.

Three years ago managers smiled when one suggested a standard system of accounts, while admitting its great desirability. The energy and promptness with which the young men of the Accountants' Association grappled with the problem and worked it out, is something of which we are all proud. Not only do we know they have succeeded, but the voluntary commendation of state railroad commissioners places their stamp of approval on the work.

What has been done in the accounting department can be done in the shop. Whether the manager is best qualified to decide on car standards; or whether he should allow his master mechanic in conference with other master mechanics to do this; or whether the managers and the master mechanics and the car builders all together, is something to think about. It would seem that the car builders and the street railway master mechanics could very profitably confer and submit a report to the managerial association for its adoption.

There is probably such a thing as overdoing the association-convention business, but as long as we have so much to learn in the shop department it cannot be an unprofitable thing for the manager to bring his shop superintendent or master mechanic, or whatever his title, with him to the annual convention. If these men after an exchange of methods and experiences cannot bring home with them ideas worth to their company many times the expense of sending them to such a meeting, it must be because they are not the right men for the place.

The shop department is bound to receive more careful attention and greater recognition from this time on, than it has been awarded in the past. The American Association has already recognized this fact to the extent of deciding on a report at the next meeting on the supply department, and if the subject receives the careful study and fearless treatment it deserves we predict the paper will be one of the most valuable and suggestive on the program.

The System of the Boston Elevated Railway Co.

The New Elevated Line—The Subway—The Organization—The Mechanical and Electrical Features and Methods in Vogue in the Different Departments.

BY C. B. FAIRCHILD.

PART I.

The name of the West End Street Railway Co., of Boston, is more familiar to the readers of street railway literature than that of the Boston Elevated Railway Co., but the latter company having leased all the lines and property of the first-named company, now controls all the street railway lines in Boston except those of the Lynn & Boston Railroad Co. This company, however, has a traffic arrangement with the Boston Elevated and enters Boston over its tracks.

It is proper to note in the introduction of this article that the credit for having made electricity available as a motive power, on a commercial scale, is largely due to the West End company because of its early adoption of this power and the liberal manner in which the company set about experimenting, and its financial ability to meet the great experimental outlays that have marked the introduction of electricity as a motive power for street railways. Probably, if names are to be mentioned in connection with the adoption of electric power for traction purposes, no one deserves more credit for foresight, faith and courage in the future of this subtle power than Mr. Henry M. Whitney, former president of the West End company. Whatever may be said, however, in the way of credit about the pioneer work that was done on these lines, no less is due to the principal officers now responsible for the operation of this extensive system and the admirable manner in which the operating forces have been organized and the methods of control that are now in vogue. These names include those of William A. Bancroft, who was made president of the company in October last, and Charles S. Sergeant, vice-president. Other names will appear in order in connection with the description of the different departments, nearly all of which will have attention in this article.

THE ELEVATED STRUCTURE.

The erection of the elevated structure which has given its name to the entire system, is now well under way, and it is expected that the elevated lines will be in full operation, by electric power, in about a year. The accompanying diagram, Fig. 1, shows the loca-

also the traffic to and from the South Union Station, locally known as the Terminal Station and which is said to be the largest steam railway station in the world. The main line of the structure in

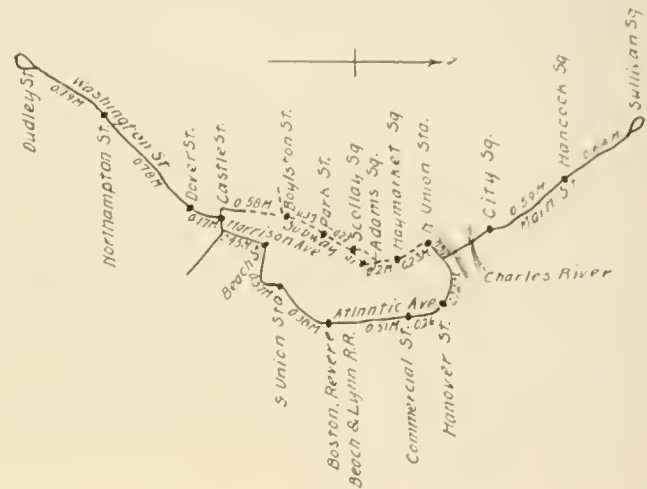
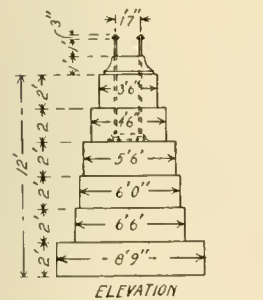
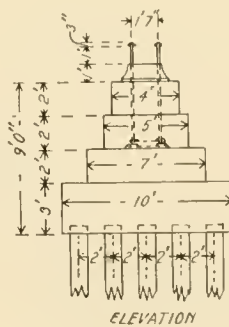


FIG. 1.

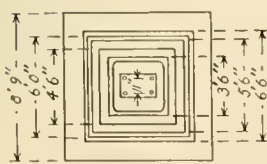
	Miles.
Dudley St. to Castle St., near Village St., elevated	2.00
Castle St. to Surface between Cornin and Pleasant Sts., incline	.05
Surface, etc., to Pleasant St., incline	.05
Subway Pleasant St. to Old Boston & Maine Station, subway	1.20
Old B. & M. Station to Travers St., incline	.05
Travers St. to Causeway St., incline	.05
Causeway St. to Sullivan Sq., elevated	1.70
Atlantic Ave. Loop, elevated	2.30
Total	7.40
From Dudley St., Roxbury,	
To Sullivan Sq., Charlestown, via Subway	5.1
To " " " Atlantic Ave. Loop	5.7
Round trip	10.8
To North Union Station, via Subway	3.4
To " " Atlantic Ave. Loop	4.2
Round trip	7.6
From Sullivan Sq.,	
To Castle and Washington Sts., via Subway	3.4
To " " " Atlantic Ave. Loop	3.9
Round trip	7.3
Loop, via Subway and Atlantic Ave.	4.1



ELEVATION

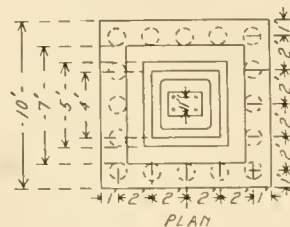


ELEVATION



PLAN

FIG. 2.



PLAN

FIG. 3.

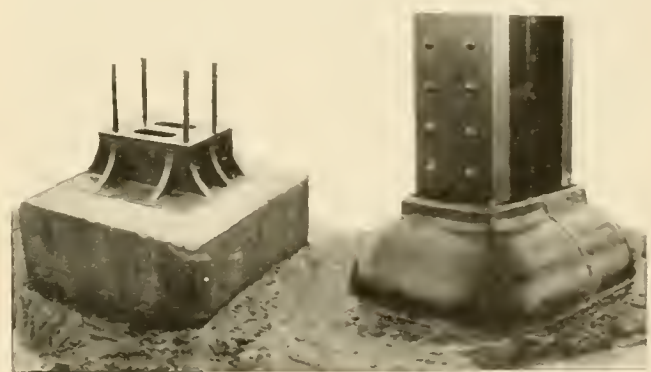


FIG. 4.

FIG. 5.

tion and direction of the elevated structure. It will be noted that the main line from each end terminates at the portals of the subway which is a prominent feature in connection with the Boston system of street railways. A loop passing around the subway connects the inner terminals and provides for the patrons on Atlantic Ave. and

Boston is located on Washington St. and in Charlestown, on Main St., and crosses the Charles River on the upper deck of a large draw bridge which with the approaches constitutes an interesting

feature of the system. The cars are to enter the subway by means of inclines and the bore of the subway is being enlarged where necessary to provide for the passage of the elevated trains. All through traffic in the subway is to be by elevated train only, while certain of the surface cars will enter the subway and loop

at a station, as is now done by some of the lines, in a manner to be described later on. The main line of the elevated structure terminates in a loop at each end and in connection with this inclines are provided for bringing the cars of certain of the surface lines to the

gusset plates, cutting away unnecessary material from the central portions.

Fig. 11 is a plan and elevation of the longitudinal trusses for spans from 29 to 37 ft. On the Charlestown Bridge, plate construc-



FIG. 7—STRUCTURE AS ERECTED IN WIDE STREETS.

same level as the elevated cars, to and from which, free transfers are to be given.

The total length of the elevated structure is 6 miles, the main line including the subway, is 5.1 miles; the Atlantic Ave. loop is 2.3 and the subway 1.2 miles.

The character of this structure which provides for a double track line throughout the entire length is shown in the accompanying diagrams and half-tone illustrations.

Fig. 2 shows a typical concrete foundation for the columns where the soil was found to be sufficiently firm to sustain the load without piling.

The foundations are of portland cement concrete mixed in proportions of 1, 2½ and 5 for the first five courses and of 1, 2 and 4 for the top course. Fig. 3 illustrates a foundation where piling was required to support the concrete, as was the case on nearly all of the Atlantic Ave. loop. The pile foundations are supported on 22 piles and are in four courses of portland cement concrete, the top course being 1, 2 and 4 and the others 1, 2½ and 5. The bottom of the first course is placed below ground water level.

Fig. 4 shows a base with anchor bolts and Fig. 5 the base of a column and fenders.

The columns and cross trusses are shown in Figs. 6 and 7. This form of construction is used only where the streets are wide and where the tracks are located above the column. Should it be found necessary in the future to provide for a third track these cross trusses will be replaced with plate or lattice girders. The clear headway under the girders on the main line is 14 ft., while on Atlantic Ave, where steam freight cars also operate, the height is 15 ft. 5 in. Typical cross girders are shown in Figs. 8 and 9. The former is of the lattice type and is employed where the shadows of the plate girders would be objectionable. The latter type, however, is generally used at the south end of the line on Washington St., Fig. 10, and on the Charlestown Bridge. Where plate girders are used on the main structure, a group of round 3-in. holes are provided in some of the plates to provide for locating the feeder cables. The lengths and other dimensions of the cross girders are shown on the diagram. Fig. 9 also shows the design of the expansion pockets which are placed at least every 200 ft.

It will be noted on inspecting the drawings of these trusses that contrary to the usual practice an effort has been made to improve the appearance of the structure by giving curved outlines to the

tion is also used for the longitudinal spans. The same diagram shows the sway frames that are placed at suitable intervals. Figs. 12 and 13 illustrate the hoists employed for erecting purposes.

THE CHARLESTOWN BRIDGE.

Fig. 14 illustrates the draw span of the Charlestown Bridge, one of the most interesting structures of its class in the world. The bridge proper was finished last year and was built by the city, but the elevated structure was built by the railway company.

The draw span is 240 ft. long, resting on a center pier,



FIG. 10—PLATE CROSS GIRDER CONSTRUCTION.

with a passage for vessels on each side 50 ft. wide. The draw is 100 ft. wide and 23 ft. above mean high water. The individual trusses, of which there are four, are 24 ft. deep at the end and 45 ft. at the highest point of the center. The bridge provides

for a double line of surface car tracks, two roadways 20 ft. wide for vehicle traffic and two side paths 10 ft. wide for pedestrians. The revolving mechanism is contained in the circular base which is 54 ft. in diameter and the load is supported on solid steel wheels which are placed very close together. Two electric motors, mounted on

manner as that described for the Charlestown Station. Fig. 17 is a cross section of the elevated station on Atlantic Ave. at the South Union or Terminal Depot, showing the approaches; it is noted that on one side a bridge leads from the elevated station through the side wall of the passenger station.



FIG. 12-ERECTING COLUMNS.



FIG. 13-ERECTING STRUCTURE.

brackets, on either side of the base, provide the power for operating the draw and are connected by suitable shafts and reducing gear to a spur wheel which meshes into a gear extending entirely around the base. Suitable hydraulic lifts at the ends of the structure serve to lock and help support the ends of the draw when closed.

The surface construction of the elevated structure is illustrated in Fig. 15 and shows the location of the track and conductor rails. The conductor rail is partially housed and guarded by means of two plank stringers which are supported by iron brackets spiked to the cross ties. The conductor rail will probably be mounted on insulating blocks. All of the rails, including the conductor rails, are to be of the A. S. C. E. standard section weighing 85 lb. per yd., and the track rails are connected by "Continuous joints." The rails are laid on tie plates. All timber work shown in the illustration is of long leaf southern pine. A tubular guard rail or fence is provided for the protection of the employes while on the structure and this is shown in the same illustration.

The different levels are indicated by the elevation above datum, and are required to meet the peculiar conditions in the station. The stairs leading to the elevated structure from the street are also shown in the same connection.

Fig. 18 shows the arrangement of the ticket offices, waiting rooms, and platforms, and is a typical layout for all the stations on the line. The others, however, are designed to suit the local condition. The exterior walls and roof of this station are of copper, painted, while the inside is finished in oak panelling, hard pine flooring, both for the station rooms and platform, and in the toilet rooms open plumbing is employed. The whole station is made as light and airy as possible.

Fig. 20 shows the general layout of the elevated and surface tracks at the Sullivan Square Station at the Charlestown Terminal. Here is also located the repair shop for the elevated system and the tracks leading off to the right enter the repair shop. As noted above the elevated tracks make a loop and the surface cars come up to a level with the structure over inclines which have a grade of about 5 per cent. Some of these inclines lead to the inside of the loop, others outside, and passengers are delivered and re-

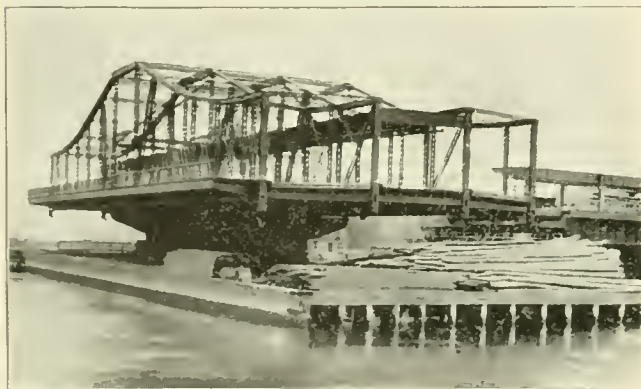


FIG. 14-DRAW-SPAN, CHARLESTOWN BRIDGE.

Fig. 16 is a layout of the south terminal loop on Dudley St. known as the Roxbury Station. Here it will be noted that two lines of surface cars come up to the elevated level and loop on each side of the elevated track, but at different levels. The platform of the surface cars is 13 in. above the rail, while that of the elevated cars is 4 ft. above the rail. The dotted lines shows the surface tracks that pass beneath the structure. The structure is roofed in the same

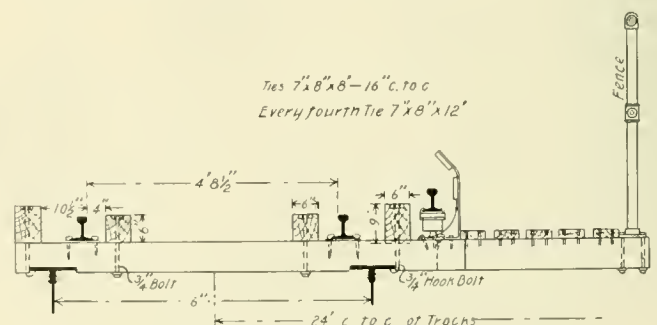


FIG. 15-SECTION OF TRACK.

ceived from the elevated platform. A double elevated track is shown around part of the loop and on one side. This is designed for storing trains after they are made up and waiting for their schedule time.

Fig. 19 shows the ground plan of the station, the ticket offices and waiting room, and also the tracks of the surface line which loop here and pass the station on the ground level. The main floor is

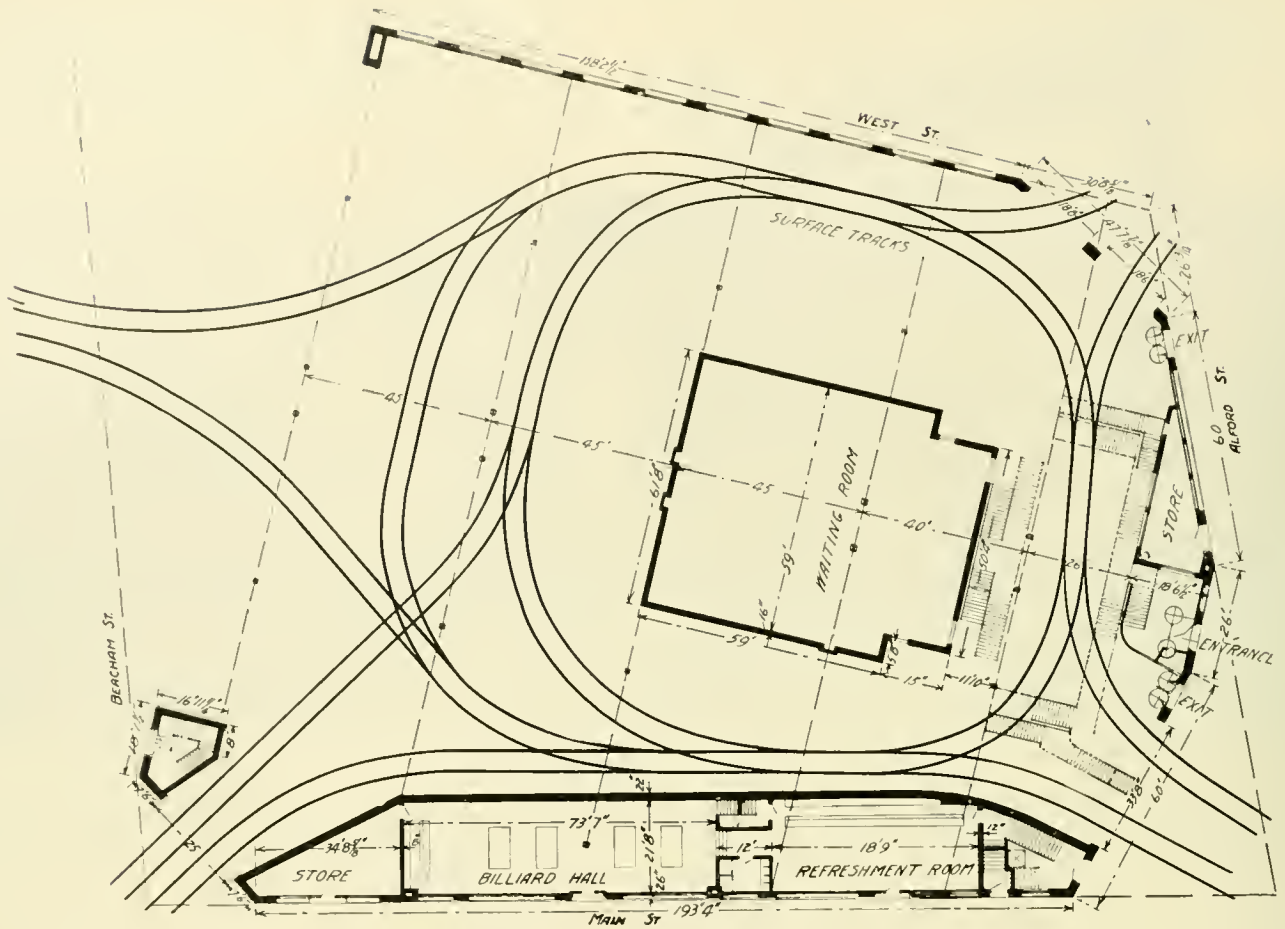


FIG. 19—GROUND PLAN OF SULLIVAN SQ. STATION.

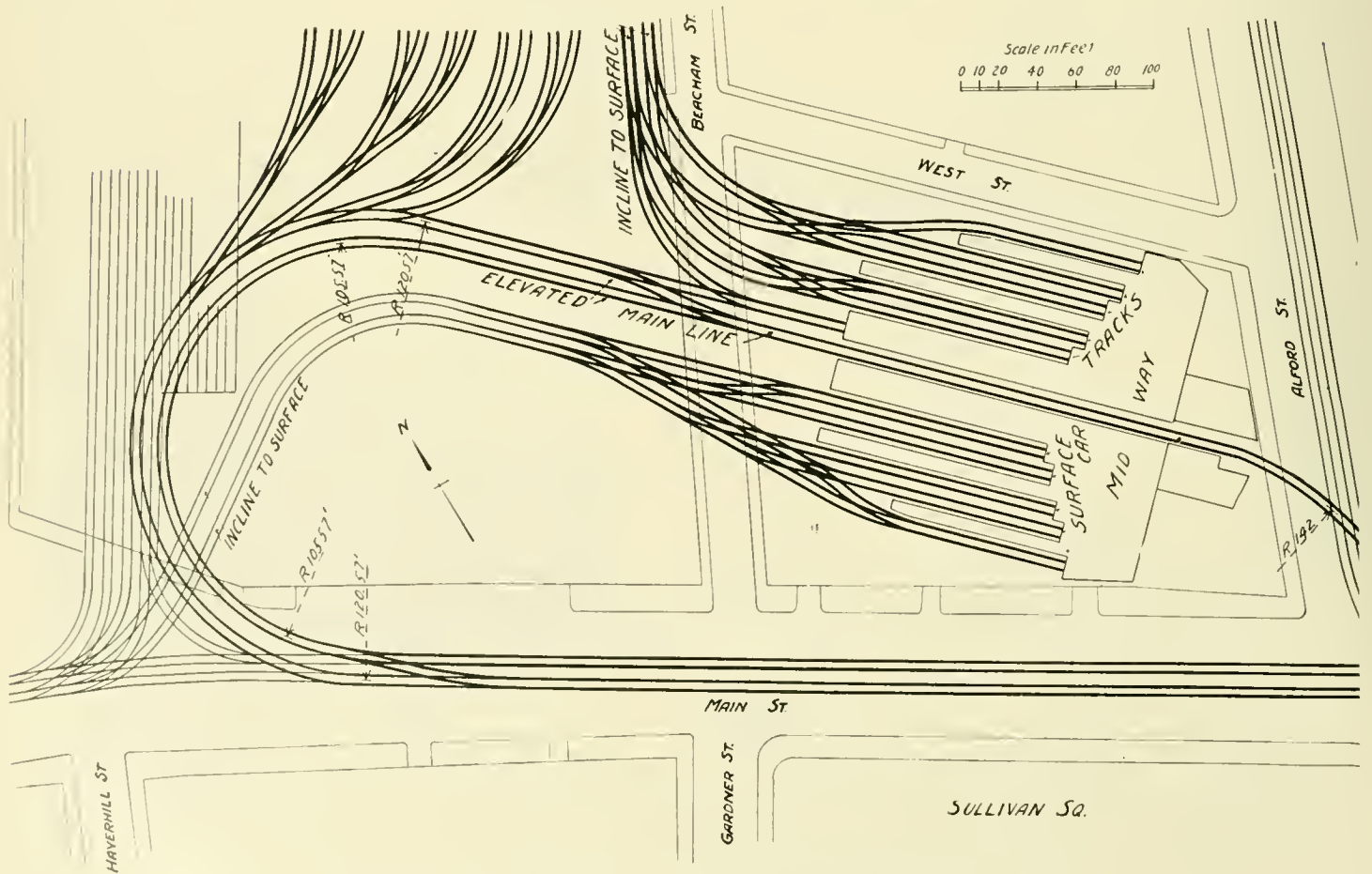


FIG. 20—LAYOUT OF ELEVATED AND SURFACE TRACKS AT SULLIVAN SQ. STATION.

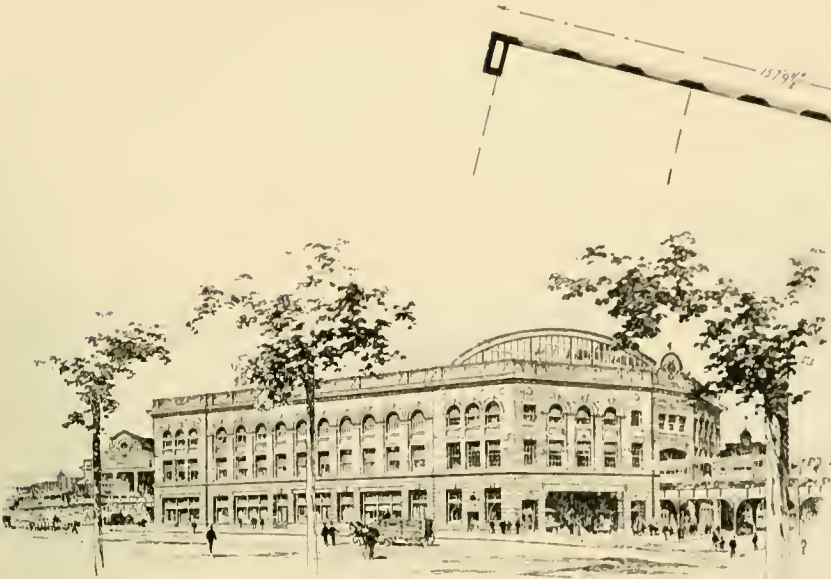


FIG. 23- SULLIVAN SQ. STATION.

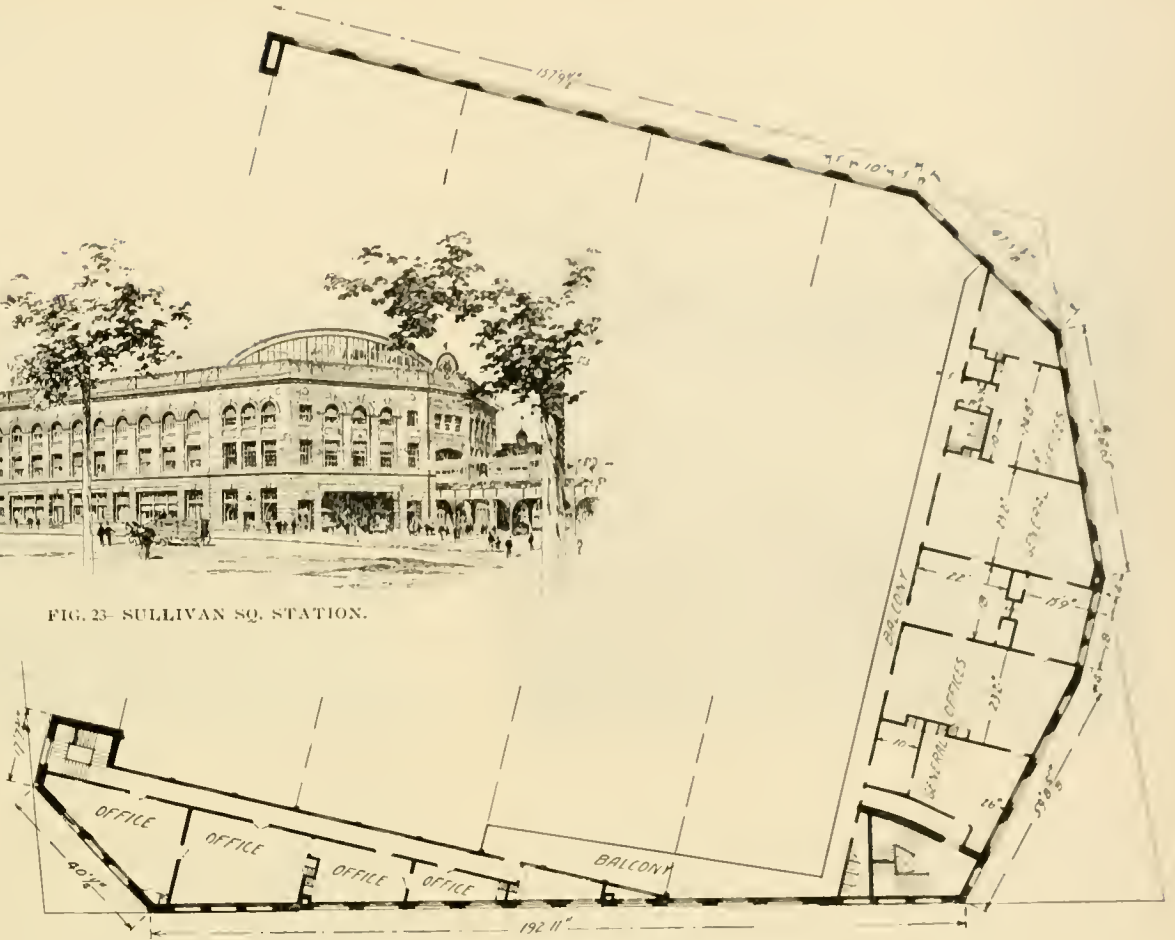


FIG. 21- THIRD FLOOR OF STATION BUILDING.

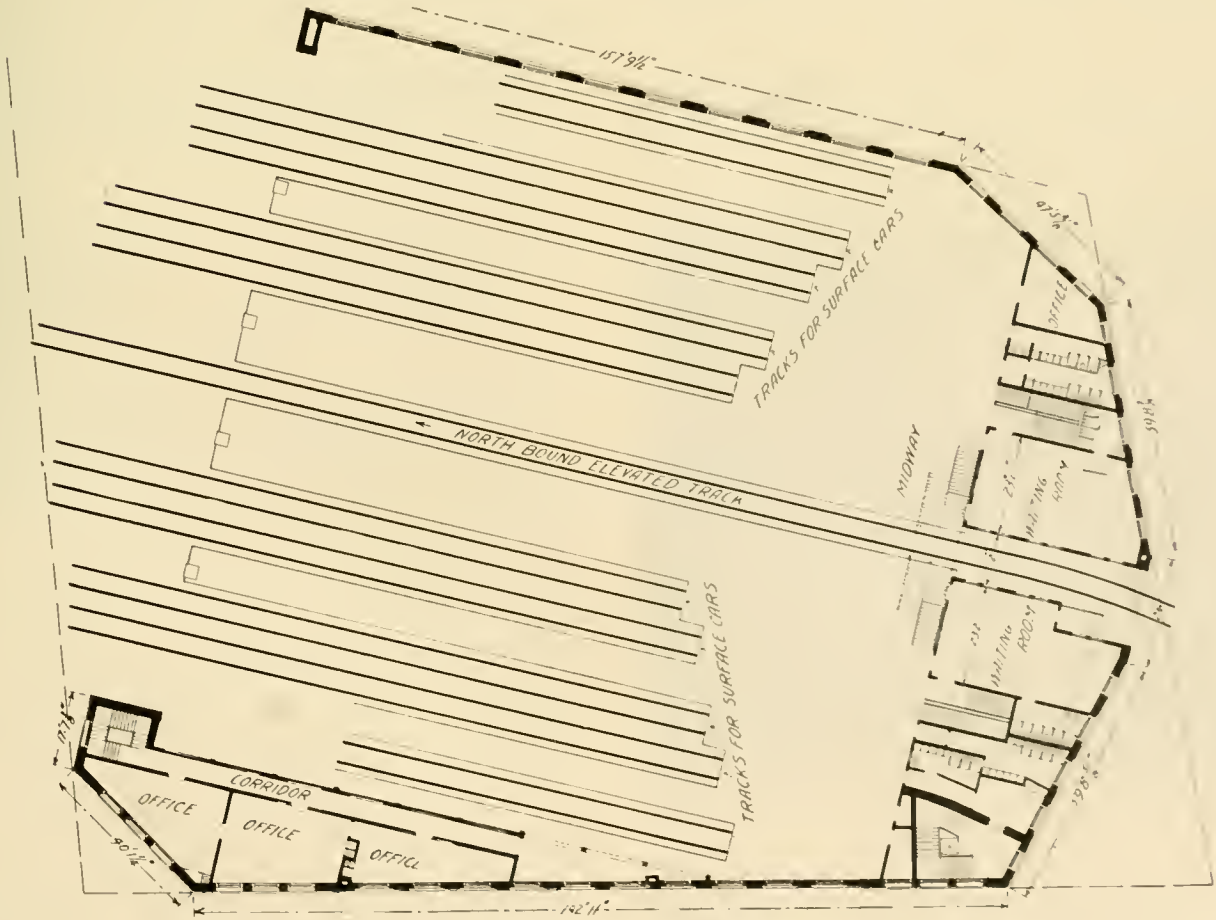


FIG. 22- LAYOUT OF SECOND FLOOR.

railed off, so that access can be had to the inner waiting room only by the passengers that come in on the surface cars. Stairs from this waiting room and also from the main ticket office lead up to the elevated platform. On the inside of the building, concessions are sold or rented for refreshment room, billiard parlors, and stores on a portion of the ground floor. The third floor layout is shown in Fig. 21 and here are the executive offices of the Elevated company. Fig. 22 is another layout of the second floor, showing waiting room with porters' closets and toilet rooms and also shows the terminal

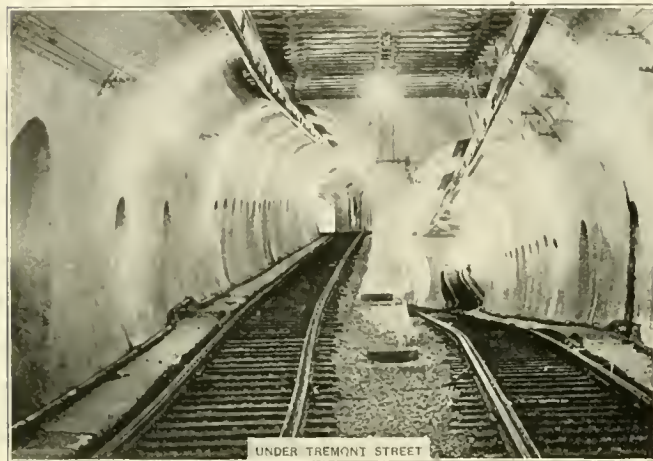


FIG. 24.

track of the surface lines on the elevated platform. The platform and part of the loop are roofed in and the roof is supported on steel arches that span the entire space of 175 ft. The return and storage tracks of the Elevated are outside the structure. Fig. 23 is an exterior view of this station. The walls are of brick and the interior finish of waiting rooms and station is of enamel brick of various shades. The station is light and airy and contains all the conveniences that can be suggested for the accommodation of the patrons and employes.

ROLLING STOCK.

The cars to be operated on the elevated structure are of about the same general pattern as those employed on the Manhattan Elevated Ry., of New York. The bodies are 46 ft. 2 in. over all, and 8 ft. 6 in. wide, and have side as well as end doors.

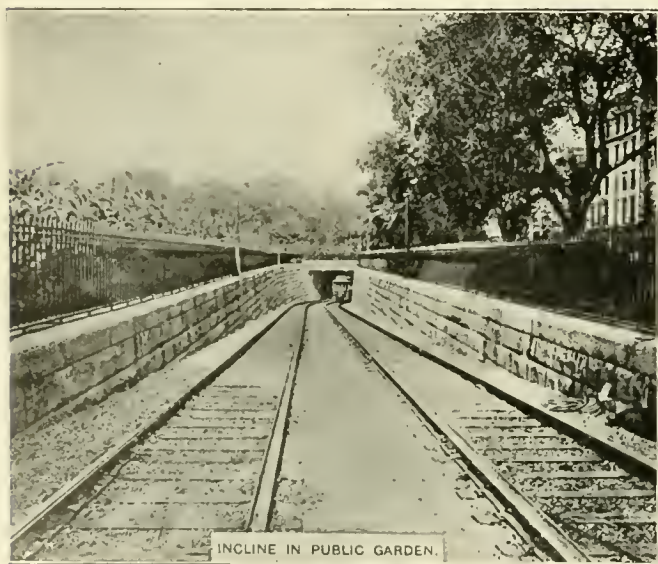


FIG. 26.

Side seats only are provided. The trains are to be run with from two to five cars and are to be controlled by a "multiple unit system" so that the motors can be operated from each platform. Before de-

termining on the make of the electrical equipment three trains of four cars each will be equipped with three different electric systems. Three cars of the type described have been built for the company by the Wasson Car Co., of Springfield, Mass., and each of these will be equipped as a motor and will each haul a train of loaded flat cars equipped with suitable controlling mechanism.

With these, experimental trips in the subway, at night, will soon be begun after the surface car traffic is withdrawn. The three experimental motor cars are mounted on trucks of the engine, swing



FIG. 25.

bolster type, which were made by the Baldwin Locomotive Works, of Philadelphia.

Each car will be equipped with two 150-h. p. motors both mounted on one truck. One of the cars will be equipped with the General Electric motors and the G. E. system of multiple control. A second will be equipped with Westinghouse motors and method of control and the third will be fitted on the Sprague system.

Automatic air brakes are to be used and one train will have the Westinghouse system, another the New York Air Brake system and the third the Christensen system. The experimental trains will be equipped with different types of electrical car heaters including the Gold system, the American Heating Corporation system, the Consolidated and a new system making use of a blower designed by Boston parties. The cars will be coupled by means of the Van Dorn draw bar and couplers and are provided with platform gates which will be fitted with the Gold locking and operating device the same as is universally employed on elevated and suburban trains.

POWER STATION.

A new plant from which the elevated line will be operated is being erected on Lincoln Wharf to which coal can be delivered direct from barges without having to pass any draw bridges. The preliminary power equipment of the station will consist of two vertical cross compound condensing engines with cylinders 44 and 88 x 60 in. and rated at 4,000 h. p. each; they will have a maximum of about 7,000 h. p. each. These machines are each direct coupled to a 500-volt direct current generator of 2,700 kw. capacity. The generators have been ordered, one from the General Electric Co., and one from the Westinghouse Electric & Manufacturing Co.

The first equipment of boilers consist of four batteries of Babcock & Wilcox boilers, each rated at 3,800 h. p. Included in the auxiliary equipment is a Green economizer with 1,152 tubes. The condensers are of the Blake type with vertical twin pumps.

The stack is of brick and is 260 ft. in height with a 13 ft. flue. Foundation and room are provided for a second stack of the same dimension. An elaborate coal storage and coal handling system will be established consisting of cars and conveyors both for handling coal and ashes. Roney stokers will be used.

The steel for the elevated structure was bought for the most part from the Pencoyd Steel Co., although considerable was furnished by the Carnegie Steel Co. and the Pennsylvania Steel Co. The design and erection of the elevated structure and equipment have been under the direction of Mr. Geo. A. Kimball, chief engineer of the elevated lines.

THE BOSTON SUBWAY.

This is a prominent and interesting feature of the Boston Elevated system. The subway was built by the city and was designed to relieve the congested condition of Tremont and Washington Sts. near the center of the city where the surface traffic had become too great for the narrow streets. The work of construction was begun in March, 1895, and was finished in 20 months. The tunnel proper is 9,498 ft. long and runs under the public gardens and under several of the principal streets. On being finished it was leased by the street railway company for a period of 20 years, and the electrical equipment, tracks, etc., installed by the company. The subway is not a low-level tunnel but is built as near the surface as possible. One section is designed for a four-track railway and here it is 48 ft. across with roof supported in the middle by a row of steel columns. The two track section is 24 ft. wide and has a flat roof which is supported by brick arches turned between I-beams with diagonal stringers connecting the vertical and horizontal beam across the corners. One section is divided into two separate single track subways, which afterwards converge into a double barrel subway. Leading to the portals, are open inclines, protected by retaining walls on concrete foundation. The grades range from 5 to 8 per cent.

Sections of the subway and one of the approaches are shown in Figs. 24, 25 and 26.

The layout of the tracks at the five principal stations in the subway and the passenger platforms are shown in Fig. 27. It will be noted that some of the tracks loop at three of the stations while the other continues through and provides for a continuous trip to and from any part of the city. Entrance to the platforms is had through stations which are built of granite with flights of steps leading to the ticket offices and platforms. The roofs of these stations are principally of glass and the stations were made as complete as the conditions would allow. The platforms are of artificial stone with suitable guard rails and wire fences for the protection and guidance of the passengers. Ticket offices are provided at each station and all subway passengers entering by the station are required to purchase tickets which the conductors collect before the cars emerge from the subway. At the stations the lining of the tube is of white enameled brick, and the stations are brilliantly lighted by arc and incandescent lamps.

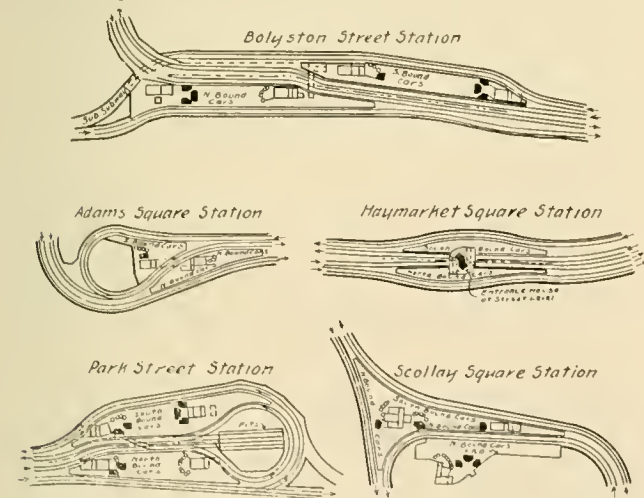


FIG. 27 - LAYOUTS AT SUBWAY STATIONS.

At the Boylston St. Station is a cross sub-subway, so that the southbound passengers after purchasing their tickets can pass under the tracks to the platform of the southbound cars. Uniformed attendants are stationed at the platforms to direct and care for passengers. The subway is lighted throughout by electric lamps and electric heaters are provided for warming the ticket offices. There is also an elaborate lock signal system. Perfect ventilation is secured by means of fans driven by electric motors with flues leading to ventilating chambers that communicate with the external air.

The Park St. Station of the subway is said to rank third among the busy railway stations of the world, although one of the smallest in platform capacity, having only 15,197 sq. ft. of available surface. This station is used as the general transfer point of the subway and it is estimated that in busy hours 2,500 people transfer at this point

while the number of tickets sold between the hour of 5 and 6 at night has been as high as 8,631, and the maximum number of cars passing in one hour is 204 including those that pass on the inside loop, and 124 in each direction on the through tracks.

The number of tickets sold daily at this station is about 25,000 and the maximum for any one day was 40,000. It is estimated



W. A. BANCROFT.

C. S. SERGEANT.

that as many people leave the station during the day of 18 hours as enter it, so that it is safe to say that as many as 100,000 people are daily accommodated at this station. Electrically operated indicators are in use during the hours of largest out-going traffic. These indicators have the names of the routes arranged in parallel columns and between these are illuminated numbers to indicate the berth at which the car will stop. This prevents the passengers from crowding to the edge of the platform to watch for their car. The subway fully meets the requirements for which it was designed and is a pronounced success both in construction and operation. About the only objection that can be named from the standpoint of the passenger is the excessive noise due to the echo from the walls and is caused chiefly, one would think, from the action of the trolley wheels on the wire.

HEADQUARTERS.

The executive offices of the company and of most of the departments occupy eight floors of a large building at 101 Milk St. The space includes the drafting room for both the elevated lines and for the civil engineer's department of the surface line. Each floor is cut up into offices suitable to the requirements of the different departments and all are supplied with the latest designs of office furniture, and are as completely organized as the latest office practice can suggest. Three of the departments have headquarters in other buildings. On the roof of this building, two blue print rooms have been constructed of sheet metal, one for the engineering department of the elevated lines and the other for the civil engineer's department of surface lines.

The equipment of these rooms is very complete and the glass with its frame and table is mounted on a truck by means of which it is run out or in over a suitable track. The layout of rooms also includes a small tool room, a track museum for samples of rail and track equipment and a store room for telephone supplies and tools.

A private telephone exchange is maintained in the building which connects all the offices, not only those in the building, but the car houses and car stations of the whole system.

ORGANIZATION AND REGULATION OF DEPARTMENTS FOR SURFACE LINES.

With one exception the system of the Boston Elevated Railway Co. is the largest under one management in the country. The length of the surface lines aggregate 338 miles, nearly all of which is operated by electric power, and for generating the current, seven power houses have been erected with a total capacity of 26,144 kw.

The number of uniformed employes ordinarily on the pay rolls is 4,421. The number of closed cars is 1,381, and of open cars, 1,392. The number of passengers including free transfers as reported for the last fiscal year was 233,136,939, of which 191,023,224 were revenue

passengers. The earnings were \$9,671,441, and the operating expenses were \$6,827,150.

In order to operate a property of such vast magnitude economically and satisfactorily, to both the patrons and the investors, it is evident that a complete organization of the forces and a wise system of discipline must be primary requirements and that each must be done to a scientific nicety. That the responsible parties have mastered the situation admirably so as to meet the many difficult problems, due both to the geographical situation and public demands is evident to one who will inform himself and compare the work with that which prevails in other cities. If there is one thing more than another to be quoted in evidence of the wisdom of the plans followed it is that of the universal harmony and good-will that is apparent among the heads of the different departments in their relations to each other.

The bureau of surface lines was established by the directors, and placed in charge of the vice-president, Mr. Charles S. Sergeant and by him organized into 10 departments with a head for each department who is responsible directly to him. The departments having been organized, a pamphlet was issued and supplied to the head of each department naming the department and briefly outlining the duties of each head and defining his relations to each of the other departments. In this pamphlet the names of the different departments appear as follows:

That of Transportation; of Motive Power and Machinery; of Wires and Conduits; of Maintenance of Way; of Civil Engineering; of Electrical Engineering; of Buildings; of Employment; of Inspection; of Stores.

The head of the auditing department is responsible directly to the president and board of directors.

(To be continued.)

TRAMWAY FOR SARAN DISTRICT, INDIA.

Some time in 1898 the District Board of Saran, India, reached the conclusion that a tramway or light railway should be built to carry the very heavy traffic over the Chapra-Satter-Ghat Road, one of the principal roads of the district. In pursuance of this decision an advertisement was published, and several replies were received; but since then little or nothing has been done in the matter, except that the board decided, at one of its recent meetings, to offer to any firm or company willing to undertake the scheme, a subsidy of 8,000 rupees per year for eight years. The engineering difficulties connected with the building of the tramway would be small.

According to Indian Engineering the native merchants of Chapra are very enthusiastic over the tramway scheme, and would afford considerable support, as, by its existence, the existing high charges for cartage would be vastly decreased, and where now it takes them two to three days to obtain their goods from the northern ghat, the "tram" would deliver them in 12 hours or less.

It is a scheme well worthy of the notice of capitalists, more especially as it will be the pioneer tramway of northern Behar, and the company taking it in hand will naturally reap all the advantages obtainable by the opening up of a hitherto untouched country, and one where, owing to population, the traffic is constant and heavy.

NEW LINES FOR KANSAS CITY.

The Metropolitan Street Railway Co., of Kansas City, Mo., and its allied companies, the Central Electric Co. and the Home Electric Co., have asked the city council for street railway franchises on 11 additional streets. The proposed franchise ordinance provides that the construction of the new lines must begin within six months after the acceptance of the franchise, and must be finished within 18 months thereafter; for the payment to the city of 2 per cent per annum of the entire gross earnings of these lines; the average rate of speed of cars to be 12 miles an hour and the fare to be 5 cents.

It is the intention of the company to make Main St., Walnut St. and Grand Ave. the three trunk lines of the city's entire car system, and every car will have one of these three streets on its route. Pres. W. H. Holmes is quoted as saying that the contemplated improvements will cost nearly \$2,000,000.

TRAMWAYS IN GREAT BRITAIN.

The report of the Board of Trade to the House of Commons, on the street and road tramways of the United Kingdom for the year ending June 30, 1899, shows that on that date there were 1,122 miles of line open for traffic, of which 881 miles were in England and Wales, 106 miles in Scotland and 135 miles in Ireland. The total paid-up capital represented by these lines was £18,052,773, of which about £8,500,000 was share capital. Out of the 169 undertakings, 61 are owned by local authorities.

The number of passengers carried on all lines for the year was 924,820,247, as against 146,001,223 for 1878, and 858,485,542 for 1898. Gross receipts for the year were £4,879,602, working expenses £3,675,559, net receipts £1,204,043, equivalent to about 6½ per cent on the total capital.

ELECTRIC RAILWAY MAGNETIC DISTURBANCE.

The question of the magnetic disturbances caused by electric street railways was discussed recently in a paper by Mr. Mariani before the Institute of the University of Rome, Italy. The author reaches the conclusion that the magnetic materials on a street railway directly affect the compass up to a distance of 150 yd. from the line, and the further disturbances such as are felt by magnetic observatories are due to the leakage currents from the earth return, the range over which these are felt being about 2,000 yd.

PULL ON TROLLEY WIRES DUE TO VARYING TEMPERATURE.

A formula for computing the stresses in trolley wires caused by variations in temperature has been worked out by Mr. M. Essig and published in the *Electrotechnischer Zeitung*. Assuming a span of 40 meters (131¼ ft.), a wire of 50 sq. mm. area (equal to .316 in. in diameter), and a working tension of 400 kg. (880 lb.), the additional pull per degree Fahrenheit is as follows:

Temperature, degrees F.	Extra pull, lb.
From 86 to 79.....	3.7
" 79 to 68.....	4.9
" 68 to 54.....	6.1
" 54 to 46.....	7.3
" 46 to 32.....	8.6
" 32 to 14.....	9.8
" 14 to 4.....	11.0

PRECAUTIONS AGAINST ELECTROLYSIS.

Mr. Edward B. Ellicott, city electrician of Chicago, states that after a careful study of the conditions for over two years and making tests which extended throughout the city, he recommends to the council that in electric railway ordinances the company be required to provide and maintain a return circuit of such conductivity that the maximum potential difference between the rails and water pipes in the street shall not exceed 1 volt, and such that the maximum difference in potential between points on the rails 300 ft. apart shall not exceed ½ volt. This will not prevent flow of current to and from water pipes, but it is claimed will reduce the liability of serious damage to a minimum.

EARNINGS OF CLEVELAND INTERURBANS.

The earnings of the Cleveland interurban electric railways for the year 1899 show substantial increases over those of the preceding year. They are: Cleveland, Berea, Elyria & Oberlin, \$67,377; Lorain & Cleveland, \$53,305; Northern Ohio Traction (A. B. & C.), \$124,300; Cleveland & Chagrin Falls, \$15,355; Cleveland, Painesville & Eastern, \$55,441.

Three-Phase Installation of the Newtown (Pa.) Electric Street Railway.

In the closing years of the seventeenth century the illustrious William Penn, founder of the present city of Philadelphia, drew up his famous contract with the Lenni Lenape tribe of Indians, who, by its wording, were to release to William Penn and his successors as much land lying between the Delaware and Susquehanna Rivers, as could be stepped off in 24 hours, commencing at a point indicated by a rough stone monument, a view of which is shown



FIG. 1—MONUMENT NEAR NEWTOWN.

in Fig. 1. From that time the people of Bucks County have had no better methods than were then in use, for traveling across from different towns to the county seat, until the construction of the present lines of the Newtown Electric Street Railway Co. This company absorbed the Bristol & Langhorne Railway Co., and by the construction of an extension of 14 miles from Newtown to Doylestown, completed one of the longest continuous suburban trolley lines at present operating. Starting at Bristol, Pa., on the New York Division of the Pennsylvania R. R., the road runs continuously on its own private right-of-way parallel to and adjacent to the turnpike, through the village of Hulmeville to Langhorne, crossing the New York Division of the Philadelphia & Reading R. R. on an overhead bridge at the above-named station, and continuing thence through Langhorne Manor, crossing under the Trenton cut-off branch of the Pennsylvania R. R. This crossing was accomplished after several years of legal battle, waged by the electric company against its steam road antagonist. The line con-

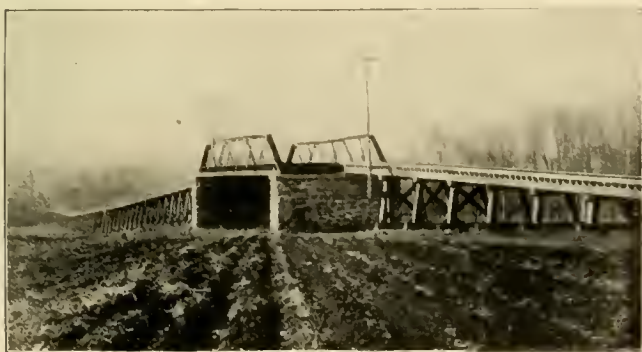


FIG. 3—BRIDGE AND TRESTLE AT WYCOMBE.

tinues to Newtown, crosses at grade the Newtown branch of the Philadelphia & Reading R. R., and thence through Main St. of Newtown, to and through the village of Wrightstown, crossing over the New Hope branch of the Philadelphia & Reading R. R. at Wycombe, Pa., on a trestle and iron bridge, shown in Fig. 3.

From this place it passes through Forrest Grove and Bushington to Doylestown, the county seat, making a total distance of 28 miles.

The rail in the boroughs is 7 in. girder and on the other portions of the road 60-lb. T rail has been used, laid on ties 6 in. x 8 in. x 8 ft., spaced 2,112 ties to the mile, laid with suspended joints, the rails being bonded together with No. 0000 copper bond, placed un-



FIG. 2—EXTERIOR OF POWER HOUSE.

der the plates. The rail and special work was furnished by William Wharton, jr., & Co., of Philadelphia; the ties by Kirby & Hawkins, of Philadelphia.

When the extension of the line from Newtown to Doylestown was first considered, the principal question that arose was the one of supplying power to the continuous line from Bristol to Doyles-



FIG. 4—CLOSED CAR.

town. It was finally concluded to install a power plant at Newtown, which is the center of the line, putting two transforming sub-stations, one seven miles to the south of power plant and one 11 miles to the north. The contract for construction was awarded to the American Engineering Co., of Philadelphia, and was by it carried

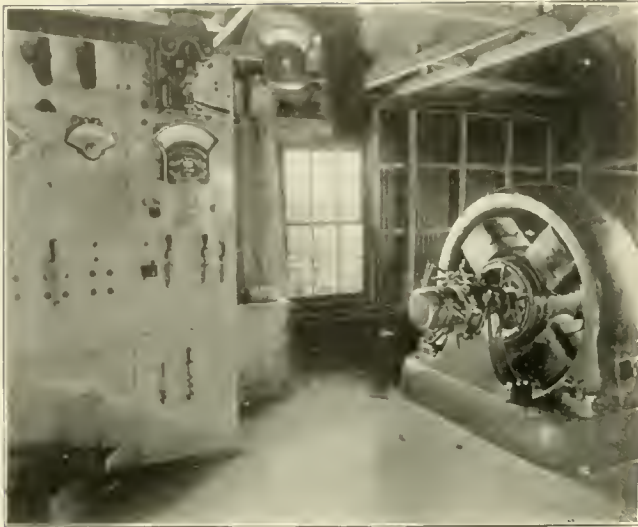


FIG. 5—ROTARY TRANSFORMERS.

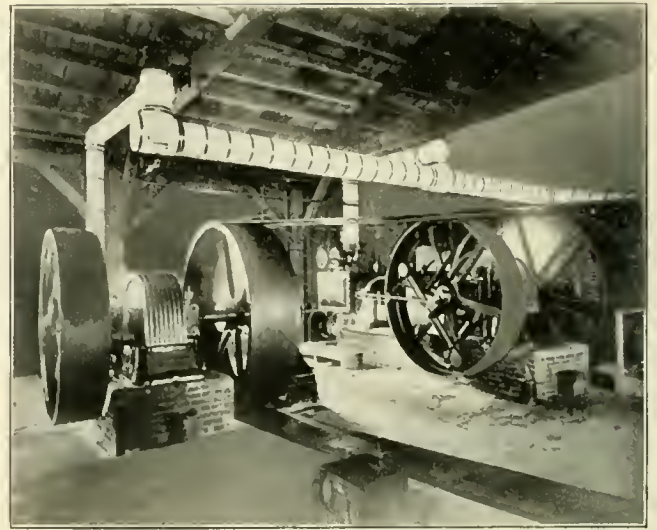


FIG. 8—ENGINES.

to successful completion, its able and efficient corps of engineers having entire charge of the work.

The power house, the exterior of which is shown in Fig. 2, is situated at Newtown, on the Philadelphia & Newtown R. R., with coal siding connecting therewith. Its equipment consists of two Ridgeway simple engines of 300 and 400 h. p. each, belt connected to one 225-kw. direct current generator and one alternating current generator. The switchboard consists of one direct current feeder panel, three alternating current feeder panels and one ex-

rotary transformers, and three stationary transformers. The alternating current enters the transformers at 6,000 volts, and is fed to the line at 550 volts, direct current. The transformer stations are also equipped with marble switchboard, consisting of alternating current and direct current panels, with necessary fixtures, the electrical equipment being furnished throughout by the General Electric Co.



FIG. 6—EXTERIOR OF SUB-STATION.

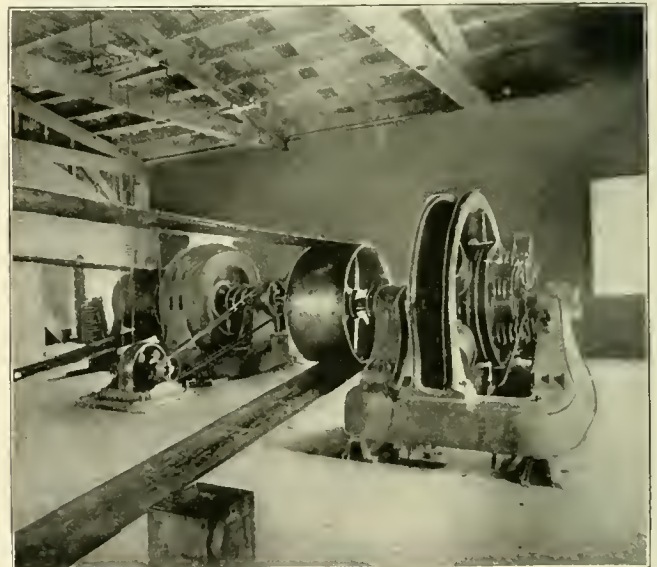


FIG. 9—MAIN POWER STATION.

terior panel mounted on Tennessee and black marble, the alternating current panels being of the light marble, and the direct current of the black. Interior views of the power station are given in Figs. 8 and 9.

The overhead material consists of No. 00 trolley wire, suspended from brackets supported by wooden poles with cross arm attached, upon which is strung the feeder wire, consisting of three No. 6 wires, hung on triple petticoated porcelain insulators, the direct

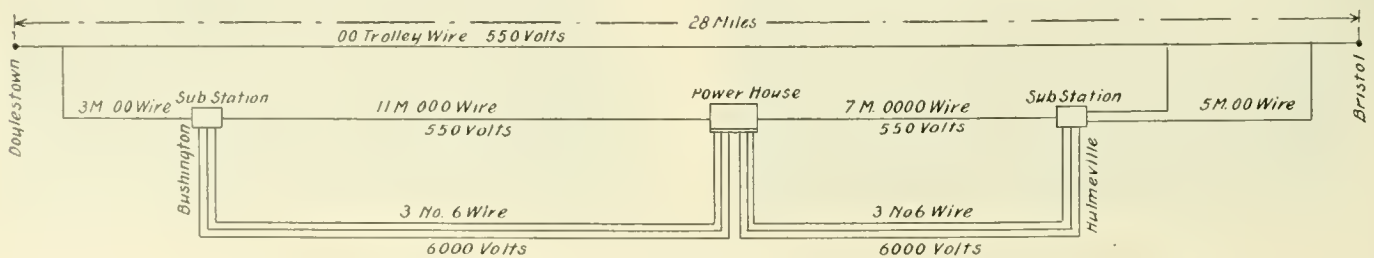


FIG. 7 FEEDER SYSTEM.

There are two sub-stations, one located at Hulmeville, 7½ miles from the power house, and the other at Bushington, 11 miles from the power house. The exterior of the sub-stations is shown in Fig. 6, the interior in Fig. 5. The sub-stations are equipped with

current feeder being hung on glass insulators. The feeder system is shown in Fig. 7.

The car barn is of wood, on stone foundation, with two tracks of sufficient capacity to hold 10 cars, which are of the type illus-

trated in Fig. 4. The closed cars were furnished by the St. Louis Car Co., and are equipped with two G. E. 1,000 motors, K-2 controllers, Syracuse changeable headlights and New Haven illuminated face registers, and rattan walkover seats. They are mounted on St. Louis No. 13 double trucks. That the road has filled a long felt want is attested by the travel since its opening.

The officers of the company are: President, Thos. P. Chambers; vice-president, G. C. Worstall; secretary, A. Chambers; treasurer, general manager and purchasing agent, W. J. Keener; superintendent, B. F. Knabb.

We were supplied with the above information and the accompanying illustrations through the courtesy of D. A. Hegarty, general superintendent of the Railways Company General, of Philadelphia.

NEW YORK RAPID TRANSIT.

The Rapid Transit Subway Construction Co., of New York, was incorporated on February 19th with a capital stock of \$6,000,000. The object is "to construct or aid in constructing and equipment of rapid transit railroad in New York City authorized by Chapter 4, Laws of 1891, and its amendments, the putting of same in operation and use, maintenance and operation thereof, also to manufacture, purchase, sell and deal in all supplies, etc., useful in connection therewith; also to deal in stock and bonds of any other corporations organized to construct or operate said railroad."

The directors of the company are: August Belmont; James Jourdan, president of the Brooklyn Union Gas Co. and the Amsterdam Gas Co.; W. H. Baldwin, jr., president of the Long Island Railroad Co.; Walter G. Oakman, director of the Long Island and Brooklyn Rapid Transit companies; Charles T. Barney, president of the Knickerbocker Trust Co.; George Coppell, president of the Wisconsin Central R. R.; Andrew Freedman, vice-president of the United States Fidelity & Guaranty Co.; John Pierce, contractor for the new Hall of Records; William A. Read, of Vermilye & Co.; George W. Young, president of the United States Mortgage & Trust Co.; Cornelius Vanderbilt; John B. McDonald; Gardiner M. Lane, formerly of Lee, Higginson & Co., Boston, and E. Mora Davison, of August Belmont & Co.

The officers are: President, August Belmont; vice-president, Walter G. Oakman; secretary, Frederick Evans; treasurer, W. C. Emmet. The offices will be in the Park Row Building.

February 24th the contract for building and operating the road was signed at the office of the New York Board of Rapid Transit Commissioners.

THE MILWAUKEE SITUATION.

The Supreme Court of Wisconsin, on February 27th, issued a peremptory writ of prohibition restraining further proceedings against Mayor Rose, of Milwaukee, the city clerk, and the 23 aldermen whom Judge Ludwig had held to be in contempt of court for disregarding the injunction against passing the street railway ordinances.

While this decision is in the Schwartzburg case only, the attorneys for the street railway believe that the other injunction cases have now no standing.

The court, which was unanimous, said in part:

"The theory of Schwartzburg's complaint is that the corporate rights and franchises in question were owned by the city and were held in trust for its citizens and taxpayers and the public, and that the same were the subject of barter and sale to the highest bidder. Such corporate rights and franchises in this country are special privileges conferred by the sovereign power of the state or nation, and do not belong to the citizens of the state or county by common right. This brings us to the question whether the common council has the power to pass the ordinance. No one doubts the power of the Legislature to create cities and give them the general powers possessed by municipal corporations at common law, and in addition thereto such powers pertaining to municipalities as may be specifically granted, as in the case of the city of Milwaukee.

"The statute expressly authorizes the formation of 'corporations for constructing, maintaining and operating street railways,' under chapter 86, R. S., and provides that they 'shall have powers and

be governed accordingly.' That section also expressly provides that 'any municipal corporation or county may grant to any such corporation the use, upon such terms as the proper authority shall determine, of any streets or bridges within its limits, for the purpose of laying single or double tracks and running cars thereon

"The authority of the Legislature to delegate to municipal corporations the power to so grant such corporate rights and franchises cannot be seriously doubted. In fact, this court, construing that section, has expressly held that a municipal ordinance granting such corporate rights and franchises 'has the force and effect of a statute of the state.'"

GENERAL ELECTRIC ROAD WINS.

In our issue for November, 1898, page 847, we described the attempts made by the General Electric Railway Co., of Chicago, to build its line in Dearborn St. and cross the tracks of the Chicago & Western Indiana R. R. at 15th St. Work was stopped, an injunction being secured by the steam road.

On February 19th, the Illinois Supreme Court dissolved the injunction and a large force of men was put at work to build the coveted crossing. The Chicago & Western Indiana men wrecked a number of cars on the crossing, seriously injuring two men who could not get out of the way in time. After a brisk fight between the opposing forces had been stopped by the police, the wreck was cleared and the street railway completed from 14th St. to 17th St., where tracks had been laid when the injunction was secured in 1898.

It is understood that work will proceed and the road be built in Custom House and Plymouth Places as soon as possible. The men controlling this company are friendly to the Chicago City Ry., and it is thought that eventually the latter will absorb it and thus secure another electric line which will relieve the Clark St. tracks.

A WATER FAMINE AVERTED.

Early in January, the engine which drives the water works pump from which the city of Hartford, Conn., receives its water supply, broke down. The engine being of an ancient type, it was found that it would require from four to six weeks to have it repaired, so that a water famine seemed imminent. In their extremity, the members of the water works board appealed to the directors of the Hartford Street Railway Co. for advice and help in the matter. The directors referred the matter to their general manager, Mr. Norman McD. Crawford. Mr. Crawford informed them that he could take one of the generators from the company's power station, install it as a motor in the water works station and have the pumps running in 24 hours, provided a suitable countershaft and pulleys could be secured. The water board accepted the proposition of the street railway company to provide motor and current up to 400 h. p. The necessary shafting was promptly ordered from New York, and in a few days the pump was running with better satisfaction to the water works engineer than the engine had given. The generator was a G. E. M. P. machine 4-200-425. As the speed of the pump could not exceed 12 r. p. m., it was necessary to reduce the generator (motor) speed 425 through a countershaft. This was successfully accomplished, and the machine ran perfectly, without sparking and at constant speed, and up to February 8th had run continuously and pumped over 68,000,000 gallons. It speaks well for the street railway company that it had machinery and power to spare in such abundance in mid-winter, that it could take the city on its shoulders and lift it out of its plight in so creditable a fashion.

EXTENSION TO RAPID RY. OPENED.

February 26th the Rapid Railway Co., of Detroit, ran its first car from Mt. Clemens to Marine City, operating its new three-phase power house at New Baltimore. Regular service will be started about April 1st and the extension from Marine City to Port Huron will be completed and ready to operate before June 1st. The new power house equipment, which was constructed by Westinghouse, Church, Kerr & Co., operated to perfection.

NEW ORLEANS CARNIVAL BY TROLLEY.

On the occasion of the opening parade of the New Orleans Carnival, on February 21st, the floats were all mounted on electric trucks and were driven by the overhead trolley system. While the feasibility of thus employing electricity for light and motive power in the Carnival parades has often been discussed, it has never before been attempted.

The pioneer was Prince Nereus, and he and his Krewe scored a great success. The pageant was run on the street car tracks, and the motive power and light derived from the trolley wires overhead. But to the spectator the tableaux moved along without any apparent motive force. The tableaux, several of which are shown in our engraving, were built upon specially constructed platforms, placed upon McGuire car trucks. The controller and brake were in the forward part, and the trolley post and pole towards the rear. Each car was equipped with a switch to control the lights and the current for the motive power. It tested the ingenuity of the designer to devise a plan to completely conceal both the motorman and trolleyman, and to so disguise the trolley pole that it would not be recognized. It was a difficult piece of work, especially on account of the radical difference of all the tableaux, but it was accomplished admirably. Due regard had to be exercised as well to give both men ample room to work in, and to see ahead. Though each tableau had a cave in front, and a larger one to the rear, the design comprehended this so cleverly that its purpose was alto-

The New Orleans City Railroad Co. donated to the Nereus organization the use of two car barns to build and store the parade, the use of 20 trucks complete with motors, controllers, trolleys, etc., and in addition furnished the skilled labor to operate them in the parade. Over 4,000 incandescent lamps were employed in the decorations. The movement of the parade was in charge of Mr. H. J. Dressel, superintendent of the company.

The use of the car tracks and power for the purpose was largely due to the recommendation of General Manager Wyman, whose predictions for a grand success were more than realized.

The company also handled an enormous traffic without accident.

ANOTHER ROAD AT ZANESVILLE, O.

The Zanesville, Adamsville & Coshocton Electric Railway Co. has been organized to connect a number of Ohio towns by an electric line. We are in receipt of the following letter from Mr. H. E. Buker, secretary of the company, concerning the project:

"Our proposed electric railway will be about 40 miles in length, and will traverse a section of country that has absolutely no outlet, except the common country roads, and being well acquainted with these roads, I am forced to say that they are very common indeed. In fact, for about five months in the year, people living along the proposed route of our road, are mud bound. We will pass through a country rich in agriculture, and a country that is also supplied with rich mineral fields. We have already been assured that we will



FLOATS IN THE NEREUS PARADE, NEW ORLEANS.

gether lost in the general effect. Take, for instance, the first car, Nereus. The motorman was concealed in the head of the fish, and a small, inconspicuous aperture gave him full opportunity to see ahead. The trolleyman was concealed in the tail of the fish, while the trolley pole was hidden by several seagulls in flight. In the car showing the burning of the Templars, the motorman and trolleyman were concealed in the flames, while the trolley pole was a huge tongue of flame which swayed to and fro with the vacillation of the wire.

be granted a free right of way, and we have already been offered a considerable sum of money by way of a cash bonus, conditioned upon the construction of this road. All this has been offered without any solicitation on our part. Our road will not be difficult to construct, as we will encounter but few hills of any consequence."

The officers of the new company are: President, J. B. Wilson; vice-president, E. G. Abbott; secretary, H. E. Buker; treasurer, W. O. Littick. The general offices are at 47 North 4th St., Zanesville, O.

Power Plant Piping and Accessories.

BY WILLIAM D. ENNIS, M. E.

PART III.

DRIP PIPES.

The drip piping and accessories form of themselves a system. Outlets for water of condensation must be provided at the header, and in long lines of pipe, at several points. Engine cylinders must be dripped, as must also vertical exhaust pipes, separators, exhaust heads, heaters, receivers, and the like. The invariable rules applicable to every drip connection are two: first, tap into the lowest part or pocket of the section of pipe to be drained; second, tap in such a position that the current of steam as it flows from boiler to engine will carry the condensation to the drip opening. To illustrate, suppose, in Fig. 19, that a single header delivers at opposite ends the steam for two engines. The boiler mains are carried into the sides of the header. The drip connections for the section of piping represented, in accordance with the first rule, are tapped in the bottom of the header. To properly observe the second rule, it is necessary that the header should be tapped in

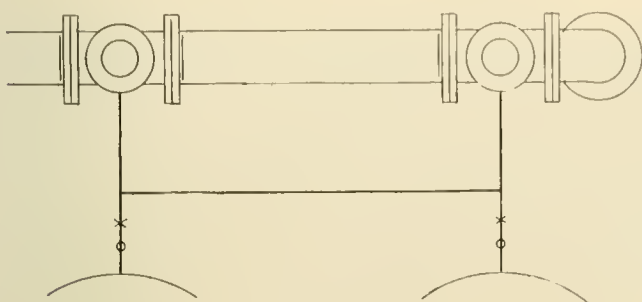


FIG. 19.

two places as shown. If either engine be stopped, the current of steam will be entirely toward the other engine. In case the left hand boiler and the left hand engine should be shut down, the current would carry the condensation away from the main body of the header and the left hand drip opening. Perfect security can only be obtained by dripping as shown. Connections are made to both boilers, so that in case one of them is not operating, all the hot water can be returned to the other boiler, where only it can be of use. Each connection to the boilers must be provided with a check valve and stop valve.

This is the method of dripping ordinarily used for elevated headers. It is of course applicable only where the lowest part of the header is above the water line in the boilers. Separators, if sufficiently high, can be dripped in the same manner.

High pressure drips can also be disposed of by using a gravity return system or return steam traps. Most of these are patented

when taken from the outboard side of the relief or back pressure valve, as from an exhaust head. Engine drips are often disposed of in the same way, but it is most economical to free the water from animal and vegetable oil and return it to the boiler. High pressure drips not returned to the boilers are taken care of by traps. The most essential quality of a steam trap is its durability. It must be depended on to keep working steadily under all conditions. For intermittent service, the writer prefers a gravity or float trap of the simplest possible construction; for constant, high pressure work, expansion traps have given good results.

The disastrous phenomenon known as a "water hammer" is caused by accumulated condensation hurling itself with immense momentum under the action of live steam. For instance, if at the foot of a vertical pipe, the direction of supply being downward, a valve is placed, and no drip connection made, a gradual accumulation of water may take place in the pipe above the valve. Let this go on for some time, and then let the valve be opened. The live steam behind the water column will force it along the pipe with increasing momentum, until it reaches a sharp turn, when something is sure to break.

There is no definite rule for determining the sizes of drip pipes. A bare steam pipe will condense from 3 lb. of steam at 125 lb. pressure per sq. ft. per hour. The efficiency of the covering, dimensions of the section of pipe it is proposed to drain, and steam pressure, being known, it is easy to calculate the amount of condensation and the size of drip pipe for that amount. This however would give sizes very much below those adopted in practice, for the reason that such a formula takes no account of the possibility of a sudden accumulation of condensation. The size must be selected with due reference to the location of the drip. Separator drips are usually fixed with reference to the size of the drip outlet on the separator. Engine drips are planned in the same way. For high pressure steam headers the formula $D^2L \div 200 = d$ may be found of use, in which D equals diameter of the header in inches, L equals length in feet, and d equals drip area required, in square inches. In every case, it is best to err on the side of liberality, and above all, to make the trap, basin, or whatever device is used to dispose of the drips, of a capacity fully equal to any work that may reasonably be given it to take care of. This rule sounds almost like a truism, but in every part of steam pipe design it must be kept constantly in mind.

PLANNING A PIPE SYSTEM.

The scientific side of pipe design is largely comprised in attention to three points; expansion, vibration, and drainage. Let these be provided for, and the rest is merely a question of sizes and standards.

In laying out a piping plant for the estimates of prospective builders, the engines and boilers must usually be taken for granted, and

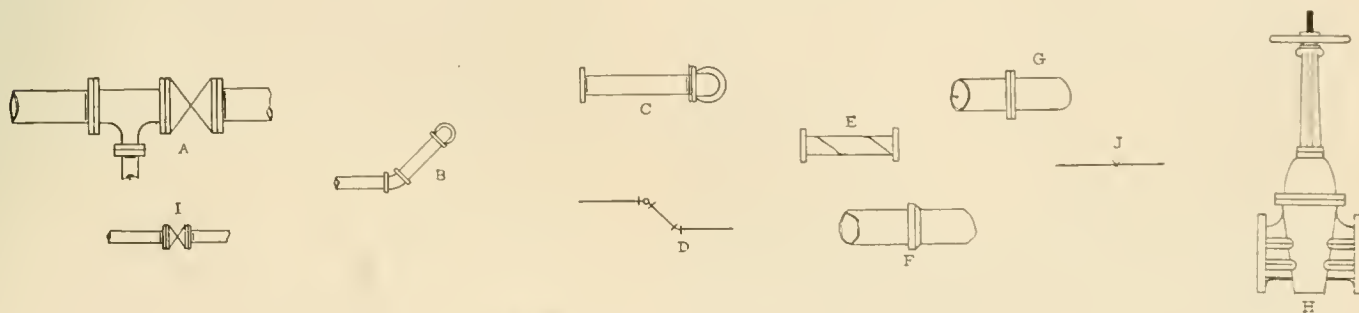


FIG. 20—CONVENTIONAL METHODS OF DRAWING PIPING.

devices, dependent for their action on the vacuum formed in closed chambers by condensing steam. The piping in connection with the special apparatus is usually very simple, consisting of a main drip line to the point where the apparatus is located, and a return line to the boilers. This return line is preferably of brass.

Low pressure drips can be carried into the blow-off tank or sewer,

the piping made to fit them. The first step is to determine the sizes of condensers, feed pumps, heaters, separators, and pipes necessary. This done, the entire system should be drawn to scale—quarter-inch to the foot being customary, and the piping arranged, not only with a view to the three factors mentioned above, but also with due regard to compactness, elasticity and convenience. The

finished plans, however, should be less crowded than this sketch must of necessity be. For plants of any size a general plan of the building and machinery should first be made. To this should be appended separate plans for the live steam, exhaust, and water piping, unless these systems can be combined without impairing the clearness and simplicity of the diagram. Various methods of representing the pipes and fittings are in use, but for plants of any importance the following conventionalisms are convenient.

Represent flanged pipe, fittings and valves with their flanges, as in A. Screwed fittings may be shown with beaded edges, B, thus being readily distinguished from flanges. All pipes 4 in. in size and above, are represented with two lines, C. Pipes below this size are shown with a single heavy line, fittings with heavy lines and beads, as in D. Spiral riveted pipe should be shown as in E. Bell and spigot, as in F; cast iron flanged, as in G. Large valves should be drawn in detail as in H. Small valves, on double lined pipe, as in I. Still smaller sizes of valves as in J. Hangers should be omitted, they being best shown by details and mention in the specifications.

Specifications for piping vary in intelligence, force, and rigor, to an almost infinite degree. Each consulting engineer has his own preferred form, but for the outside engineer who casually finds himself called upon to draw up a set of specifications for competitive bids for piping a plant, a few suggestions may be of value. The arrangement of items should be somewhat as follows:

- (1. Advertisement and invitation to bidders.)
2. General scope of the work.
3. Description of the boilers, engines, and apparatus to be piped.
- (4. Auxiliaries to be furnished by the contractor.)
- (5. Auxiliaries to be furnished by the owner.)
6. Pipe—grades of each size for various purposes.
7. Fittings—weights, qualities, standards.
8. Valves—kinds, maker, special details.
9. Joints—flanged or screwed, for various sizes of steam and exhaust pipes.
- (10. Pipe covering.)
- (11. Hangers and supports.)
12. Bolts, nuts and gaskets.
- (13. Time of completion.)
- (14. Miscellaneous.)
- (15. Tests.)
- (16. Guarantee.)
- (17. Payments.)
- (18. Extras and deductions.)

The items enclosed in parenthesis in certain cases would be unnecessary. Under 2 should be stated the size and location of the plant, the facilities for teaming, freightage, etc., and the different systems of piping to be furnished. Under 3 the size and types of boilers, engines, condensers, pumps, heaters, separators, etc., should be stated, and where apparatus furnished by the owner is to connect with that furnished by the contractor, the standard of drilling necessary should be described, in order that the latter party may not be delayed in getting out his stock. This paragraph should also describe in a general way the plan of the piping, mentioning all the special apparatus, stating clearly the exhaust arrangement, whether simple-condensing, compound-condensing, or non-condensing, and describing the headers, bypasses, etc., required.

Paragraphs 4 and 5 should settle whether such work as excavation, foundations, cutting of walls, floors, and the like, is to be done by the owner or by the contractor.

Paragraph 10 should specify the makes and grades of pipe covering that will be accepted if this work is to be included in the piping contract. As nearly all steam fitters sub-let the pipe covering, and as it is a distinct and separate kind of work, it is not to be recommended that it be combined with the piping contract.

Paragraph 11 should describe the location, spacing, and character of the various pipe hangers, brackets, and other supports, referring to the plans for details. Under 12 the bolts, nuts and gaskets should be specified, the amount of machining necessary on the two former—whether the heads and nuts are hexagonal or square—and the kind, diameter, and thickness of gasket for various sizes and grades of pipe.

Under 13 should be stated the forfeiture for non-completion of the work in the specified time, if any is required.

Under 14 may be specified such small piping and accessories as cannot be conveniently shown on the plan.

Paragraph 15 should state at whose expense the tests are to be made, what they are to consist of, when they are to be made, what

requirements are to be fulfilled, and what penalties are to be enforced if the requirements are not met.

Paragraph 18 should arrange for the amicable adjustment of questions as to extra work and deductions from the work in the contract; stating whether the decision of the engineer is to be final, or whether an appeal to a mixed board of arbitration may be made. If the latter, the composition of such board should be specified.

A methodical arrangement of procedure is vastly preferable to the haphazard way in which some managers who possess the requisite knowledge and skill for planning their own pipe systems often express their wishes on paper. Such a method the writer has endeavored to set forth. Even for a small addition to an existing plant, it pays to draw up a regular specification, and the time spent in doing so will never be wasted.

"ANNOYANCES."

BY G. J. A. P.

The lot of a superintendent of a road, where he must be a "little of everything" is not a very happy one and this is particularly true when his equipment is insufficient and he is obliged to hustle through repair works when a car is disabled, in order to get it out and keep up the service. Many of his experiences are exasperating yet the mishaps have their amusing sides.

An annoying occurrence came up some time since, in which an F. 30 armature newly rewound at the factory was the cause of the writer's righteous anger. The motorman—a careful one—reported that the commutator would "flash fire" all the time while coming towards the house. Careful examination showed the brushes, yoke and commutator to be in perfect order and tight. No signs of sparking were noticeable until a curve was reached, when the flash was very pronounced. On reversing the motor and going back over the line there was no sign of sparking. A chalk mark was made on the armature hood and down over the shaft, and the run back continued; when the first curve was reached, a "squeak" came from the armature and the flash was there. The reader can imagine my sentiments when on inspecting the chalk marks it was discovered that the wire had turned one-third way round on the core!

An occurrence, as interesting as it is rare, took place in the power house during a day of heavy travel. The pull became so hard toward evening that the voltage died down to where the lights represented mere "red strings in bottles." The night man stated that the needle in the ammeter went clear out of sight. The car, supposed to be the offender, was brought in and thoroughly examined, but found in fine shape and returned to the line. Another car was brought in, and it was then noticed that bringing in any one car overcame the trouble to some extent. Changing engines and generators showed the load was only normal for the number of cars running. Examination of the first generator failed to disclose any trouble. Starting up again, the voltage built up as usual, but, as soon as the load was thrown on the same trouble appeared. Placing a speed indicator on the engine showed that it was running at the regulation speed, but placing it on the generator it was found that as soon as the load exceeded 100 amperes the armature slowed down to half speed. The trouble was only a new belt slipping so nicely and quietly that the most sensitive ear could not hear it.

One rainy, cold afternoon, when all hands (that meant two) were taking life easy, the following telephone message came from a motorman: "The commutator on car 13 exploded, and is scattered all over the street." The car was brought in and another armature substituted, first examining the commutator very closely and finding it to be sound. The motorman had gone only a half mile when he sent in the same message as before concerning the same car! Still another commutator was put on that night by a faithful young man who volunteered to "sit up and repair the leads of the corpse." The car went out the next morning and is still in service.

Perhaps some of your readers have experienced the delightful sensation of being on a car when a motor broke from the nose beam, bringing the car to a stand still, quicker than if it had been "plugged." The motorman made a quick "ground"—over the dasher—and the only passenger, a young lady, was uninjured but she did not like the way the car stopped. To quote the motorman: "She just roasted me good and plenty, for stopping so quick. I tried to explain what had happened, but no use; she would have it, that I had no business to stop so quick as that."

Electric Tramways of Coventry, England.

The Coventry Electric Tramway Co. has been operating some seven miles of road, including turn-outs, for about three years and has recently completed extensions which make its total trackage $12\frac{1}{2}$ miles, of which $8\frac{1}{2}$ is single track. There was at first some prejudice against the electric cars, and especially to the overhead trolley system, but the steam tram had become quite unbearable, so the people finally became venturesome enough to permit the electric tram on one of the streets. When once the electric tram had been thoroughly tried, the fair minded citizen said, "I scarcely see how we ever got on without them." So when application was made for an extension of the system, the officials were encouraged and received the support of those who had to travel on the line.

The new extension necessitated a change in the location of the power house which was too far from the center of the system, and not near any good water supply. The new power plant is situated on the bank of the canal, from which water is secured and by which coal can be placed at the very door of the coal shed. It is also much nearer the center of the system than the old one.

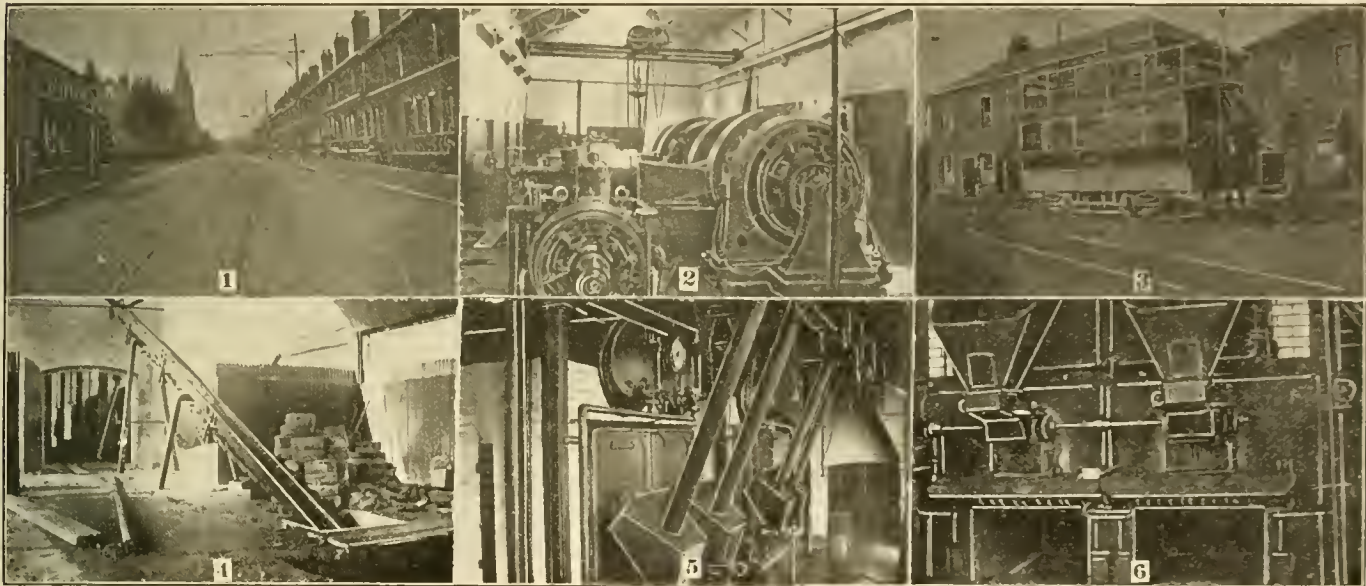
The general arrangement of the power plant, shops, and yards is apparent from an inspection of Fig. 1. The boiler room is 40×60 ft.

sure cylinders 13×13 in. added when the present station was built. These two engines are belt connected while the other two are direct connected to their generators. All four generators are of the Westinghouse make, of 100 kw. capacity and give 500 volts at no load and 550 volts at full load. The two generators that were in the old station have four poles and run at 650 r. p. m.; the two new ones have six poles and run at 250 r. p. m.

In addition to this main equipment, there is a small lighting unit consisting of a Westinghouse single acting engine and generator. This generator is of 17 kw. capacity and furnishes current at 500 volts, so that it can be used to drive the shop motors in case night work is necessary.

The condensing plant is located in a pit in the engine room floor and comprises two surface condensers with 450 sq. ft. of surface each, two vertical air pumps $12\frac{1}{4} \times 8$ in., making 100 double strokes per minute when the driving engine runs at 300 r. p. m., and a centrifugal circulating pump belted to the engine.

The switchboard was also furnished by the Westinghouse company. It is of marble and consists of eight panels, four for the generators, two for feeders, one for Board of Trade instruments



COVENTRY ELECTRIC TRAMWAYS.

1—View on Line.
4—Coal Conveyor.

2—Interior of Engine Room.
5—Stokers.

3—The Trial Trip.
6—Furnace Front.

and is equipped with four Babcock & Wilcox boilers, two rated at 172 h. p. and two rated at 106 h. p., all of which are fitted with patent mechanical stokers and grates and endless chain conveyors made by Bennis & Co., of Bolton. The grates have open ash-pits and steam-jet fire bars. In one of our illustrations there are shown three views of the conveyor and stokers; the conveyor takes coal from the store house, which has a capacity for 500 tons, and delivers it to the stokers. In this connection it should be stated that the company has a market for its ashes which not only cost nothing for removal but are paid for.

There are three Worthington feed pumps with 3-in. plungers. Adjoining the boiler room is a Green economizer of 240 tubes; the scrapers for this are driven from a small steam engine used in the old plant.

The engine room adjoins the boiler room, being separated by a brick wall. It is 25×80 ft. and covered with slate. The slates are nailed to three inches of coke breeze laid on sheet iron, supported by steel framework. The floor is asphalt on concrete. The foundations for the engines and generators are constructed of 2 ft. of concrete and 4 ft. of brick laid in concrete.

There are four tandem compound condensing engines each rated at 150 h. p. Two of these were originally installed as simple non-condensing engines with cylinders 13×19 in., and had high pres-

and one for the lighting circuits of station. There are two Weston voltmeters, seven Westinghouse ammeters and four Thompson wattmeters.

The station, car shed, shops and office may be lighted by the small lighting unit mentioned, which is run only after the rest of the plant is shut down, generally from about 1 o'clock until daylight.

The engine room is furnished with a 5-ton crane. It is worked by hand power and is heavy enough to handle any piece of machinery in the room.

The stack is of brick, circular above the base, and lined with fire brick to a point 6 ft. above where the flue enters. The base is of concrete, 22 ft. square and extends down 12 ft. to solid rock. The stack is 100 ft. high and 6 ft. 4 in. in diameter at the top.

The building for the car shed and shops is 60 ft. wide, and 93 ft. long; 58 ft. of it is used for the car shed, and 35 ft. for the shops. There are six tracks, three of which have pits and run the whole length of the building, while the other three run the length of the car shed only, and have no pits.

The shops are divided into three parts, known as the paint shop, carpenter shop and general repair shop. They are equipped with modern conveniences and the necessary machines. In the carpenter shop is a band saw, a universal planer and circular saw.

and a wheel grinder, all of which are driven by a 10-h. p. Westinghouse motor. In the machine shop are several lathes, a wheel-press, power hack-saw, two drilling machines, and a tool grinder, all driven by a 5-h. p. Westinghouse motor, which also drives the blower for the smithy just outside the shop.

The offices are located just in front of the car shed. All these

brackets being designed by Mr. I. E. Winslow, chief engineer. Fig. 5 shows the details of these bracket arms. No. 1 is the arm used for double tracks, while Nos. 2 and 3 are the arms used for single track; it will be noted that they are designed for the use of double trolley wires. As will be seen the suspension wire is run between the prongs of the bracket which are sufficiently wide apart

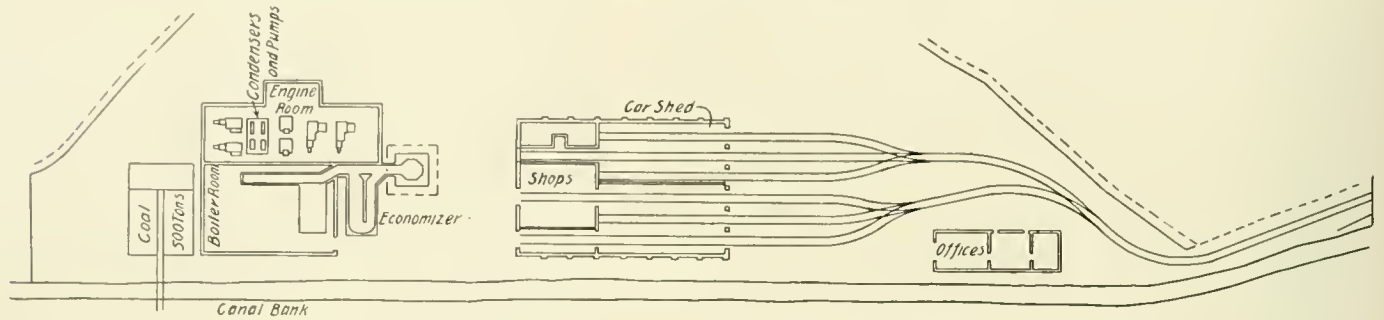


FIG. 1 PLAN OF POWER PLANT, SHOPS AND YARDS.

buildings are of brick. They are substantial in appearance; the architecture is pleasing, and the plan is excellent.

The track, 3 ft. 6 1/8 in. gage, is laid with grooved rails weighing 65 1/2 lb. per yd. The groove is 1 1/4 in. deep and the tread is 1/8 in. higher than the lip of the groove; the tread projects above the pavement and allows considerable wear before it gets below the street level. The rails are clamped to steel cross-ties spaced 10 ft. c. to c. The ties are 5 ft. long, and like an inverted trough in section; width of the tie at the top is 3 in. and at the bottom, measured over the flanges, 6 in.; the depth is 2 1/4 in. and the thickness of the metal 3/4 in. Half way between the ties are iron tie-rods 1 1/2 x 3/4 in. in section. The foundation for the roadbed is a layer of concrete 6 in. deep, in which the ties are imbedded so as to have the tops flush and thus let the rails bear on the concrete throughout their entire length. The rails are 6 in. high and the paving

to allow the trolley car to rise between them. In case of a loose suspension, to prevent the trolley wire from coming in contact with the bracket and being short-circuited, a guard is placed above each suspension. Guard wires are placed above the line where there are telephone or telegraph wires crossing it.

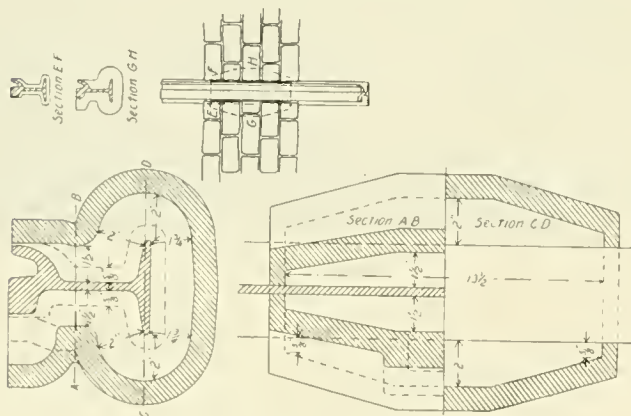


FIG. 3—FALK JOINTS AND MOLDS.

stones used 5 in. deep, thus giving space for a bedding of concrete 1 in. thick. Concrete is placed between the paving and the rail webs, as appears from Fig. 2.

The joints are all cast-welded by the Falk process. The dimensions of the joint and molds are given in Fig. 3. The special work is of 85-lb. rails, all welded; at the switches all portions below the tongue are welded together.

Fig. 4 shows the long arm trolley pole used; the poles are of steel in three sections and are 30 ft. long. The bracket arm is unusually long from an American point of view, the center of the trolley line being 12 ft. from the pole. This distance, of course, varies with the width of the street. The bracket is affixed to the pole at a point 2 ft. from the top and the pole is set 6 ft. in the ground, which brings the wires 22 ft. above grade. The feeders are laid underground in the city and where connection is made with the trolley wires they are carried up the interior of the poles; the detail drawings in Fig. 4 show the construction where the feeders enter and leave the poles.

The insulators are supported by two wires fixed in harps, the

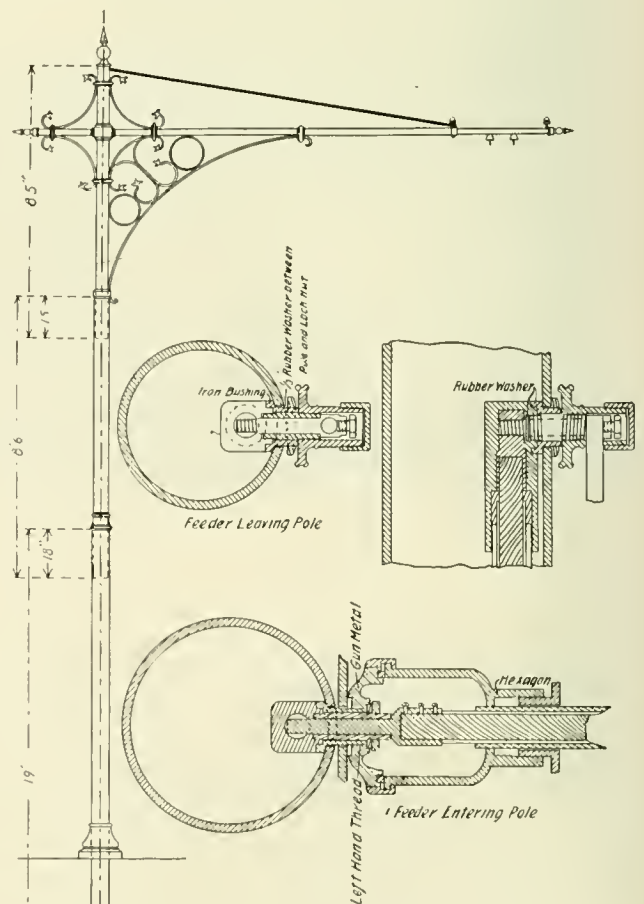


FIG. 4—POLE AND FEEDER DETAILS.

The trolley lines are divided into half-mile sections, which is required by the Board of Trade regulations. A switch is placed on the pole at each of these section insulators which is normally closed and carries the current around the insulator to the next section.

There are four distributing boxes placed at important feeding points along the line, each being supplied by one of the four feeders; three of the feeders are of .24 sq. in. cross section and 900 ft., 3,900 ft. and 5,700 ft. long respectively; the fourth one is of .5 sq. in. section and 3,600 ft. long. In the distributing boxes there are

fective radius at each point bears a constant ratio to the sine of the angle the trolley arm makes with the axis of the standard. The tension of the springs, being transmitted to the trolley arm by a wire cable which runs over the cam, it is evident that the upward thrust at the trolley wheel is always the same. The sec-

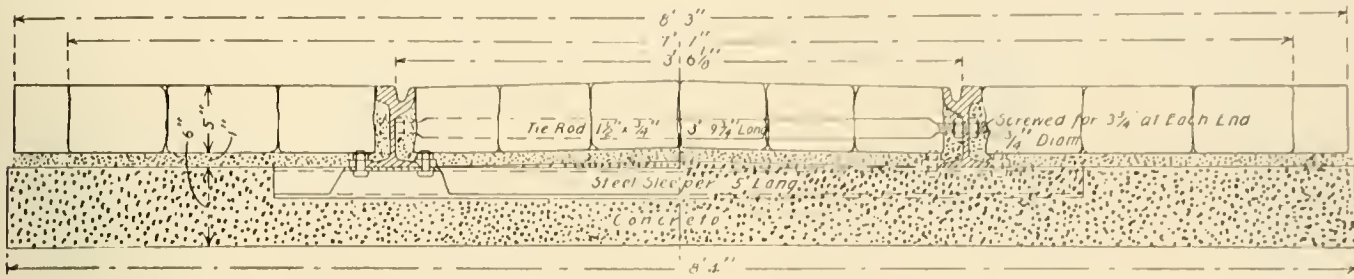


FIG. 2—SECTION OF TRACK CONSTRUCTION.

switches for controlling the feed to the line. Running parallel to the whole track are test wire which connect the station directly with any point on the line where testing may be desirable.

There are no insulated return feeders, but the rail return from the old line, five miles long, is supplemented by old rails laid four in parallel with plastic bonds at the joints.

While, as stated before, the trolley poles are designed to carry the wires 22 ft. above the street, there are a number of points on the line where by reason of bridges the clearance had to be reduced to 16 ft. To meet this variation and yet maintain a uniform pressure

tional view of the standard shows the hood which prevents water from entering the interior.

The company has 10 old motor cars, 10 new motor cars and 5 trailers; all the motor cars are equipped with two 20 h. p. Westinghouse motors, and the series-parallel controllers. They are all double decked and mounted on Peckham single trucks. The capacity of the new motor cars is 26 persons inside and 26 outside. The trailers carry 20 outside and 20 inside. The old cars are very narrow, being only 6 ft. over all. The new ones are 6 ft. 6 in. The extra 6 in. adds a great deal to the convenience of the cars.

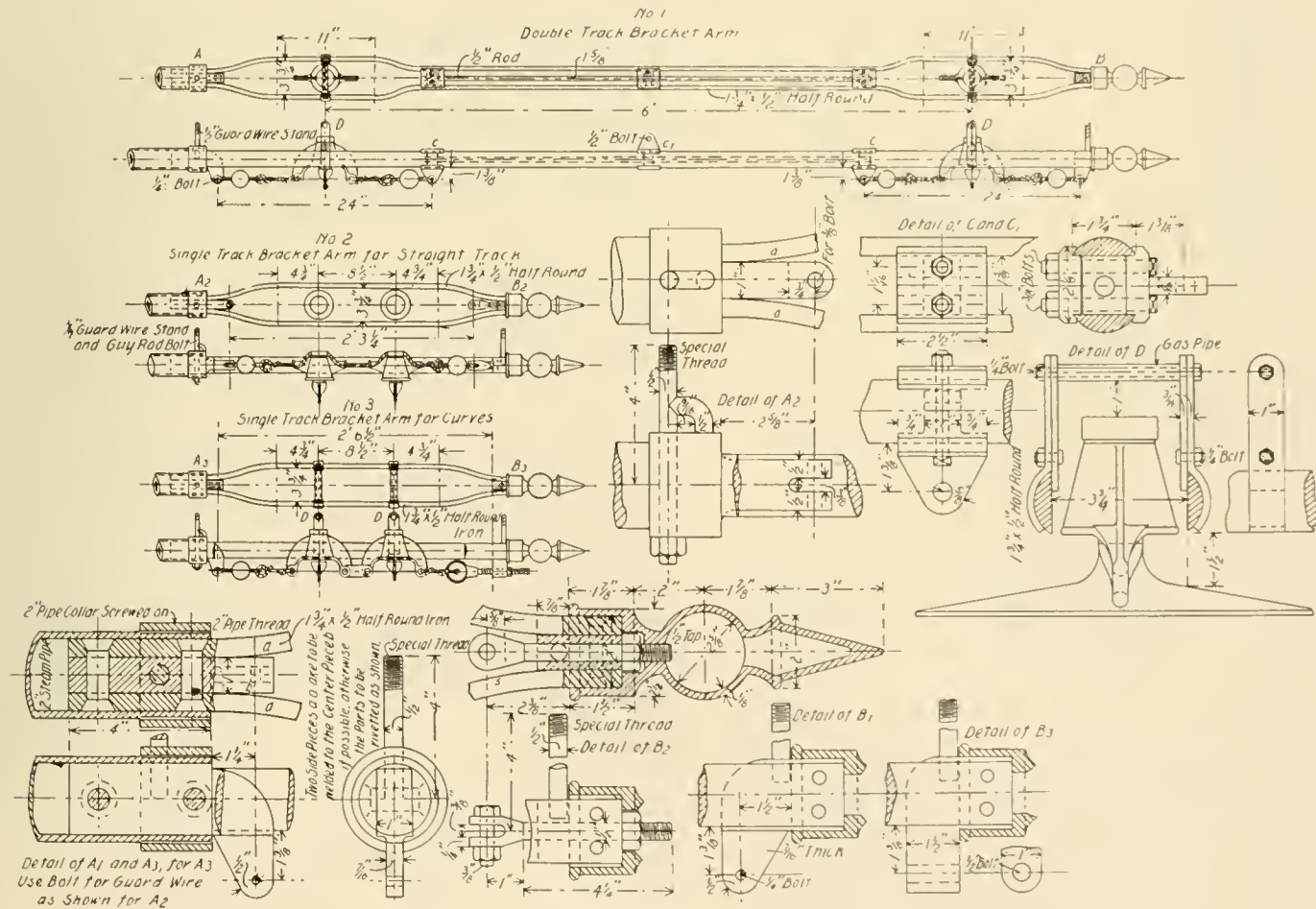


FIG. 5—DETAILS OF BRACKET ARMS AND HANGERS.

of the trolley wheel on the wire, Mr. Winslow designed a special standard which is shown in Fig. 6. The springs are placed vertically within the standard; the swivel head of the standard and the pivot of the trolley arm are both provided with ball bearings. The trolley arm on the short end has a cam so designed that the ef-

The car bodies were all furnished by the Brush Electric Co. The cars having reversible back seats are much more popular than those which have one long double seat running the whole length of the top of the car. The passengers much prefer facing the direction the car is moving.

Fig. 7 is a section of the wheels used, and shows the shallow flanges used.

Coventry has been fortunate in having its tramway lines placed in such good hands as the New General Traction Co., Ltd., and

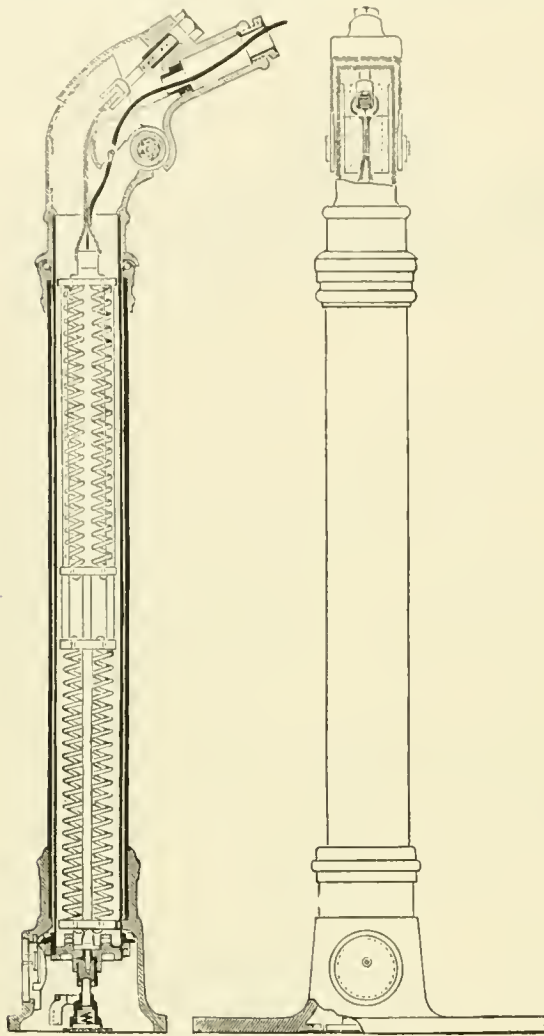


FIG. 6—TROLLEY STANDARD.

Mr. I. E. Winslow deserves much credit for the pioneer work he has done in constructing this road. He is one of the engineers in England who does not befriend side trolley wire and the swivel

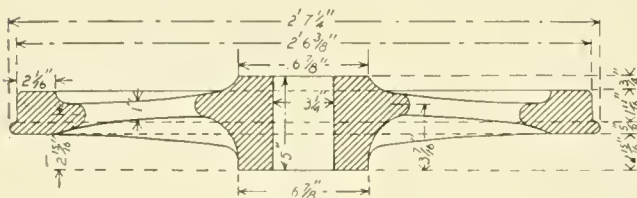


FIG. 7—SECTION OF CAR WHEEL.

trolley wheel and stand, and if the reports that come from some roads using the swivel trolley and side wire system are true, he certainly has good grounds for the position he takes. Mr. R. T. Whitehead is resident engineer and manager of the system.

The Cleveland Electric Ry. has let the contract for an addition to its Cedar Ave. power house and will install a 1,600-kw. unit.

The Consolidated Street Railway Co., of Worcester, Mass., takes an active interest in the welfare of its men and has arranged a number of pleasant concerts and entertainments for their benefit. It also permits sacred services to be held Sunday mornings, at the car barn, and which are conducted by pastors from the different churches in the city.

PREPARING FOR A CONVENTION.

Mr. W. H. Holmes, president of the Metropolitan Street Railway Co., of Kansas City, is making preparations for handling the crowds which will be at the city during the Democratic convention in July next. The company has had much experience with crowds during the carnival weeks and Mr. Holmes expects that with the sundry improvements, which will be completed before July, he can show visitors a model transportation system.

MAINE COMMISSIONERS MAKE DECISION.

At a recent hearing the Railroad Commissioners of Maine refused to approve the application of the Biddeford, Kennebunk & Wells Electric Railroad Co., of which the promoters are William A. Roberts, Edgar A. Hubbard, Ex-Mayor Chas. S. Hamilton, Ex-Mayor Jas. O. Bradbury of Saco, Me., and others, for power to build an electric railway from Biddeford to Wells, through the towns of Kennebunk and Kennebunkport, on the ground that the route of the proposed road was in part over Main St. in Kennebunk, where the tracks of another company are already laid. An appeal will probably be made to the courts from this ruling.

Referring to the "good faith" required by the statutes of promoters applying for permission to construct, maintain and operate an electric railway the Commissioners said: "Of course the high standard of faith, which is defined as 'the substance of things hoped for, and the evidence of things not seen,' cannot be expected in street railway affidavits, yet those who make them should not be wholly satisfied with mere form, when the substance may be entirely lacking."

The Board also makes the ruling that under the public laws of the state the charter of any electric railroad company becomes null and void if the road is not built within two years. According to this, it is stated the charter of the Saco River Electric Railway Co., whose road is not completed, expired last July.

The present commissioners since they have been in office have approved the articles of association of 10 electric railway companies.

OPERATING CONDITIONS IN TOKYO.

From the Japan-American Commercial Journal, published at Tokyo, Japan, we take the following information concerning the conditions under which the Council of Aldermen in that city has granted franchises to a new tramway company.

The total length of the routes shall be 200 miles. When the city deems it necessary, for the purpose of improving, relaying or reconstructing roads, sewers or water pipes, it may remove the street railway tracks without paying compensation. The motive power is to be compressed air, storage batteries or the single or double overhead trolley system. In case the single overhead system is used, the concession shall be granted only when all possible precautions have been provided to prevent leakage currents from the return circuit.

After paying a dividend of 7 per cent in any one year, and the necessary charges to sinking fund, the company shall pay to the city one-third of the remaining surplus.

Other conditions are: Where streets are not wide enough to permit tracks to be laid the company shall widen such streets at its own expense; the company shall keep in good repair a strip of the street 18 in. wide on both sides of its tracks; it must sprinkle the streets in summer and remove snow in winter; it shall bear a share of the expense incidental to the repairing, widening or building of bridges and drains on its route; when altering or fixing the rates of fares the company shall first secure the consent of the city; on the expiration of the term of charter the city may buy up the whole concern at current valuation; the city reserves the privilege of appointing an official supervisor for the company when it deems such a step necessary, and also of examining its books at any time.

The Grand Rapids (Mich.), Holland & Lake Michigan Rapid Ry. hopes to have its cars running by May.

The services of a wife are valued at \$12 a week according to a suit brought against the Harrisburg (Pa.) Traction Co., by the husband of a woman injured by one of defendant's cars.

Street Railway Mutual Benefit Associations.

The United Traction Relief Association, of Allegheny City, Pa., then known as the Pleasant Valley Beneficial Society, of Allegheny, Pa., and composed of employes and ex-employes of the Federal Street & Pleasant Valley Passenger Railway Co., was organized in May, 1893, with 50 members. The name was changed in June, 1897, because of changes in the street railway company. Up to Dec. 31, 1895, the total receipts of the association were \$3,904, and \$2,376 had been paid for sick benefits and \$600 for death benefits.

Later financial figures are not at hand except for the year 1899, when the death claims amounted to \$600 and the sick benefits to \$1,860. The present membership is 310.

From a copy of the constitution and by-laws for which we are indebted to the secretary, Mr. S. S. Perrine, the following data are taken: Any person in the employ of the United Traction Co. who is in good health is eligible to membership, and shall retain his membership upon leaving the company's service so long as he shall be in good standing with the association; but having left the company's service and also withdrawing from the association, he cannot again become a member unless he shall first be employed by the company.

The admission fee is \$1.00, and the dues 10 cents per week, which amounts the member authorizes the paymaster of the United Traction Co. to withhold from wages due. In event these dues will not pay the benefits provided an assessment to pay death benefits will be made. When in arrears for 13 weeks a member is suspended, and if his dues remain unpaid after 24 weeks his name is dropped from the rolls. Men may be reinstated by a majority vote, but cannot participate in benefits till four weeks after all dues have been paid up.

When a member shall be reported sick, and the illness is not the result of intemperance or vicious habits, he shall be entitled to \$5.00 per week beginning after the third day's illness, unless the disability is the result of accident in which case the benefits begin with the first day. Benefits will not be allowed to continue for more than 12 successive weeks, in which case 12 weeks more must elapse when benefits may be paid for another 12 weeks if necessary; after paying benefits for 24 weeks, further claims for that particular illness will not be recognized.

On the death of a member \$100 will be paid to his beneficiaries.

The elective officers are a president, a vice-president, and a secretary and treasurer. The relief committee consists of five members appointed by the president and serve without pay for terms not longer than three months. The secretary and treasurer is paid a salary of \$100 per annum. The company's paymaster merely deducts the dues from the men's wages and his responsibility ceases when the money so collected is turned over to the association's treasurer.

The Employes Mutual Benefit Association of the Syracuse (N. Y.) Rapid Transit Co. was organized Jan. 1, 1899, largely through the efforts of Mr. C. Loomis Allen, then general manager of the company, and now has a membership of 148. Mr. Theodore Morrison, secretary of the association, has sent us a membership book which contains the constitution and by-laws and a certificate of membership which is signed by the secretary and issued to the new member.

Membership is limited to employes of the company and terminates on leaving its service. All persons who had been in the employ of the company for three months on Dec. 1, 1899, and those entering the service later who are between the ages of 21 and 45 years are eligible to membership on passing the medical examination.

The dues are \$1.00 initiation, 50 cents per month, and such assessments (not exceeding 50 cents in any one month nor \$3.00 in any one year) as may be necessary to pay the benefits allowed. Dues are not payable while a member is sick or disabled.

The sick benefit is \$1 per day after the first seven days and no member shall draw more than \$90 sick benefits in any one year. In case of death the beneficiaries of the deceased receive \$150, but out of this sum the association in its discretion may expend not exceeding \$60 for funeral expenses and \$30 for other urgent expenses incidental to the death of a member.

The officers are a president, a vice-president, a secretary and a treasurer chosen by the association by ballot. There are also eight trustees who with the president of the association constitute the executive board; the trustees are apportioned among the different departments of the service and each is chosen by the members in the

department he represents. Vouchers and warrants on the treasurer are countersigned by the general manager of the company.

The association has paid \$1,953 in sick benefits and \$300 in death benefits since its organization. At the time of organization the Syracuse Rapid Transit Railway Co. made a donation of \$500 to the association and provided meeting rooms; in these rooms are two pool tables and a library.

The New Orleans Traction Co. Employes Aid Association was organized Mar. 25, 1896, with about 650 members. The management is by a board consisting of the president of the New Orleans City Railroad Co., three other active members whom he may appoint and seven members, one elected from each of the seven branches, making a governing board of 11 members.

Any employe in good physical health and of Caucasian birth is eligible for membership, and all applicants must submit to medical examination. The regular dues are initiation \$1.00, and 50 cents per month; an assessment of 50 cents is levied upon the death of a member and 25 cents upon the death of a wife of a member or the mother of an unmarried member dependent upon him for support. Benefits are also paid on the death of children under 14 years of age.

Sick benefits of \$3.00 a week are allowed for six consecutive months, after which benefits cease. A death benefit is an amount equal to 50 cents a member at the time of the death. Besides these benefits, the association provides a physician for the member and his family, for medical and minor surgical attendance, and also provides free medicines for the members and their families.

Since its organization the association has paid 16 death benefits for members.

The present officers of the association are: President, W. G. Lusk, painter in the shops; vice-president, H. J. Dole, pitman; secretary, Ed. Holt, conductor; treasurer, A. H. Ford, secretary and treasurer of the New Orleans City R. R. The following data are from the treasurer's annual statement for the year ending Jan. 9, 1900, sent us by Mr. Ford:

RECEIPTS.	
Cash balance on hand Feb. 16, 1899	\$ 785.79
From dues and assessments of members	4,610.35
From New Orleans City R. R.—subscription	1,000.00
Total	\$6,396.14
DISBURSEMENTS.	
5 Member Death payments	\$1,072.00
8 Wife and Mother Death payments	400.00
13 Child Death payments	195.00
Sick Benefits—363 weeks	1,189.00
Physicians' Fees	960.50
Druggists' Fees	880.84
Sundry expense items	138.70
Total Disbursements	\$4,772.04
Cash in Bank Jan. 9, 1900	\$1,624.10

MEMBERSHIP JAN. 1, 1900.		
Station.	Men Attached to Station.	Members.
Poland	110	58
Esplanade	96	67
Canal	114	61
Magazine	63	63
Prattania	96	45
Arabella	213	82
Annunciation	117	51
Total	839	426

In touch with the Magazine Station are the shop and power house employes, 65 in each. Possibly but a small number of these employes are not eligible to membership in the association, but many belong to other associations. In addition to these employes, there are 188 men on the overhead and track forces. A few of the latter are members of the Aid Association, but this is a changing force, which condition keeps many of them out of the association. The membership of the association at present is principally and almost entirely among the station and car employes.

Mr. Ford's report concludes: "Since organization, not quite four years, the receipts from members have been \$16,712.77 and subscriptions from the company \$3,500, a total of \$20,212.77, nearly all of which large amount has been paid out on hundreds of claims for sickness and death, going directly into the families of our members and in many cases relieving them of absolute want or helping them over a hard place while the family support was disabled. Your treasurer has seen much of these sufferings and can testify to the

great good our association is doing. Our affairs are in a prosperous condition and I can see no reason why every fellow-employee should not be with us and sharing the benefits.

"We have passed through the experimental stage, have kept every promise and paid every obligation, and our association is now upon a solid foundation and working upon a broad and safe plan. We should not fail to hold in grateful remembrance the substantial help our employers are giving us, for to this help is due in great measure our success."

The Street Car Mutual Benefit Association is the organization formed among the employes of the Union Railroad Co., of Providence, R. I., and the following concerning the association is extracted from an "official souvenir" recently issued by it, and of which we have received a copy from the secretary and treasurer, Mr. D. S. B. Allardice.

"The association was formed in 1894 by a few conductors and motormen, who believed in insurance, and especially in that form that affords assistance to the living in times of sickness and distress. They reasoned that if it was wise for wealthy men and for men receiving large incomes or salaries to provide for their families by insuring their lives for large sums running up into the thousands, it was more than wise for the working man, whose daily earnings support himself and his family, to lay aside a few dollars from time to time, while enjoying good health, and thus to provide for a future possible need, rather than to depend upon cold charity when sickness cuts off the weekly earnings, and when the expenses for medicine, nurses, doctors, food and other supplies are greatly increased—coming to the member of the association as a right and not as a charity and when it is most needed, supplying little comforts and accompanied by cheering words to the sick one, it brings a gleam of sunshine and hope into his home and assists his recovery.

"Does a man love his wife, children or parents dependent upon him for support? Can he be so selfish as to decline to lay aside a small part of his earnings for their benefit or perhaps for his own relief when he becomes helpless? Will he permit a fellow employe to suffer for the want of necessary food and medicine, when that person would hasten to his assistance under like conditions?

"The wisdom as well as the peculiar advantage of this fraternal assistance has already been well demonstrated in other organizations of this nature. It is therefore no experiment.

"All intelligent and true men recognize the blessings bestowed by life insurance. In these insurance companies are found men noted as governors, statesmen, bankers, manufacturers and otherwise prominent and whose great wealth would seemingly place them or their families beyond all possible need of assistance, and yet they recognize the uncertainty of wealth and provide for future emergencies. Far more does the wage-earner need assistance today or tomorrow when accidents or sickness overtakes him with no accumulated wealth to draw from.

"This relief association was organized Nov. 5, 1894, with no funds in its treasury. It has paid from its receipts to sick members over \$400; and to the widow of the only member dying in that time, \$100, and there still remains on deposit in bank, over \$600 for future needs.

"The only assistance received by the association from the public was derived from a concert and ball given in Infantry Hall a few years ago. While this organization has been dispensing its assistance many of the employes not members of the association have fallen by the wayside, leaving their families, in many instances, in destitute circumstances and the objects of pity and charity, when if they had been members they would have been promptly and kindly relieved.

The business affairs of the association are managed carefully and economically; none of its officers are paid for their services. A board of directors, chosen annually, one from each station, elect from their own number a president and a vice-president, and from the association a secretary and treasurer. All employes of the Union Railroad Co., having been in its employ for six months, between the ages of 21 and 50, having a good moral character and capable of passing a physician's examination, may become members of this association.

The cost of membership is as follows: Admission fee \$5, yearly dues \$8, payable quarterly in advance; assessments, \$2 on the death of each member. The benefits allowed a member are, \$5 a week for 13 weeks, after the first week's sickness, and should the sickness

continues they may be continued by a vote of the directors. Upon the receipt of proof of the death of a member his wife or children are paid \$100, and this sum is to be made larger when the membership has increased sufficiently to warrant doing so.

"It can thus be clearly seen by this brief sketch of the methods of affording relief and transacting its business that this association is not a money-making enterprise, dependent upon trade conditions, nor a labor union for adjusting troubles between the employer and employed."

The "souvenir" from which the foregoing history of the association is taken is a pamphlet of 68 pages; it includes a copy of the constitution and by-laws, the portraits of officers of the association, officers of the Union Railroad Co., the Governor of Rhode Island and other prominent persons, and some 42 pages of advertisements.

The Capital Traction Employes' Relief Association is the present name of an association organized among the employes of the Washington & Georgetown R. R., of Washington, D. C. The change in name was a consequence of the absorption of the Washington & Georgetown road by the Capital Traction. The relief association was organized Aug. 2, 1886, with a membership of 236, which increased to 257 in 1889 and to 457 in 1897; the present membership is 403.

Any employe of the company between the ages of 21 and 50 is eligible for membership. The management is chosen by ballot on the first Wednesday in January of each year. There is no initiation fee and the dues are \$1 a month with an assessment of 50 cents in case of the death of a member and 25 cents in case of the death of the wife of a member. The sick benefit is \$1 for each day (except Sunday) so lost, but if a disability shall continue for more than six months the benefit is reduced to 50 cents per day and ceases after one year. No sick payments are made in cases of disability of less than six working days. The death benefit is \$100 on the death of a member and \$50 on the death of a member's wife. Members withdrawing from the service of the company shall withdraw from the association and are entitled to receive the full amount of contributions paid by them less their pro rata share of disbursements made during the time they were members.

Moneys and securities belonging to the association are entrusted to the custody of the treasurer of the company, subject to the order of the management. The association now has a surplus of \$5,539.46, of which amount \$5,000 was donated by the company.

In addition to the relief features the association receives savings accounts, on which it pays interest at the rate of 5 per cent per annum. The amount on deposit January 1st was \$67,231.87.

The secretary of the association, Mr. H. D. Crampton, advises us that by reason of the destruction of the records by fire some time since, he cannot state the total of death and sick benefits paid. In a statement concerning this association published in the "Review" for February, 1897, the total of sick benefits paid up to Jan. 1, 1897, was given as \$18,030 and the total of death benefits as \$4,000. In 1899 the amounts were \$3,000 for sick and \$200 for death benefits.

CAPITAL TRACTION EMPLOYES' RELIEF ASSOCIATION.

CERTIFICATE OF PHYSICIAN.

I hereby certify, That on the _____ day of _____ 18____
 I commenced attending _____ holding Certificate
 No. _____ for _____
 _____ and that from that
 date to the _____ day of _____ 18____, he has been totally disabled
 from bodily labor _____

 In my judgment he will not be able to perform his accustomed labor or duties for a
 further period of _____ days.

 Dated _____ 18____ Office or residence _____

 FORM 3.

CAPITAL TRACTION EMPLOYEES' RELIEF ASSOCIATION.

No. ... WASHINGTON, D. C., 18

THIS CERTIFIES that

employed as a ... by the Capital Traction Company, is a member of this Association, and is entitled to all the benefits enjoyed by contributors to its Relief Fund, as herein set forth.

President.
Secretary.

Constitution and By-Laws subscribed to by me, this day of 18

WITNESS:

[SEAL.]

FORM 1.

CAPITAL TRACTION EMPLOYEES' RELIEF ASSOCIATION.

APPLICATION FOR MEMBERSHIP.

To the Secretary of the Capital Traction Employees' Relief Association:

I, ... of ... in the service of the Capital Traction Company, apply to be admitted a member of the CAPITAL TRACTION EMPLOYEES' RELIEF ASSOCIATION, hereby consenting to be bound by the rules of the Association as set forth in the Constitution and By-Laws, which I have read (or have heard read to me), and also to conform to, and be bound by, such additional by-laws, rules, and regulations as have been, or may hereafter be, adopted by its Committee of Management, in accordance with the provisions of its Constitution.

I also agree that \$1.00, in addition to the death assessments, shall be deducted monthly, in advance, from the wages that are now, or may hereafter become, due me, in order to secure to myself, or in case of my death, to ...

or if there shall then be no such person, to my legal representatives, the benefits and return of contribution secured by said rules, by-laws, and regulations to contributors to its relief fund.

I certify that I am correct and temperate in my habits; that I am now in good health; that I have no injury or disease which will tend to shorten my life, and that I am ... years of age.

I do hereby acknowledge, consent, and agree that my suspension or discharge from, or voluntary severance of my connection with, the Capital Traction Company shall forfeit my rights of membership in the above-named Association, and all benefits arising therefrom, except the return of contributions as provided for in its Constitution and By-Laws.

In witness hereof, I have signed these presents this ... day of ... 18 ... [SEAL.]

WITNESS:

FORM 2.

RECEIPT FOR SICK ALLOWANCE.

Received this day from the CAPITAL TRACTION EMPLOYEES' RELIEF ASSOCIATION, by the hands of the Treasurer, the sum of ... Dollars (\$...), the same being full allowance, which, as a member of said Association, I am entitled to receive from its funds for the period commencing ... and ending ... 18 by reason of sickness incurred in the service of the Capital Traction Company.

I declare, on honor, that during the period above stated I have not been able, by reason of said sickness, to perform my accustomed labor, and have not done work of any kind for pay

(Sign)

Member of Association.

[SEAL.]

WITNESS:

No.	CAPITAL TRACTION EMPLOYEES' RELIEF ASSOCIATION	Claim For Sick Allowance.	Name	Occupation	Address	Per C. of M.	18
			Amount, \$	days at \$	per day		
			Approved,				
			Member of Association,				
			Witness:				

FORM 4.

This association was organized through the efforts of Mr. Henry Hurt, who was then president of the Washington & Georgetown company.

The constitution and by laws of the association are printed on the first pages of the individual pass books, one of which is issued to each member and in which his account with the association is kept. These books are about 4 x 6 in. and contain 34 blank pages ruled for the account. Following the constitution and by laws is a certificate of membership shown in Form 1.

The application form is printed on a sheet 8 x 10 in. and is shown reduced in Form 2. The physician's certificate of disability and the receipt for benefit received are on opposite sides of a sheet 7 x 8 in., and are shown reduced in Forms 3 and 4.

INSTRUCTION BY CORRESPONDENCE.

During the last 10 years an entirely novel method of education has been developed in this country and has proved to be extremely popular because the instruction, being carried on by correspondence, was available to a very large number who had neither time nor money for a regular course in the engineering schools.

The growth of the International Correspondence Schools of Scranton, Pa., which are typical of this method of education, has been so rapid as to be phenomenal. They developed originally from a demand made by the miners of Pennsylvania for education to help them pass the mine law examinations. Mr. T. J. Foster, manager of "The Colliery Engineer and Metal Miner," Scranton, prepared, in 1891, a course of study in mining to meet this demand, and from this small beginning the schools have grown until now there are some 70 separate courses with 150,000 students enrolled.

The system of instruction is based fundamentally on "instruction papers," which are pamphlets of from 30 to 150 pages, convenient for the pocket and hence for study at any available time. These papers are frequently revised to make them clearer on points which correspondence with students shows are most difficult, are made as simple in style as the subject will permit and are freely illustrated. Each course is made up of from 1 to 60 instruction papers and accompanying "question papers" containing test questions. These papers become the property of the student, who, however, agrees to reserve them solely for his own use.

The instruction of a student is carried on as follows: When he enrolls he is sent the first two instruction papers with their question papers. After thoroughly studying the first instruction paper he writes his answers to the test questions and sends his work to the Schools for examination and correction, and continues with the second paper. All corrections are noted in red ink upon the student's work, which is then returned to him with suggestions for improvement, and so on until the course is finished. The student is obliged to pass a final examination in all the subjects before a diploma is issued to him.

When a student desires assistance from his instructors he uses an "information blank" provided for the purpose, and the information is promptly given him in personal letters. If he fails to send in work within a reasonable time it is presumed that he is not progressing and he is urged to resume. A special instructor is provided for him if he so desires; thus many backward students are enabled to finish their courses. Each student is provided with a complete set of instruction papers in the form of bound volumes.

The subjects taught by mail include all branches of mechanical, electrical, steam and civil engineering, mining, architecture, plumbing, chemistry, bookkeeping, stenography, lettering and English branches.

That new lines often create their own traffic is well shown in the case of the extension of the Helena Power & Light Co., of Helena, Mont., to East Helena. The new branch runs through a thinly populated country to the little smelting town, but the travel has already reached large proportions and is increasing.

The Toledo (O.) Traction Co., in anticipation of next summer's demands, has ordered 13 new 38-ft motor cars, having a seating capacity of 65 passengers each.

Operating Expenses of Connecticut Roads in 1899.

In accordance with our custom, we give below extracts from the report of the Railroad Commissioners of Connecticut and itemized statements of operating expenses on a car-mile basis. The report covers the year ending June 30, 1899.

Since the 1898 report, the Waterbury Traction Co., the Central Railway & Electric Co. (New Britain), and the Norwalk Street Railway Co. have passed under the control of the Connecticut Lighting & Power Co. The Fair Haven & Westville road has acquired the New Haven Street Ry. The Hartford & West Hartford Horse Ry. has been placed in receiver's hands. The Milford Street Railway Co. and the Meriden, Southington & Compounce Traction Co. present their first reports this year.

The street railways of the state carried 59,084,702 passengers during the year, as against 50,269,468 passengers carried by the steam roads of the state which have more than seven times the mileage.

The total length of street railways in operation June 30, 1899, was 416.233 miles, exclusive of 26.351 miles of siding; the increase during the year was 29.222 miles of main track and 1.956 miles of siding. The roads having the greatest mileage are the Hartford Street Ry., 65.9 miles; Fair Haven & Westville R. R., 60.9 miles; Bridgeport Traction Co., 53.6 miles; Connecticut Light & Power Co., 25.6 miles.

The total capital stock authorized is \$23,328,000, of which \$12,715,948 is issued; the increase during the year was \$2,264,908. Per mile of road the capitalization is \$30,550.07, not including sidings, and \$28,731.15 including sidings.

The total amount of bond issued is \$10,608,800, an increase of \$580,000 during the year. Per mile of road the bonded debt is \$25,487.65, not including sidings, or \$23,970.14, sidings included.

The floating indebtedness is \$1,341,314.31, an increase of \$582,486.27 over the previous year. The total of stock, bonds and floating debt is \$59,260.23 per mile of track not including sidings, or \$55,731.94 per mile including sidings.

The cost of construction is placed at \$50,452.17 per mile not including sidings and \$47,418.30 per mile including sidings. The corresponding figures for cost of equipment are \$6,162.34 and \$5,795.43. The totals are \$56,614.50 and \$53,243.71. The figures include the cost of lighting plants in some instances.

The gross earnings were \$3,040,886.83, which is \$7,305.73 per mile of track operated, \$0.2082 per car-mile and \$0.05147 per passenger.

Operating expenses were \$1,919,378.24, being 63 per cent of the gross earnings. The operating expenses were \$4,611.31 per mile of track, \$0.1314 per car-mile and \$0.03248 per passenger.

Dividends were paid by 15 out of 31 companies reporting, the amount being \$343,000 on \$9,940,000 of capital. No dividends were paid on \$2,775,948 of capital stock.

Interest charges were \$468,848.26, including all of the bonded debts save that of the Hartford & West Hartford Horse R. R.

The taxes paid aggregate \$150,276.61, which is .7 per cent on the cost of construction, 4.9 per cent of the gross earnings and 13 per cent of the net earnings.

Pages 55 to 123 of the report are devoted to a reprint of the "Standard System" of street railway accounting, which has been made compulsory for the street railways of Connecticut.

In the following statements, the trackage is measured as single track exclusive of switches and sidings, and the costs are in cents per car-mile:

BRIDGEPORT TRACTION CO.

Track operated, 53.60 miles; closed cars, 53; open cars, 35; equipped with motors, 71; snow plows, 7; car-miles run, 1,911,373; passengers carried, 6,943,559; passengers per car-mile, 3.633; round trips run, 329,465; employes, 200; fare, 5, 10 and 15 cents; operating expenses, 53.7 per cent of earnings.

Repairs of roadbed and track.....	.3126
Repairs of buildings and fixtures.....	.1511
Repairs of electric line construction.....	.5107
Removal of snow and ice.....	.5838
Repairs of cars.....	.3889
Repairs of electrical car equipment.....	.5544
Care of horses.....	.1022

Electric motive power.....	.8700
Wages, conducting transportation.....	4.6397
Wages and salaries, other.....	.6042
Damages.....	.1175
Insurance (fire and accident).....	.5946
Legal expenses.....	.3474
General expenses and miscellaneous.....	.2705

Total expenses per car-mile.....	10.0527
Receipts from passengers per car-mile.....	18.1673
Earnings per car-mile.....	18.7130

BRISTOL & PLAINVILLE TRAMWAY CO.

Road operated, 7.34 miles; closed cars, 5; open cars, 10; equipped with motors, 14; snow plows, 1; car-miles run, 208,175; passengers carried, 735,790; passengers per car-mile, 3.535; round trips run, 23,065; employes, 30; fare, 5 and 10 cents, 4-cent commutation, 3-cent school; operating expenses, 80.3 per cent of passenger earnings.

Repairs of roadbed and track.....	.9262
Repairs of buildings and fixtures.....	.0107
Repairs of electric line construction.....	.0372
Removal of snow and ice.....	.2906
Repairs of cars.....	.4459
Repairs of electrical car equipment.....	.2370
Electric motive power.....	2.4994
Wages, conducting transportation.....	6.1223
Wages and salaries, other.....	.8647
Damages.....	.0663
Insurance.....	.4564
Legal expenses.....	.3883
Park expenses.....	1.0017
General expenses and miscellaneous.....	.6643

Total expenses per car-mile.....	14.0110
Receipts from passengers per car-mile.....	17.4033

CONNECTICUT LIGHTING & POWER CO., NEW BRITAIN (FORMERLY CENTRAL RAILWAY & ELECTRIC CO.).

Road operated, 16.55 miles; closed cars, 16; open cars, 22; equipped with motors, 32; snow plows, 4; car-miles run, 450,219; passengers carried, 2,078,275; passengers per car-mile, 4.616; round trips run, 79,985; employes, 85; fare, 5, 8 and 10 cents; operating expenses 69.2 per cent of earnings.

Repairs of roadbed and track.....	.8226
Repairs of buildings and fixtures.....	.0176
Repairs of electric line construction.....	.2035
Removal of snow and ice.....	.5993
Repairs of cars.....	.9048
Repairs of electrical car equipment.....	.2677
Electric motive power.....	2.3851
Wages, conducting transportation.....	5.5599
Wages and salaries, other.....	.5504
Damages.....	.0194
Insurance.....	1.2180
Legal expenses.....	.0515
Park expenses.....	.7257
General expenses and miscellaneous.....	.6661

Total expenses per car-mile.....	14.0648
Receipts from passengers per car-mile.....	19.3514
Earnings per car-mile.....	20.3260

CONNECTICUT LIGHTING & POWER CO., WATERBURY DISTRICT (FORMERLY WATERBURY TRACTION CO.).

Road operated, 13.04 miles; closed cars, 28; open cars, 30; equipped with motors, 54; snow plows, 3; car-miles run, 642,836; passengers carried, 3,897,112; passengers per car-mile, 6.062; round trips run, 103,680; employes, 100; fare, 5 and 10 cents, 4-cent tickets, 3-cent school; operating expenses, 57.8 per cent of earnings.

Repairs of roadbed and track.....	1,0221
Repairs of buildings and fixtures.....	.0283
Repairs of electric line construction.....	.1873
Removal of snow and ice.....	.4961
Repairs of cars.....	.9232
Repairs of electrical car equipment.....	.4736
Electric motive power.....	3,0930
Wages, conducting transportation.....	6,0708
Wages and salaries, other.....	.7071
Damages.....	.6601
Insurance.....	1,1381
Legal expenses.....	.1090
Transportation supplies accounts.....	.7340
General expenses.....	.4125
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Total expenses per car-mile.....	16,3890
Passenger receipts per car-mile.....	28,2848
Earnings per car-mile.....	28,3456

DANBURY & BETHEL STREET RAILWAY CO.

Road operated, 10.59 miles; closed cars, 13; open cars, 18; equipped with motors, 25; snow plows, 1; car-miles run, 327,511; passengers carried, 1,132,032; passengers per car-mile, 3,458; round trips run, 572,044; employes, 45; fare, 5 and 10 cents; operating expenses, 63.6 per cent of earnings.

Repairs of roadbed and track.....	.5476
Repairs of electric line construction.....	.0964
Removal of snow and ice.....	.1721
Repairs of cars.....	.5930
Repairs of electrical car equipment.....	.6857
Electric motive power.....	2,4749
Blacksmithing.....	.2975
Fires and headlights.....	.1817
Wages, conducting transportation.....	4,6172
Wages and salaries, other.....	.7420
Insurance.....	.8689
Park expenses.....	.0361
General expenses.....	.0792
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Total expenses per car-mile.....	11,3933
Passenger receipts per car-mile.....	17,5808
Earnings per car-mile.....	17,9161

DERBY STREET RAILWAY CO.

Road operated, 5.89 miles; closed cars, 10; open cars, 15; equipped with motors, 17; snow plows, 1; car-miles run, 231,709; passengers carried, 1,240,705; passengers per car-mile, 5,355; round trips run, 51,674; employes, 22; fare, 5 cents; operating expenses, 56.7 per cent of earnings.

Repairs of roadbed and track.....	.2526
Repairs of buildings and fixtures.....	.1483
Repairs of electric line construction.....	.2048
Removal of snow and ice.....	.1250
Repairs of cars.....	.9192
Repairs of electrical car equipment.....	.9163
Electric motive power.....	2,3641
Wages conducting transportation.....	5,1063
Wages and salaries, other.....	1,2316
Damages.....	.4117
Insurance.....	.0475
Park expenses.....	1,5379
General expenses.....	1,0753
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Total expenses per car-mile.....	14,3409
Passenger receipts per car-mile.....	24,0293
Earnings per car-mile.....	25,3019

ENFIELD & LONGMEADOW ELECTRIC RAILWAY CO.

Road operated, 8.36 miles; closed cars, 5; open cars, 5; equipped with motors, 10; snow plows, 1; car-miles run, 190,044; passengers carried, 480,258; passengers per car-mile, 2,528; round trips run, 11,000; employes, 17; fare, 5 and 10 cents; operating expenses, 77.8 per cent of earnings.

Repairs of roadbed and track.....	46.48
Repairs of buildings and fixtures.....	05.80
Repairs of electrical line construction.....	06.72
Removal of snow and ice.....	12.29
Repairs of cars.....	11.17
Repairs of electrical car equipment.....	06.18
Electric motive power.....	2 08.37
Wages, conducting transportation.....	3 44.80
Wages and salaries, other.....	2 41.78
Damages.....	14.61
Insurance.....	10.74
Amusements.....	08.72
General expense.....	70.66
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Total expenses per car mile.....	9 88.01
Passenger receipts per car mile.....	12 60.67
Earnings per car mile.....	12 70.67

FAIR HAVEN & WESTVILLE RAILROAD CO. (INCLUDING NEW HAVEN STREET RAILWAY CO.)

The roads were operated separately for the first four months of the year. The data below are for the whole year.

Road operated, 60.9 miles; closed cars, 97; open cars, 99; equipped with motors, 181; snow plows, 5; car miles run, 2,942,217; passengers carried, 11,456,747; passengers per car-mile, 3,894; round trips run, 276,273 in eight months; employes, 432; fare, 5, 10 and 15 cents; operating expenses, 60.1 per cent of earnings.

Repairs of roadbed and track.....	.6379
Repairs of buildings and fixtures.....	.0542
Repairs of electric line construction.....	.2370
Removal of snow and ice.....	.4388
Repairs of cars.....	.7384
Repairs of electrical car equipment.....	.4286
Electric motive power.....	1,3800
Repairs of machinery and fixtures.....	.0897
Wages, conducting transportation.....	5 45.96
Wages and salaries, other.....	1,0632
Damages.....	.1138
Insurance.....	.0763
Attractions.....	.1654
General expenses.....	.8850
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Total expenses per car-mile.....	11.7713
Passenger receipts per car-mile.....	19.2477
Earnings per car-mile.....	19.5845

HARTFORD, MANCHESTER & ROCKVILLE TRAMWAY CO.

Road operated, 18.68 miles; closed cars, 12; open cars, 21; equipped with motors, 33; snow plows, 2; car-miles run, 420,051; passengers carried, 926,260; passengers per car-mile, 2,205; round trips run, 33,712; employes, 65; fare, 5, 10 and 15 cents; operating expenses, 74.1 per cent of passenger earnings.

Repairs of roadbed and track.....	1,3516
Repairs of buildings and fixtures.....	1,2423
Repairs of electric line construction.....	.1286
Removal of snow and ice.....	.4190
Repairs of cars.....	1,3988
Repairs of electrical car equipment.....	1,2907
Electric motive power.....	3,3472
Wages, conducting transportation.....	5,0190
Wages and salaries, other.....	1,9160
Damages.....	.1635
Insurance.....	.2748
Rent of leased line.....	.1667
General expenses.....	1,2855
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Total expenses per car-mile.....	17.9800
Passenger receipts per car-mile.....	24.2643

HARTFORD STREET RAILWAY CO.

Road operated, 70.56 miles; closed cars, 89; open cars, 85; equipped with motors, 174; snow plows, 16; car-miles run, 3,148,-

930; passengers carried, 12,506,948; passengers per car-mile, 4,000; round trips run, 385,560; employes, 550; fare, 5, 10, 15 and 20 cents; operating expenses, 70.6 per cent of earnings.

Repairs of roadbed and track.....	.8597
Repairs of buildings and fixtures.....	.1755
Repairs of electric line construction.....	.3184
Removal of snow and ice.....	.3876
Repairs of cars.....	1.0273
Repairs of electrical car equipment.....	.5498
Electric motive power.....	1.8011
Wages, conducting transportation.....	6.2159
Wages and salaries, other.....	.8508
Damages.....	.2814
Insurance.....	.1879
Legal expenses.....	.1469
Supplies and incidentals.....	.7143
Repairs to machinery and tools.....	.2563
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Total expenses per car-mile.....	13.7729
Passenger receipts per car-mile.....	19.3898
Earnings per car-mile.....	19.5183

MERIDEN ELECTRIC RAILROAD CO.

Road operated, 17 miles; closed cars, 22; open cars, 24; equipped with motors, 22; snow plows, 2; car-miles run, 587,636; passengers carried, 2,209,458; passengers per car-mile, 3.760; employes, 79; fare, 5, 10 and 15 cents; operating expenses, 65.9 per cent of earnings.

Repairs of roadbed and track.....	.8336
Repairs of buildings and fixtures.....	.0871
Repairs of electric line construction.....	.0952
Removal of snow and ice.....	.4228
Repairs of cars.....	.1969
Repairs of electrical car equipment.....	.1314
Electric motive power.....	1.9777
Wages, conducting transportation.....	5.6422
Insurance.....	.1517
Legal expenses.....	.0624
Park expenses.....	1.0433
Sundries.....	1.9336
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Total expenses per car-mile.....	12.5784
Passenger receipts per car-mile.....	18.1561
Earnings per car-mile.....	19.0810

MERIDEN, SOUTHLINGTON & COMPOUNCE TRAMWAY CO.

Road operated, 8 miles; closed cars, 5; open cars, 4; equipped with motors, 9; snow plows, 1; car-miles run, 218,160; passengers carried, 495,397; passengers per car-mile, 2.271; round trips run, 13,635; employes, 16; fare, 5 cents on each of three divisions; operating expenses, 62.4 per cent of earnings.

Repairs of roadbed and track.....	.2039
Repairs of buildings and fixtures.....	.0018
Repairs of electric line construction.....	.0126
Removal of snow and ice.....	.2175
Repairs of cars.....	.0762
Repairs of electrical car equipment.....	.0360
Electric motive power.....	1.6507
Wages, conducting transportation.....	2.9626
Wages and salaries, other.....	1.9476
Damages.....	.0114
Insurance.....	.2217
Miscellaneous expenses.....	.3423
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Total expenses per car-mile.....	7.7747
Passenger receipts per car-mile.....	11.3520
Earnings per car-mile.....	12.4557

MIDDLETOWN STREET RAILWAY CO.

Road operated, 9.05 miles; closed cars, 6; open cars, 16; equipped with motors, 13; snow plows, 2; car-miles run, 199,297; passengers carried, 880,151; passengers per car-mile, 4.416; round trips run,

44,676; employes, 17; fare, 5 cents; operating expenses, 72.5 per cent of earnings.

Repairs of roadbed and track.....	.3454
Repairs of buildings and fixtures.....	.1564
Repairs of electric line construction.....	.5027
Removal of snow and ice.....	.4152
Repairs of cars.....	.3650
Repairs of electrical car equipment.....	.3487
Car house expense.....	.6798
Electric motive power.....	3.7175
Wages, conducting transportation.....	4.7030
Wages and salaries, other.....	.7526
Damages.....	.0535
Insurance.....	.2386
Park expenses.....	2.0244
Sundries.....	.4392
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Total expenses per car-mile.....	14.7432
Passenger receipts per car-mile.....	18.4489
Earnings per car-mile.....	20.3268

MILFORD STREET RAILWAY CO.

Road operated, 13.6 miles; leases cars from Bridgeport Traction Co.; car-miles run, 153,731; passengers carried, 306,836; passengers per car-mile, 1.996; round trips run, 9,272; employes, 19; fare, 5, 10, 15 and 20 cents; operating expenses, 69.3 per cent of earnings.

Repairs of roadbed and track.....	5.0530
Repairs of electric line construction.....	.4944
Removal of snow and ice.....	.5838
Use of cars, hay and provender.....	2.9061
Power and wages, conducting transportation.....	2.6850
Wages and salaries, other.....	.0971
Damages.....	.1243
Miscellaneous.....	.1902
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Total expenses per car-mile.....	12.1366
Earnings per car-mile.....	17.5200

NEW LONDON STREET RAILWAY CO.

Road operated, 6.96 miles; closed cars, 7; open cars, 16; equipped with motors, 22; snow plows, 2; car-miles run, 220,427; passengers carried, 1,210,526; passengers per car-mile, 5.502; round trips run, 36,339; employes, 25; fare, 5 cents; operating expenses, 58.3 per cent of earnings.

Repairs of roadbed and track.....	.7418
Repairs of buildings and fixtures.....	.0260
Repairs of electric line construction.....	.1115
Removal of snow and ice.....	.5345
Repairs of cars.....	.6547
Repairs of electrical car equipment.....	.3910
Electric motive power.....	3.1701
Wages, conducting transportation.....	5.2482
Wages and salaries, other.....	1.4798
Damages.....	.0152
Insurance.....	1.2460
Sundries.....	.7227
General expenses.....	.6351
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Total expenses per car-mile.....	14.9784
Passenger earnings per car-mile.....	25.3723
Earnings per car-mile.....	25.6698

NORWALK STREET RAILWAY CO.

Road operated, 7.9 miles; closed cars, 11; open cars, 9; equipped with motors, 19; snow plows, 1; car-miles run, 223,916; passengers carried, 1,020,886; passengers per car-mile, 4.559; round trips run, 36,746; employes, 25; fare, 5 cents; operating expenses, 58.4 per cent of earnings.

Repairs of roadbed and track.....	.0079
Repairs of buildings and fixtures.....	.0149
Repairs of electric line construction.....	.0562
Removal of snow and ice.....	.2661
Repairs of cars and electrical car equipment.....	.5034

Electric motive power.....	3,378.9
Wages, conducting transportation.....	5,301.8
Wages and salaries, other.....	1,878.2
Damages .....	.0035
Insurance .....	.7166
Legal expenses .....	.1381
Sundries .....	.3529
General expenses .....	.354.3

Total expenses per car-mile.....	12,973.1
Earnings per car-mile.....	22,214.2

NORWALK TRAMWAY CO.

Road operated, 18.33 miles; closed cars, 9; open cars, 16; equipped with motors, 17; snow plows, 1; car-miles run, 451,761; passengers carried, 1,535,601; passengers per car-mile, 3,400; round trips run, 64,251; employes, 50; fare, 5 cents, operating expenses, 63.0 per cent of earnings.

Repairs of roadbed and track.....	.2750
Repairs of buildings and fixtures.....	.0367
Repairs of electric line and track construction.....	.3725
Removal of snow and ice.....	.2946
Repairs of cars and trucks.....	.3000
Repairs of electrical car equipment.....	.2887
Electric motive power.....	2,135.8
Wages, conducting transportation.....	3,677.8
Wages and salaries, other.....	.6831
Damages .....	.0759
Insurance .....	.1386
Legal expenses .....	.1037
Park expenses .....	.2468
General and miscellaneous expenses.....	1,041.3

Total expenses per car-mile.....	9,671.4
Earnings per car-mile.....	15,337.9

NORWICH STREET RAILWAY CO.

Road operated, 12.4 miles; closed cars, 13; open cars, 14; equipped with motors, 21; snow plows, 2; car-miles run, 295,083; passengers carried, 1,821,115; passengers per car-mile, 6,173; round trips run, 68,577; employes, 45; fare, 5 cents; operating expenses, 68.2 per cent of earnings.

Repairs of roadbed and track.....	1,137.0
Repairs of buildings and fixtures.....	.0260
Repairs of electric line construction.....	.2061
Removal of snow and ice.....	.5999
Repairs of cars.....	.4423
Repairs of electrical car equipment.....	1,003.6
Electric motive power.....	3,759.3
Wages conducting transportation.....	6,111.0
Wages and salaries, other.....	1,867.5
Damages .....	.0070
Insurance	1,065.1
Park expenses .....	.2800
General and miscellaneous expenses.....	1,452.7

Total expenses per car-mile.....	17,957.3
Passenger receipts per car-mile.....	25,900.0
Earnings per car-mile.....	26,320.5

SHELTON STREET RAILWAY CO.

Road operated, 2.5 miles; closed cars, 4; equipped with motors, 4; car-miles run, 61,037; passengers carried, 106,104; passengers per car-mile, 1,740; round trips run, 24,455; employes, 6; fare, 5 cents; operating expenses, 83.5 per cent of earnings.

Repairs of roadbed, track and bridges.....	.4650
Repairs of buildings and fixtures.....	.0467
Repairs of electric line construction.....	.0041
Removal of snow and ice.....	.0817
Repairs of cars.....	.3787
Electric motive power.....	3,484.4
Wages, conducting transportation.....	3,812.4

Damages .....	.0164
Other expenses	337.5

Total expenses per car mile.....	8,627.0
Earnings per car mile.....	10,336.4

STAMFORD STREET RAILROAD CO.

Road operated, 10.41 miles; closed cars, 9; open cars, 11; equipped with motors, 15; snow plows, 1; car-miles run, 314,001; passengers carried, 1,026,325; passengers per car-mile, 3,268; employes, 40; fare, 5 cents local; operating expenses, 72.8 per cent of earnings.

Repairs of roadbed and track.....	.2757
Repairs of buildings and fixtures.....	.0428
Repairs of electric line construction.....	.2296
Removal of snow and ice.....	.2328
Repairs of cars.....	.3742
Repairs of electrical car equipment.....	.1547
Repairs of motors, trucks and other repairs.....	.5815
Electric motive power.....	4,934.3
Wages, conducting transportation.....	4,592.4
Horses and provender.....	.9770
Insurance .....	.9539
General and miscellaneous expenses.....	.9474

Total expenses per car-mile.....	11,596.2
Passenger receipts per car-mile.....	15,837.5
Earnings per car-mile.....	15,937.0

TORRINGTON & WINCHESTER STREET RAILWAY CO.

Road operated, 12.56 miles; closed cars, 5; open cars, 9; equipped with motors, 12; snow plows, 2; car-miles run, 247,527; passengers carried, 844,984; passengers per car-mile, 3,414; round trips run, 16,198; employes, 27; fare, 5 and 15 cents; operating expenses, 53.7 per cent of earnings.

Repairs of roadbed and track.....	.3618
Repairs of buildings and fixtures.....	.0775
Repairs of electric line construction.....	.0688
Removal of snow and ice.....	.1600
Repairs of cars.....	.2451
Repairs of electrical car equipment.....	.1331
Electric motive power.....	2,130.6
Wages, conducting transportation.....	3,190.4
Car house labor.....	.5491
Wages and salaries, other.....	.6937
Insurance .....	.6725
Amusements .....	.2495
General expenses .....	.2121

Total expenses per car-mile.....	8,753.5
Passenger receipts per car-mile.....	16,227.5
Earnings per car-mile.....	16,204.1

WESTPORT & SAUGATUCK STREET RAILWAY CO.

Road operated, 5.12 miles; closed cars, 3; open cars, 2; equipped with motors, 5; snow plows, 1; car-miles run, 58,757; passengers carried, 125,214; passengers per car-mile, 2,131; round trips run, 7,776; employes, 6; fare, 5 cents; operating expenses, 98.9 per cent of earnings.

Repairs of roadbed and track.....	1,886.0
Repairs of buildings and fixtures.....	.0340
Repairs of electric line construction.....	.0110
Removal of snow and ice.....	.1241
Repairs of cars and electrical car equipment.....	.3311
Wages, conducting transportation.....	6,008.4
Wages and salaries, other.....	.0645
Damages .....	.0213
Insurance .....	.3798
Legal expenses .....	.5236
Other operating expenses.....	1,352.2

Total expenses per car-mile.....	10,729.8
Passenger receipts per car-mile.....	10,604.2
Earnings per car-mile.....	10,731.0

WINCHESTER AVENUE RAILROAD CO.

Road operated, 21.5 miles; closed cars, 42; open cars, 58; equipped with motors, 68; snow plows, 4; car miles run, 1,099,558; passengers carried, 6,014,419; passengers per car-mile, 5.460; employes, 170; fare, 5 and 10 cents; operating expenses, 58.3 per cent of earnings.

Repairs of roadbed and track.....	.9797
Repairs of buildings and fixtures.....	.1768
Repairs of electric line construction.....	.1025
Removal of snow and ice.....	.2829
Repairs of cars.....	.6389
Repairs of electrical car equipment.....	.5395
Electric motive power.....	1.7420
Wages, conducting transportation.....	6.6582
Wages and salaries, other.....	.7500
Damages.....	.2434
Insurance.....	.2036
Legal expenses.....	.0772
Attractions.....	.7783
Sundries.....	.8300
General expenses.....	.4208

Total expenses per car-mile.....14.4343
Earnings per car-mile.....24.7332

A GALLERY STREET CAR.

Letters patent have been granted to Fred Steffens and Otto F. Koss of St. Joseph, Mo., for a new design of street car which is shown in the accompanying illustration. The objects of the improvements are to provide a car having greater seating capacity than any single compartment car now in use, one that will be better ventilated and cooler in summer and warmer in winter, that will be more accessible to the conductor than a double-deck car, and that will economize in height over the usual double-deck car.



STEFFENS AND KOSS CAR.

As will be seen, the lower portion is constructed substantially as an ordinary motor car, except that in each of the four corners there is a stairway connecting with the gallery floor above. The gallery flooring is supported by T iron bars, which at one end are rigidly fastened to the side posts of the lower section, and at the center are arched, to enable passengers in the lower compartment to stand upright in the aisle, the floor itself not being of

sufficient height above the main floor to permit this. The seats in the gallery compartment are arranged along this arch, back to back, as shown.

We publish a description of this car because of its novelty and not with the idea that the construction will commend itself to American street railway managers.

WEIGHT OF STORAGE BATTERIES FOR VEHICLES.

Mr. J. Rosset, discussing the "Weight of Accumulators for Electric Vehicles" in *L'Industrie Electrique*, gives the equation $y = Pl \div (250 - l)$; where y is the weight in kilograms of the accumulators, P the weight in kilograms of the vehicle including passengers, and l the distance run in kilometers.

Reduced to English units this formula becomes: $w = Wl \div (150 - w)$; where W is the weight of the vehicle and load in pounds, w the weight of the accumulators in pounds, and l the distance run in miles.

A LONG VIADUCT.

The Wilkesbarre (Pa.) & Wyoming Valley Traction Company last year completed a viaduct in Wilkesbarre which is over 1,000 ft. long and crosses 19 steam railroad tracks. The viaduct was designed by Thomas Wright, chief engineer of the Traction Company; the material was furnished by the Pennsylvania Steel Company.

The street railway track is in Welles street which is parallel to the tracks of the Delaware & Hudson Canal Company and the Lehigh Valley Railroad. The Delaware & Hudson Canal tracks are about 35 ft. below, and the Lehigh Valley about 30 ft. below the grade of Welles street. The viaduct begins at a point 220 ft. from the line of Welles street, the approach to it being an earth fill on a down grade of about 3 per cent, and continues in a line at right angles to that of Welles street for a distance of 560 ft. On the approach is located a turn-out there being but a single track laid on the viaduct.

The first four spans of the viaduct are 40 ft. each in length and cover the sharp slope from the higher level down to the Delaware & Hudson Canal tracks; these spans are of 48-in. plate girders. The six succeeding spans are from 45 ft. to 76 ft. in length, and are of 72-in. plate girders. In crossing the Lehigh Valley tracks the viaduct is on a skew, the railway track being curved to a radius of 80 ft. and thence proceeding at right angles to the former direction; over these tracks the floor of the viaduct is carried on the lower instead of the upper flanges of the girders, this arrangement giving the same clearance, 21 ft., above these tracks as above the others.

Up to this point the length is, measuring the periphery of the curve, 689 ft. and is level; from here on the structure is 331 ft. long on a down grade of about 5.5 per cent. From the end of the structure to Market street is an earth embankment 135 ft. long on the same grade. Under the descending portion of the viaduct is a switch of the Lehigh Valley Company which had to be covered to avoid interference.

The viaduct is 12 ft. wide in clear with hand rails of gas pipe and fittings. The ties are of 8-in. x 8-in. yellow pine. The trolley poles are of steel mounted on the side of the bent and braced by 1/2-in. x 6-in. plates bolted to the cross ties.

The foundation piers for the structure are of concrete and at some points are over 20 ft. deep by reason of being located over the bed of the old canal. The piers are with stones 30 in. square and 24 in. thick. Resting on the piers are steel columns to support the viaduct, and these are fastened to 1 1/4-in. rods 5 ft. long, built into the piers.

INSURING A TRAMWAY BILL.

Street railway presidents and general managers who have spent time and labor in getting a franchise through a contrarily-minded city council will be interested to know that in England it is possible to insure oneself against the risk involved in undertaking such a task. The following is taken from the *Light Railway and Tramway Journal*, of London.

"It is pretty generally known that the underwriters who compose the institution of world-wide reputation called Lloyds, will insure almost anything, from the risk of twins up to the largest battleship, but we fancy that a good many of our readers were not aware that they can insure a bill in Parliament. That such is the case, however, is proven by recent happenings in connection with the Coatbridge & Airdrie Tramways. The Town Council of Coatbridge had carefully debated the best plan to adopt in order to carry out the tramway scheme, and had decided to apply for a board of trade order, when at the last moment the dean of Guild (also convenor of the tramways committee) received a telegram from Mr. Kennedy, the Parliamentary agent in London of the burgh, announcing that the expense of a bill could be insured with Lloyds for a premium of 10 per cent." In view of the fact that a bill from Parliament gives greater privileges, it was decided to apply to that body, and take out insurance against possible defeat.

Arrangements may soon be made by the Chicago & Milwaukee Electric Railway Co. for furnishing electric lights to all the towns along the north shore from Waukegan to Evanston.

A DIFFERENTIAL METHOD OF TESTING RAIL BONDING AND RETURN CIRCUITS FOR ELECTRIC RAILWAYS.

BY LINCOLN NISSLEY, E. E., M. E.

For the past eight or nine years there have appeared at various irregular intervals in the columns of the technical press, descriptive articles relative to rail bonding, return circuits and electrolysis of electric railways.

The instruments and methods employed in making tests, the style of bonding and the results obtained by the various electric railway companies who have made investigations in this very important subject and whose claims from time to time have been advanced by conceded authorities, differ widely, and hence are very confusing to those who happen to notice the disparity.

In the absence of definite information as to how results have been obtained in any particular case, and the various different opinions held by those directing electric railway properties, the electrical engineer who happens to be making investigations in this field, is liable to have his report of results obtained classified at once among those mysterious variables that affect the economies of operation of nearly every electric railway in the country—and have his investigation placed in that category, of being capable only of approximative predictions.

The writer believes that the attention of investors in electric railway properties has never been sufficiently called to this matter, and that in a great many cases they have suffered from this lack of attention to the question; but the past year has witnessed the amalgamation of many of the smaller and competing roads into larger systems. The manifest advantages of such consolidation will be the placing of such properties in the hands of men who from their special training and wider experience will organize and operate them with due regard to technical and financial economies.

This article is, therefore, an attempt to describe a method of testing return circuits of electric railways, a method successfully employed by the writer in a recent test made on one of the largest consolidated roads in the country.

For making this test an old 18-ft. car with single motor equipment was fitted up, the necessary instruments and contact arrangements for making observation were devised and installed at very slight expense, the method of wiring and connecting differentially

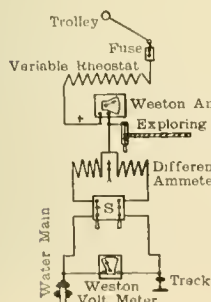


FIG. 1.

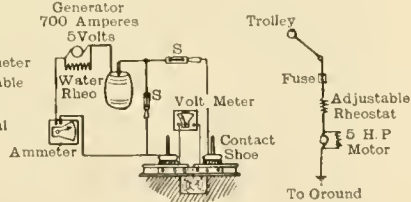


FIG. 2.

the instruments, rheostats, switches, etc., in testing car, is shown in wiring diagrams Figs. 1 and 2, and is sufficiently clear to need no further description.

The time of making observations and measurements was at night, this plan being adopted for the purpose of getting uniform conditions throughout the operations, and to avoid, as far as possible, interference with regular car schedules. Fortunately during the time of taking the observations the condition of track was the same, there being a dry rail.

The method of taking the readings was as follows: The car was stopped opposite, or at the place where the observations were to be taken, if at a fire hydrant, the smaller cable (not shown on Fig. 1) was taken by an assistant and contact made on the composition valve of the hydrant. Now, if the Weston ammeter indicated that current was passing, the differential ammeter was switched into circuit and the current increased by the rheostats to 20 amperes, which was decided upon by former adjustment of the instrument to be about the best range of its graduation, and within the safe

limits of its winding. With 20 amperes of current flowing (as indicated by the Weston ammeter) from the trolley to the rail and fire hydrant, the voltage was taken, simultaneously the reading of the differential ammeter was also taken and the readings noted, and the difference or proportionate amount of current passing into rail and hydrant according to the law of divided circuits placed in the proper column of the record.

In testing bridges, viaduct and other conductors along the lines, the exploring cable was run out and attached, the differential ammeter cut out and the current increased to 500 and 600 amperes and the drop measured. A water rheostat was used in connection with taking these readings, so as to better guard against the accidental burning out of the instruments and the possible overloading of the independent generator used in the car.

After the entire system of trackage was covered by the testing car operations, and the electrical survey finished, all the notes and data sheets were calculated and properly reduced to graphic form.

Fig. 3 shows a cross-section sheet with plotted curve derived from the deductions of the notes and covering one of the shorter

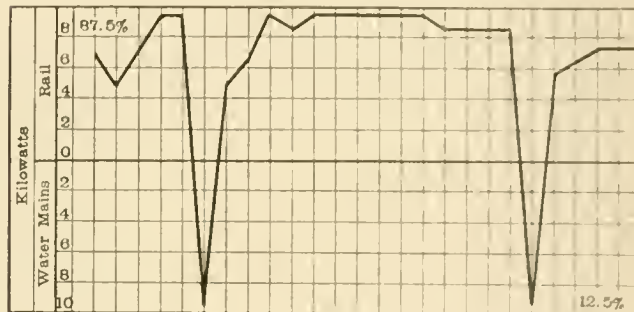


FIG. 3.

divisions of the road. All of the divisions were similarly treated, and from the curve sheets a map was constructed where-on electric contour lines were drawn, condensing, to a handy and workable form all the electrical track conditions as they existed at the time of making the survey. The curve readily shows where the greatest leakage is taking place between the rails and the water mains. On this division the two points of the curve show that the pipes in this part of the system are not within the danger zone as the current is leaking from the rails to the pipes, but after uncovering the rails at the two points indicated by the curve it was found that the base of the rail was nearly eaten away by corrosion. To illustrate further, it was easy to determine in running the testing car over the various divisions the portions of track that were in poor shape electrically. Whenever a portion of the track was reached that was not well bonded the instruments would show it instantly. Readings in this test would invariably show an increase of current on the water main side of the differential instrument, indicating of course that the water main and the intervening soil combined offered the path of least resistance from the testing car to the station. Within the danger zones of the metallic conductors underground, the reverse would be shown, or in other words the instruments would indicate the underground structures to be positive to the rails, and the amount of current passing, and the difference of potential could be determined, in the same way as before. On the better bonded tracks the current would proportion itself between the rails and the pipes and in many instances would gradually come back to the rails and abandon the pipes and vice versa.

At all points where instruments indicated that all the current that was flowing was returning to the generator by the pipe routes, the resistance at that point was measured, and also the resistance by way of the rail route was calculated from the same point of observation. Taking the cross-section of the rails and assuming them to be electrically continuous from the car to the generator, anyone would naturally suppose that the current from the car passing to the generator would take this route, but in the majority of cases that have come under the observation of the writer the pipe route is the path of least resistance back to the station, whether it be one, two or six miles, and if the cross section of the rails be small, but bonded to their carrying capacity part of the current will still return to the station by way of the pipe and earth route. The kil-

watt curves show this to advantage, and this fact points to the necessity in the case in hand of connecting the pipes to the rails at the points of the curve on the water main side of the diagram, or by connecting the rails at these points to a pre-determined size of return feeder of such low resistance compared with the earth as to completely lead away from these two points of positive to earth all the current that would otherwise escape into the pipe.

Only a slight study of the curve in Fig. 3 is needed to discover the value of the differential method of testing, which the writer has so far described. If it is desirable to devise a protective system for all metallic conductors buried underground, the danger zones can be easily traced out on the electric contour map and their location relative to the power stations at once determined. The primary cause of all the trouble is, of course, poor bonding.

The contour map will show at a glance where this prevails and the remedy can then be applied at these points. If the underground metallic conductor to be protected should be the lead sheathing of the electric railway's own feeders, then a ready means is at hand for knowing the destructive currents most active. It is certain that these lead covered cables will be the first to suffer.

If it is advisable to connect the system of trackage to the water companies' underground piping, then it is only necessary to find on the plotted curves of each division of the road the lowest points of the curve and note their location and make the connection at these points. After one or more of these things have been carried out, another survey of the lines should be made with the testing car, the data thus gathered to be again reduced to graphic form and the electric contour drawn on the original map, using ink of a different color.

A comparative study can now be made of the two surveys and if we desire to go further into the study of the condition, calculating from the mean areas of the contours will give the approximate return reduced to dollars, on the money invested for bonding after the first survey was made. It will now also be found that the areas of the danger zones have been reduced very much in size and have shifted into new locations and are now confined to small areas in close proximity to the power station or stations, where they belong and can be further treated in these newer locations much more economically and with greater certainty.

It will readily be seen from the above that in a further study of the contour map, other information can be gathered affecting the economy of other departments of electric railway construction and operation. In fact there is hardly any limit to the uses of a testing car, where these comparative tests may not be employed to advantage. The use of plotted data in graphic form can continually be enlarged and extended to cover almost every department of electric railway work.

Every electric railway company should make careful observations and measurements at the power stations for the determination of the existing conditions of the ground return in these stations. One particular case the writer has recently had to deal with, will suffice as an illustration of how this important detail is neglected, by some electric railway companies at least. The location of the station was about 1,000 ft. from the nearest line of rails. There was found to be over 4,000,000 c. m. of copper in the feeder leaving the station switchboard and ramifying to all parts of the system, and supplying the positive side of the line which was the trolley. As a return for the negative or rail side of the system was found one 500,000 c. m. cable fastened with a clampband to the deep well pump and leading from there to the negative bus bar. This feeder was supplemented by one of equal cross section leading from the switchboard, over a pole line to the nearest point of the rails and there tapped in making a total of 1,000,000 c. m. for a return of a station in which the maximum amount of current to be delivered to the line daily amounted to about 2,100 amperes. There was also found a potential difference of many volts between the pipes in the station and the negative bus bar. The investor in electric railway properties has no protection, no hope for dividends where such an unbalanced, ohmic condition exists. It has been said that the business of electric railways is a business of detail; it is hoped by the writer that investors at least will find it to be true, that it is becoming to be, in a large measure, an engineering detail. In no other enterprise is a smattering of knowledge so dangerous as in the direction of electric railways. We do not insist that in this particular instance the profound mathematics of a Clerk Maxwell need be applied to obtain results, but rather an abundance of common sense of the broad

gage type. Conditions will, of course, vary in every instance. No two systems being exactly alike, individual study must be made of every detail to reach results of best economy. In this instance of neglected return circuit the only way to realize an ohmic balance in the distributing system would be to reduce to a minimum the potential difference between the piping in the station and the negative bus bar, thus relieving the pipes from further damage. The most economical way in the end would be to reduce the potential difference between all the pipes, and all the parts of the track system to and below a safe limit by tapping the rails at pre-determined points with insulated return feeders so calculated as to size that the proportionate drop in all of them will be the same. This would necessitate an outlay for additional copper, which would mean an increase of fixed charges; but the resultant increase of economy of operation, the saving of fuel, better lighted cars, reduction of repairs to motors, increased speed, and the reduced liability for electrolytic losses would in the opinion of the writer fully warrant a considerable increase in the fixed charges.

That too large an investment could be made for additional copper is granted, as well as that there may be too little copper, but there is a happy medium between the two, in which it is nearly always possible to confine the case.

It is in place to add here, however, that the return feeders should not be determined in the perfunctory way that such feeders are generally put up, but the entire system should be completely worked out on the electric contour map, and be made exactly analogous to the trolley and over-head feeder system.

The investigations of the system, at present in vogue, of utilizing the metal of the rails for taking current back to the station, from the more distant portion of the line, show that the cross-section of the rails is sometimes insufficient to bring the current in without excessive drop. Assume two power stations of a consolidated line supplying a net work of trackage, and say that for present conditions a drop of 50 volts between the distant ends and the sections adjacent to station A and station B as a fair basis. It has been found in the writer's experience of testing such lines, that the drop is considerably more than this; the great deterioration of bonds, or no bonds, and the growth of traffic beyond that anticipated when the lines were built, have more than doubled this drop so that there is now a potential difference of 100 and even 200 volts between the grounded return systems in sections between station A and station B. This potential difference is enough to force the great current flowing through a wide sweep of area about the system of trackage and eat whatever metal it can find buried in the ground. Better bonds, heavier and longer rails, and more return copper can be added, but so long as the rails only are used as a return the reduction of the drop between 10 or 15 volts would, under the conditions assumed, require an excessive coat of the conducting system.

WHY DON'T THEY GET ON?

The bureau-of-information-man in blank depot of blank road—one of the great roads—yawned and said: "No show for an ambitious man in this position; no chance to advance." I asked him for information as to how to buy my ticket for Crystal, Fla. He didn't know, and, getting out the Plant System book, he couldn't find out.

First, it was December 30th, and he passed out a November book; all out of tune, as a December book was out changing many time tables.

Next, he was dumb about sleeper accommodations.

Finally, he wound up by saying: "I guess you know more about this than I do."

This was the man who yawned and said: "No show in my position for an ambitious man."

He cursed his "luck," cursed Carnegie, and Rockefeller for having "money to burn." "Them fellers," he said, "had a show," and more to same intent. He is a twentieth century illustration of the New Testament, first century parable of the talents: "I know thee, Lord, that thou wert a hard master, austere. Take your old talent,—a little bureau of information job is no place in which to get recognition." Then the Lord took it, and possibly will give it to Carnegie or Rockefeller, saying: "He will improve it; for to him that hath shall be given, and to him that hath not, shall be taken away, even that which he hath."—Graphite.

MECHANICAL DEPARTMENT

ELECTRIC PILE DRIVER.

By courtesy of Mr. A. L. Kempster, secretary of the Seattle (Wash.) Traction Co., we have received a photograph and description of an electric pile driver built in the company's shops after designs of Supt. N. Lawson. The company has about two miles of trestle work along the east shore of Lake Union, and when it became necessary to replace this piling last spring the car shown in the accompanying illustration was built for the work.

The machine is mounted on a 30-ft. double truck flat car. The gins are 35 ft. in height and in order to permit the car to pass under the span wires, the gins are swung from channel



ELECTRIC PILE DRIVER, SEATTLE.

pins 8 ft. above the deck of the car. The hammer is of the ordinary design weighing 2,400 lb. The motive power is one 15-h. p. F-30 railway motor.

With this pile driver as many as 72 piles were driven in one day, the average number being 50.

SOME ESTIMATES ON COSTS.

The following table is extracted from an article entitled "The Commercial Engineer" by Mr. C. W. Bennett, B. M. E., published in the Wisconsin Engineer. Mr. Bennett is connected with the Elwood, Ind., plant of the American Tin Plate Co., and the data were prepared with special reference to rolling mill construction. However, they should be of value for other shop and manufacturing buildings.

"The following table of costs has been found very useful and fairly accurate for estimate work, the various items having been checked over a number of years' observations and under varying conditions

of locality and state of market. The present unstable high prices quoted on steel products prevent close figures on these lines and necessitate in the case of steel buildings or machinery the addition of a percentage to the average cost, which percentage at present is about one hundred. Where a ranging price on material or labor is given the one best suited to the particular locality is of course to be selected."

TABLE OF COSTS USED IN ESTIMATES.

Excavation—earth or clay.....		\$0.40 per yd.	
Excavation—rock cutting.....		1.70 per yd.	
Brick work in foundations and walls—			
Common red brick—8½ x 4 x 2½—20½ to the cu. ft.			
Cost per 1000.....	Laid in cement. \$4.50 to \$5.50	Lime mortar. \$4.50 to \$5.50	
Labor laying.....	2.00 to 6.00	2.00 to 6.00	
Sand—¾ yd.....	45 to 70	45 to 70	
Cement—Portland—6 sacks of 87 lbs.....	78 to 4.50	30 to 45	
Lime—3 bu.....			
Total cost per 1,000.....	\$7.73 to \$13.70	\$7.31 to \$12.68	
First quality fire brick—9 x 4½ x 2½—17 to cu. ft.			
Cost per 1000.....		\$22.00	
Labor laying.....		4.50	
Fire-clay—½ ton.....		1.00	
Total.....		\$27.50	
Masonry Rubble—16½ cu. ft. equal 1 perch.			
Cost per perch.....	Laid in Cement. \$0.60 to \$1.35	Lime Mortar. \$0.60 to \$1.35	
Labor laying.....	.80 to 2.00	.80 to 2.00	
Sand—½ yd.....	.30 to .45	.30 to .45	
Cement—5 sacks of 87 lb.....	.65 to 1.30	2 bu. 24 to 32	
Total.....	\$2.35 to \$5.10	\$1.94 to \$4.12	
Concreting for foundations—			
Crushed stone—1 yd.....		\$1.75	
Labor.....		.80	
Sand—1 yd.....		.90	
Cement—6 sacks of 87 lb.....		.78	
Total.....		\$4.23	
Mill Buildings. Safe load on roof 40 lb. per square ft. ground area. Horizontal wind pressure 30 lb. per sq. ft. Foundations and floors not included.			
Iron or steel throughout, 50 ft. span, 18 ft. columns.....		\$0.40 sq. ft.	
Iron or steel throughout, 65 ft. span, 25 ft. columns, crane runway.....		.50 sq. ft.	
Iron or steel throughout, 60 ft. span, 30 ft. columns, crane runway, brick curtains, asbestos roof.....		.70 sq. ft.	
Iron or steel throughout, 50 ft. span, 30 ft. columns, slate roof.....		.50 sq. ft.	
Brick—50 ft. span, 18 ft. height, walls 18 ft. high, wood trusses, iron roof.....		.50 sq. ft.	
Frame, for shop and factory purposes.....		.40 to .60 sq. ft.	
Foundation walls for brick building.....	.10 to .15 sq. ft. bld. area		
Piers for iron building.....		.02 sq. ft.	
Flooring—2 in. oak plank, 600 lbs. per sq. ft. net load.....		.14 sq. ft.	
Hard burned paving brick.....		.09 sq. ft.	
Cast iron plates—¾ in. thick.....		.35 sq. ft.	
Boilers	Actual floor space occupied per h. p.	Cost per h. p. set up complete.	
Return tubular.....	\$0.85 to \$1.25 sq. ft.	\$ 9.00 to \$11.00	
Water tube.....	.66 to .85 sq. ft.	11.00 to 14.00	
Piping and Boiler Connections.			
Steam header and boiler pipes.....		\$0.80 per h. p.	
Feed pumps.....		.40 per h. p.	
Steam line to engines, 10 in. erected.....		3.25 per ft.	
Cast iron water line 12 in.....		2.45 per ft.	
Engines F. O. B. plant, per h. p.	Simple. \$7 to \$9	Cross Compound. \$15 to \$15	Tandem Compound. \$9 to \$14

"The preceding table does not pretend to be strictly accurate in the matter of costs, but serves as a good guide in the making up of preliminary estimates. As showing the difficulty of establishing a fixed line of prices, the particular item of steel buildings may be noted: the prices given in the table are the average that have prevailed for the past few years. A building that per the table would cost 40 cents a square foot, at the present writing would be quoted at 80 cents a square foot, or an advance of 100 per cent, as before remarked. This is due to extraordinary conditions in the steel trade, but it may confidently be expected that the immense producing capacity of the country, which is being rapidly increased by the construction of numerous large steel plants, will shortly have the effect of bringing the price of steel down to the average of the past seven

years. It was thought best to give average prices in the table and then make due allowance for a phenomenal condition. A few further remarks as to the conditions governing some of the other items herewith attach.

"Excavation for the ordinary mill foundation is usually performed by hand labor with wheel barrows. If the dirt is wheeled over 100 ft. the cost may reach 50 cents or more per yard; on the other hand if shoveling directly into cars is possible, or if wheel scrapers are used to good advantage, the cost may be as low as 20 cents.

"Foundation structure is governed largely by local conditions. It is assumed that hard-pan, stiff clay, or other bed can be uncovered within a few feet of the surface. Soft, marshy, or quicksand formations requiring the use of piling, need special treatment in every particular case. Of the materials ordinarily used, brick and limestone, either makes an excellent foundation when properly put in. The expression 'foundations are often too light but never too heavy' deserves a wide and emphatic publication. Poorly constructed masonry, or insufficient depth of same, are exceedingly difficult things to rectify after a foundation is once in place. Good cement mortar should always be used below the flooring level and the top courses laid with portland to give greater cohesion and solidity. Financial considerations will advise the use of limestone, where same can be delivered for 50 cents a perch or thereabouts. In central Indiana, where the cost reaches \$1.35 or more with good brick at \$4.50 or \$5.00, the use of the latter material will dominate. The class of work determines the cost of laying in either case. In rough foundations the mason will lay as high as 4,000 brick or 10 perch of stone per day, but in faced walls of less than 18 in. thickness the average will be 1,200 brick or 4 perch of stone.

"Mill building specifications often provide for loads of one ton or more to be suspended from any point of a roof truss, in which case allowance should be made for the increased weight of material required. The strain sheet for trusses is usually based on 1,200 lb. tension, 10,000 lb. compression, 9,000 lb. shear per sq. in. of net section of member. Crane runways, say for 10-ton cranes, cost approximately \$6.00 per running foot, when put in independent of building. The commonly specified iron or steel roofing consists of No. 20 corrugated sheets, 2½-in. corrugations; for sides of building No. 22 gage is used."

NEW CARS FOR THE CHICAGO UNION TRACTION CO.

The Chicago Union Traction Co. is building at its Madison and West 40th St. shops, which were described on page 661 of the "Review" for Oct. 15, 1899, 70 single truck cars 31 ft. long, and 10 double truck cars, 40 ft. long. These cars, which are all of the open type, are being erected after plans drawn by Mr. F. T. C. Brydges, superintendent of shops, and the aim is to turn out solid, substantial rolling stock without "frills" or unnecessary decorative features, and built to fill the traffic conditions encountered on the North and West Side lines. The single truck car-bodies have reversible seats, ceilings finished in quartered oak, and will be mounted on Brill E 21 trucks with G. E. No. 52 motors. Curtains will be supplied by the Curtain Supply Co., of Chicago.

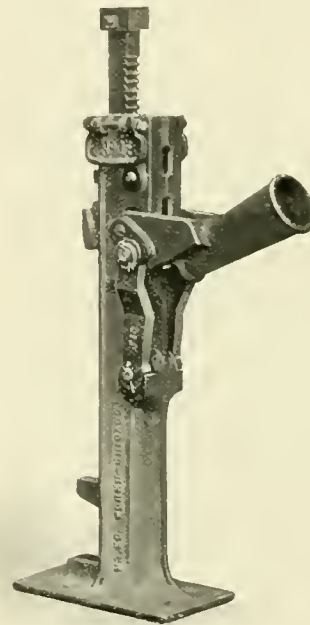
In addition to the construction of these new cars, most of the regular repair work for all the West Side lines of the Union Traction Co. and also some for the Chicago Consolidated Traction Co., which has no repair shops of its own, is being carried out at this plant. Since our description in the "Review" a number of new wood and iron working tools have been placed in position to enable certain classes of repairs to be made with greater dispatch and economy.

To keep track of the quantity of small tools, as drill points, punches, wrenches, etc., constantly in use in a large machine shop such as this, the company employs the numbered check system. Each man in the shop has a number and is allotted six brass checks upon which his number is stamped. When he requires some tool not included in the regular kit that goes with his machine, he applies to the store keeper and obtains it, and the keeper hangs upon a small hook in front of the pigeon hole from which the tool was taken, a check bearing the man's number. In this way the employe in charge of the store room can quickly tell where every small tool in the shop is, and it is his duty to see that tools are returned within a reasonable time, particularly when it is a special

pattern, of which there is a limited number. When the man returns the borrowed tool the check is taken from the hook and placed on a board near the store keeper's desk. The checks are not given to the men personally. The store keeper is a mechanic and busies himself making light electrical repairs and doing odd jobs of punching and drilling when his services are not otherwise required.

UNION TRACK JACK.

The accompanying illustrations show the "Union" track jack which has been perfected by the Morden Frog & Crossing Works, of South Chicago, Ill., for railway track work.

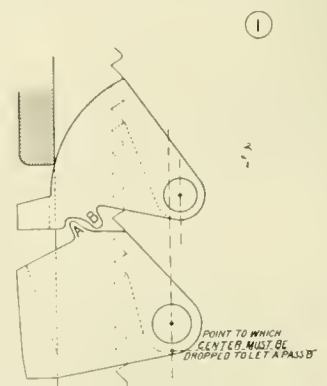


Experience for several years on both steam and electric roads has demonstrated that it is admirably designed for the service required. The movement is simple, the number of parts small, the frame open so that dirt does not collect inside and clog the movements and all the working parts are easy of access. A cap or lug is placed over the fulcrum pin obviating the use of bushings and providing double wearing surfaces. The teeth on the lifting bar are ½ in. apart and the full movement of the lever reaches three teeth; by taking stroke of one tooth only with the lever well down, a very powerful leverage is secured, the arrangement of bearing pins giving a toggle joint. The movable fulcrum permits the pin carrying the lifting pawl to move in a straight line, and permits a

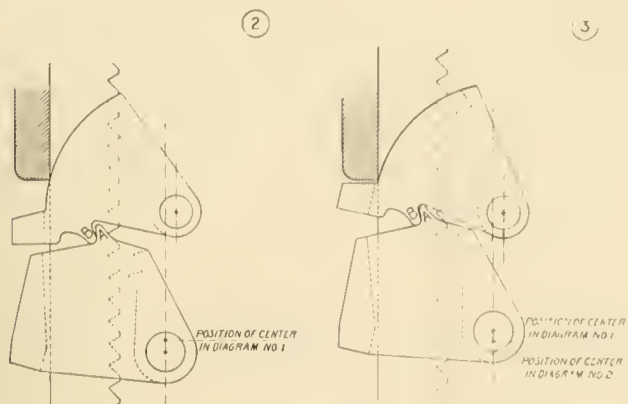
lifting pawl that is practically a clutch to be used; there is no rocking motion of the pawl relative to the rack, as occurs where the pawl pin moves in an arc.

The method of tripping the jack is readily seen by reference to the three line drawings. No. 1 shows the position of the pawls when the bar has been raised to the full extent of a single stroke of the lever, and is at a point where both pawls are in engagement with the teeth of the bar. To set the pawls to trip remove the wooden handle, depress the lower pawl by raising the iron lever socket, until it is low enough to allow A to pass B without touching. Hold the lever with one hand and lift the front of the lower pawl, revolving it on the pin, until it comes in contact with the face of the bar and A has passed by B. Then raise the pawl, by depressing the lever socket, until A has passed up back of B, as shown in No. 2. In this position the lower pawl is securely held out of engagement with the rack by the upper pawl, which is still sustaining the load, and the jack is ready to be tripped. Press down on the lever socket with the hand or foot and the lower pawl will move upward, throwing the holding pawl out of engagement and releasing the load.

The pawls will then, as is shown in No. 3, each be securely held away from the teeth while the bar descends. The first upward stroke of the lever releases the pawls and they engage the bar without further attention. With a weight of 150 to 200 lb. on the lifting bar there is sufficient friction on the upper pawl to hold it in place against the weight of the lever socket when set to trip. This makes it possible to remove the



wooden handle and set the pawls to trip when the track has been raised to the proper height, before doing any tamping; and the jack can be tripped instantly and removed in case of emergency,



without the necessity of stopping to adjust a key and lower the load, as with many other jacks.

The number of the jack corresponds to the distance in inches through which it lifts its load. The capacity from No. 14 to No. 18, inclusive, is 12 tons, and they are exactly alike save in height. All parts are malleable iron, except the bar and pawl teeth, which are of steel.

the under side of the roof, thus keeping them out of the way of snow water.

The body is a car formerly used as an express car. The weight complete, when the car is loaded with sand to increase the traction, is from 9 to 10 tons.

Mr. Rice advises us that this plow has been needed several times this winter and has done its work in a satisfactory manner. Only two men are required.

TOLEDO-MONROE ELECTRIC RAILWAY.

The Toledo Monroe Electric Railway Co. was recently formed by some of Detroit's wealthiest business men, and will build from Toledo to Monroe, and from Monroe to Monroe Beach (a distance of about 22 miles), an electric road of the very best character.

It has placed the building and equipping of the road in the hands of J. G. White & Co. (well-known contractors and engineers, of 29 Broadway, New York), who will survey the route, plan the special structures, power house, cars, etc., and supervise the installation of the entire outfit, turning over the road in complete working order. The specifications for apparatus are complete and cover the very latest and best types.

The power house will be equipped with an alternating current plant, and current will be distributed to sub-stations at a potential of 15,000 volts and there converted to direct current at 600 volts. The cars will be quite similar to those used on the Niagara Falls & Buffalo road (which was built and equipped by J. G. White & Co.), and will be equipped with sufficient motor capacity



SNOW PLOWS BANGOR, ORONO & OLD TOWN RY.

A MAINE SNOW PLOW.

We are indebted to Mr. W. G. Rice, superintendent of the Bangor, Orono & Old Town Railway Co., of Bangor, Me., for the accompanying illustration and description of a snow plow built in the shops of that company. The company formerly had two snow plows like that shown at the right in the engraving, and the truck from one of these was lengthened for the new plow and the noses fastened at the ends. The noses are about 8 ft. 8 in. wide at the base and are built of white oak covered with 1/4-in. iron plates. When the wings at the rear of the nose are extended the snow is cleared for a distance of 6 ft. on either side of the track.

In front of the wheels are the ordinary diggers to clear the rail for the wheel flanges. The noses have a vertical movement of about 12 in. and the position is readily controlled by means of hoisting apparatus, which is easily operated by one man. The details of this were worked out by the company's foreman, Mr. A. E. Reynolds.

The motor equipment consists of two 30-h. p. Westinghouse motors, but the wires are carried directly through the floor and along

for making a maximum speed of between 50 and 60 miles an hour. T-rails of 70-lb. section will be used and the road will be of the very best possible character; rock ballast is to be used throughout the entire length of the line. With the exception of terminal connections, this road will be built on private right-of-way, and in every respect will be laid out on the lines of a high-grade steam railroad.

This work was secured for J. G. White & Co. by its agent, the Michigan Electric Co., of Detroit.

A new 24 and 52 by 48-in. compound Green-Wheelock engine direct connected to a General Electric generator has been put in operation at the power house of the Columbus (O.) Street Ry.

The Duluth (Minn.) Street Railway Co. is making preparation for improving its service to Park Point, a popular camping ground and beach. New cars have been ordered and additional switches will be laid down. A large hotel and pavilion will also be erected at the Point by the company.

LOSSES DUE TO REMOVAL OF BONDS.

Last month the manager of an interurban electric railway which has suffered the loss of its bonds and direct return wires at the hands of copper thieves, wrote us requesting information concerning the losses involved, aside from the mere cost of the copper. This company has secured the conviction of six copper thieves, the sentences being 18 months in each case, and it is believed that if the judge understood the full money loss the company suffers by reason of the impairment of its return lines, heavier sentences would be imposed.

The road in question operates from 1 to 14 miles from the power house.

Following are the replies of several electrical engineers of street railways to whom the hypothetical question was submitted:

"I cannot answer off hand. In fact, it would be impossible to give any kind of an idea without actually making tests. The resistance of the return, under the conditions mentioned, would very likely be extremely high, probably so high that on a road 1 to 14 miles long it would hardly be possible to move a car at the far end of the line. And again, the small amount of current that they would be able to have flow would necessarily have to return by way of the earth, water pipes or other than through the rails."

"A."

"It is a very difficult matter to arrive definitely at an answer to the question, but I would say that, under ordinary conditions, on a line having three or four hundred bonds removed, unless of extra heavy rails with well tightened fish plates, the cars would be practically at a standstill. On a stretch of road recently acquired where both bonds and fish plates were very much out of repair, the drop on the line was enormous. The maximum voltage obtained from the car while going up a slight grade was about 300 volts, while the station voltage was 550. After bonding the rail, this drop was reduced so that, under similar conditions, 500 volts was obtained. I should say the only definite way to arrive at the exact loss due to bonds being removed would be to measure the drop on the joint when properly bonded, then remove the bond and measure the drop with other conditions the same. The difference between the drop in these two cases multiplied by the current flowing will give the loss in watts at that joint, multiplying this by the length of time that the bond is removed will give the watt-hours of current lost. This multiplied by the cost of power per watt-hour will give the loss in dollars and cents due to the bond being removed.

"This on a recent test showed as follows: Current flowing, 99 amperes; drop on joint without bond, .5 volts; drop when bonded, .001 volt; equaling a loss of 49.41 watts per hour. At the rate of 5 cents per kw. h. (average rate charged for electric power) this is a cost of 2.47 cents per joint per hour. As this is only a test on an individual joint, the actual conditions on the road referred to may be better or worse according to the condition of the fish plate, as I have seen the drop across a fish plate without bonds as high as 5 volts."

"B."

"From actual experience with the rail bond question, I have found that the loss of the copper used for these bonds is a mere trifle of the actual loss caused by their removal from the rails. Testing a stretch of track (from which the bonds were stolen for about 200 yd.) by putting an ammeter in circuit with the car motors, I found that the increase in amperes was from 20 to 25 per cent; and this was not confined to that particular place alone, but for all the track beyond this place and away from the power plant. In this case there were 5½ miles of track beyond the point where the bonds had been removed and the schedule called for three cars on this portion, each one of which required 20 to 25 per cent more current to operate it. When new bonds were put in, a test showed a corresponding reduction in current consumption.

"My experience with another road resulted in practically the same figures. The fish plates will carry the current so long as the rail and plates are bright and perfectly tight, but after only one or two rains rust appears between the plates and rail, and if the bonds are removed, there is to a certain extent a 'dead section.' All the tests I have made showed a loss of 20 to 25 per cent, and in one instance 52 per cent—consequently requiring so much additional

power, to say nothing of the heating of motors caused by the imperfect circuits."

"C."

Where the line from which the bonds are removed is part of an extensive system the loss may not be readily discovered, as is shown by the following from the engineer of a large road:

"The loss of more or less bonds on a line extending from 1 to 14 miles from the power house, in my opinion, will depend entirely upon the condition of the fish plates. We have had a similar experience on a road three miles long where practically four-fifths of the bonds were stolen and the operating department were not aware of the loss for some weeks afterwards. The rail was 70-lb. and the fish plates were generally tight."

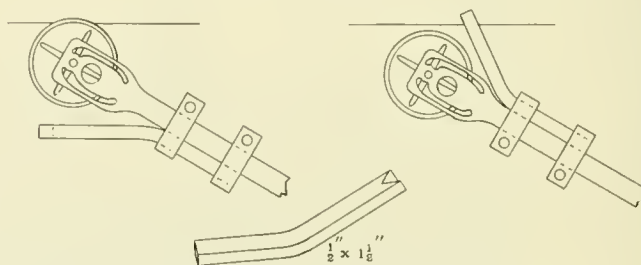
"D."

"We have no data at hand which would show us the loss due to absence of rail bonds. We do know, however, that if bonds are removed the rails themselves would deteriorate very rapidly where heavy currents are used."

"E."

CUTTER FOR ICE ON TROLLEY WIRE.

The Chicago, Harvard & Geneva Lake Ry. has during this winter made use of a device for cutting sleet from the trolley wire which will be readily understood from an inspection of the accompanying drawing. It is simply a bar of iron ½ x 1½ in. and about 10 in. long, bent slightly in the middle and with a V-shaped notch cut in one end. It is clamped to the pole in contact with the harp



CUTTER FOR ICE ON TROLLEY WIRE.

and replaces the trolley wheel so far as making contact is concerned; when not in use it is clamped to the under side of the pole.

Usually when the wires are so coated with ice as to require the use of this fork there is a man stationed on top of the car to manipulate the trolley pole.

The experience of this company was that the sleet on its overhead wires is very hard and forms with extraordinary rapidity, due to the peculiar atmospheric conditions.

REDUCED FARES AT FORT WAYNE.

As announced in the last issue of the "Review," the Fort Wayne (Ind.) Traction Co. has placed on sale books of tickets for working people at the rate of 3½ cents per ticket. In a recent interview, A. L. Scott, manager of the road, stated that these reduced rates were for working people only, the term including any person engaged at a regular occupation and drawing a weekly or monthly salary, as clerks, mechanics, solicitors, bookkeepers, etc. The person must be working for an employer, whose name must be written on the book. The books will be sold to men only at 100 tickets for \$3.50, but girls or women can purchase 50 tickets at a time at \$1.75. A number of large firms in the city have bought quantities of the books for the benefit of their employees, allowing the latter to pay for the tickets in small installments. The books are good only during the hours of 6 to 7 a. m. and from 5:30 to 7:30 p. m.

The Fort Wayne Traction Co. also sells what it calls a citizens' 4-cent ticket, good at all hours. These are issued in books of 25 and 100, and the person buying one must give his full name and this is written on the book. If he wants his family to use the tickets he must state that fact and the words "and family" will be added.

SINGLE RAIL SUSPENSION RAILWAY.

There is now nearing completion in Germany what may safely said to be the most novel electric railway that ever progressed beyond the paper stage. This line extends from the Rittershausen railroad station in Bremen, through Elberfeld to the railroad station in Vohwinkle, having a length of 8 1/3 miles, all double track, and the accompanying illustrations, which are reproduced from our German contemporary, the Zeitschrift fuer Kleinbahnen, will be of interest. The structure for a portion of the line is built over the

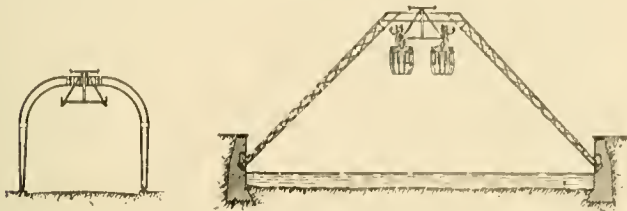


FIG. 1—SECTIONS.

River Wupper; the general arrangement is shown in Figs. 1 and 2. The cars, seating 50 or 60 passengers, are suspended from above and run on small double flanged wheels bearing on a single rail. The arrangement of the truck and the method of preventing derailment are very well seen from Figs. 3 and 4, in which c is the electrical conductor, g the trolley, and s the running rail. The speed to be attained is 25 to 30 miles per hour.

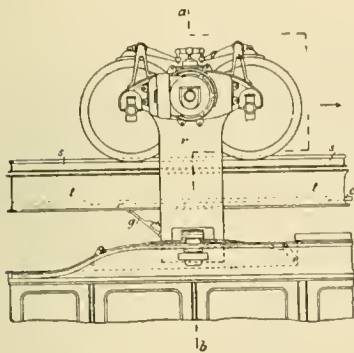


FIG. 3.

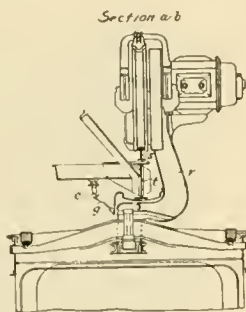


FIG. 4.

The curves are made of 300 ft. radius where possible, though near the Vohwinkle terminus are some of 100 ft.; in the car shed and station, shown in plan in Fig. 5, some of the curves have radii as short as 8 and 9 m. (26.6 ft. and 30 ft.).

The longitudinal portion of the structure is in section like an I with the lower bar extended, and is built of rolled shapes. The relative position of the running rails on straight track, on curves, and at island stations is shown in Figs. 6, 7 and 8. In Figs. 6 and 7

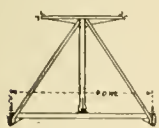


FIG. 6.

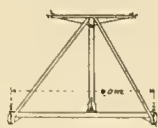


FIG. 7.

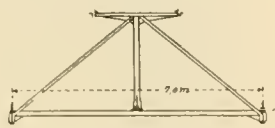


FIG. 8.

the two rails are 157 1/2 in. c. to c. and at the stations 275 3/8 in. c. to c. The height is such as to bring the cars 16 ft. above the bridges over the river.

The system is the invention of Mr. Eugene Langen, of Cologne, and the road is being built by a Nuremburg company.

The postmaster of Chicago contemplates establishing three new electric railway postoffices, the cars to run over the Clark St. and Wentworth Ave. lines of the Chicago City Ry., connecting the Armour, Brighton Park, Stockyards and Englewood postal stations with the main office. This extension has long been considered a desirable one, but was impracticable until after the grade crossings at Clark and 16th Sts. were abolished.

MARYLAND 4-CENT FARE BILL.

There was last month pending in the Maryland Legislature a bill providing for lower street car fares in Baltimore. The Senate gave the opponents of the measure a hearing, and as a result the bill failed to pass. At this hearing Gen. Mgr W. A. House, of the United Railways & Electric Co., said:

"Basing our calculations on the passenger earnings for 1899, which were \$4,127,209.77, and upon the theory that all of the revenue passengers carried would avail themselves of the privilege of six tickets for a quarter, our passenger earnings would be \$3,439,341.50,



FIG. 2 ELEVATION.

showing the enormous decrease of \$687,868.29, and to make up this loss we would have to carry 16,508,839 additional revenue passengers for the year or 45,230 passengers per diem. This statement, however, that all riders will avail themselves of the privilege of buying tickets has been questioned, and we are informed that where six tickets for a quarter are sold 80 per cent of the company's revenue is in tickets, and upon this basis we will submit the loss that will be sustained by the company. Taking the passenger earnings for 1899 as a basis, our earnings would then be \$3,576,915.12, \$2,751,473 from sale of tickets and \$825,442 cash, thus showing a loss to the company of \$550,294.65, requiring us to carry 13,207,072 additional revenue passengers for the year or 36,184 per diem.

"It has been said that a large number of people now walk because they will not pay 5 cents, but would ride if six tickets for a quarter were sold. Is it reasonable to suppose that a man who is

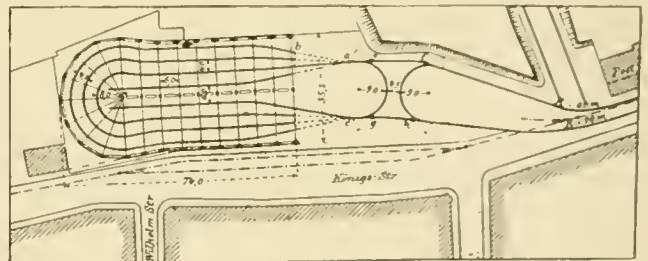


FIG. 5—TERMINAL STATION.

now walking to save 60 cents per week will spend 50 cents to secure two free rides? Certainly there is but one answer to this question—he'll not do it, and we cannot look for this increase in passengers from those who do not now ride at all, and surely we have not the floating population, and must depend entirely upon the more frequent riding of our old patrons. For the sake of argument, and admitting that this reduction in fare would become popular, increasing the riding thereby to the extent that is necessary to realize the same revenue, how is it to be taken care of? Our present equipment, taxed to its full capacity, is carrying 235,268 revenue passengers per diem, and should we secure the increased riding on the 80 per cent basis, or 36,184 additional passengers, we would be compelled to increase our rolling stock 15 per cent, our working force in the transportation department, the mechanical department, our power house capacity, and even the clerical force, and the fact should not be lost sight of that in handling this greater number of passengers the liability of accident is proportionately increased, all without any increase whatever in revenue.

"The company's claim is that it will be injured for the reason that it must do 20 per cent more business to take in the same amount of cash, and in doing this increased business it will materially increase its operating expenses; but, assuming that the revenue of the company will not only equal its present revenue, but will be increased, granting the argument that has been made, that the public

will ride more and that those who do not now ride will then ride, wherein lies the benefit to the public, when the aggregate amount of car fare spent by the public must necessarily be greater than that now spent, if the argument made by the friends of the bill holds good."

Mr. Robert Crain, counsel for the company, said in part: "An argument that I understand has weight with you is the fact that six tickets for a quarter works well in Washington. It is the one city in the country where it does work well, and the reasons are obvious. Washington is no criterion for Baltimore. In the first place, Washington has a large transient population and we have none. Two things result from this: Many strangers never use tickets at all and many who do buy them never use them; less than 40 per cent of the Washington traffic is on tickets and unredeemed tickets amount to as much as \$200,000 a year. But the great reason why six tickets for a quarter is a success in Washington and would ruin us is this: Our roads in 1897 carried less than 165,000 per mile; the Metropolitan, of Washington, in that year carried 766,414 passengers per mile—nearly five times as many. Washington streets have no hills, no curves, no narrow crowded thoroughfares. There is less danger of accident, the service can be operated more economically and there are no burdensome franchise taxes."

REPORT OF LOUISVILLE RY.

The annual meeting of the Louisville (Ky.) Railway Co. was held February 21st. The report of Pres. T. J. Minary gave the following summary of the business for 1899:

Gross receipts	\$1,436,828.30
Operating expenses, including taxes, interest and dividend on preferred stock.....	1,399,749.06
Net earnings	\$ 37,088.24
Dividend of 1 per cent on common stock.....	35,000.00
Net balance	\$ 2,088.24

During the year the claim of the city of Louisville for back taxes has been compromised by the payment of \$182,948.71, the same being 70 per cent of the amount claimed. The power house was improved at an expense of about \$40,000, extensions made to the lines and some additional rolling stock bought.

The earnings of the company in excess of what was necessary to meet fixed charges have for some time past been used for improvements, but as this plan did not altogether meet with the approval of the stockholders, it was at this meeting decided to issue second mortgage 4½ per cent bonds to the amount of \$2,000,000 upon the property, to be sold at the rate of not exceeding \$200,000 per annum, the proceeds to be expended for extensions and betterments. The first issue will be as of March 1st, and a 3½-mile extension will be built this spring.

SPRINGFIELD TROUBLES OVER.

The boycott against the Springfield (Ill.) Street Railway Co. was declared off on February 20th. The strike began on October 19th, the grievance being that the company would not recognize the union. No cars were run for two days, but the tie-up was of short duration, as the company found little trouble in securing men to take charge of the cars in place of the union men who had quit work. The Federation of Labor in a short time decided to put a 'bus line into operation, which for a time was liberally patronized by a number of union men and sympathizers. After a time the 'bus line did not pay expenses and the union men who were making weekly payments for the strike fund became dissatisfied and as a result objected to making them. The matter was discussed in a number of unions, which resulted in the Federation declaring the boycott off. It is understood that the Federation has contracted debts to the amount of several hundred dollars.

A company, in which Dr. J. E. Lowes is interested, has been organized to build a 36 mile interurban electric line from Dayton, O., to Greenville, and has secured franchises. Twelve towns are on the line. Dr. Lowes advises us that work will be commenced about April first.

FARES AT BUTTE, MONT.

The Butte Consolidated Railway Co. in accordance with its promise made several months ago to the people of Butte has from time to time reduced the fare from 10 cents to 5 cents on its different lines until there are but two branches remaining upon which 10 cents is charged, the Meaderville and Boulevard line and the branch to the Columbia Gardens; in pursuance of this policy the announcement was made last month that when tickets were purchased in quantities the fare on the Meaderville and Boulevard line would be 5 cents, although the regular cash fare would remain at 10 cents for the present.

The company has recently issued a little handbook containing the following information regarding rates:

Twenty 10-cent tickets will be sold for.....	\$1.50
Twenty 5-cent tickets for.....	1.00
Fifty 5-cent tickets for.....	2.50
Twenty students' tickets for.....	.50

Ten-cent tickets are good for one fare to Columbia Gardens. Five-cent tickets are good for one fare to cemeteries, Williamsburg and Meaderville.

Students' tickets good for one fare on all lines at all times during school days only, for students over 10 years of age, and good at all times for children under 10 years old.

During workmen's hours, from 6 to 8 o'clock a. m., fare on all 10-cent lines is 5 cents.

Funeral cars from all points on the lines to and from cemetery for \$10, including motor car, seating 40 passengers.

Special cars to and from cemetery from all points in Butte for \$5, from Centerville \$7.50, from Meaderville \$7.50.

NORTH METROPOLITAN, LONDON.

We are indebted to Mr. R. L. Adamson, a director of the North Metropolitan Tramways Co., of London, for a copy of the directors' report for the half-year ending Dec. 31, 1899, from which we take the following data:

The company owns 62¼ miles of tramways (nearly all double lines) and at the close of the half-year owned the following working stock: 681 street cars seating from 38 to 52 persons each; 21 omnibuses seating 26 persons each; 6,928 horses; 117 carts, traps, vans and trolleys; 37 water vans; 19 forage vans; 3 breaks, 3 horse conveyances.

The following is a comparison between the second half-year of 1899 with that of 1898:

	1898.	1899.
Average number of cars run.....	562.27	566.35
Car-miles run	7,611,207	7,808,075
Passengers carried.....	80,782,426	81,787,750
Average receipts per passenger...	2.24 cents	2.26 cents
Average receipts per car-mile....	23.90 cents	23.66 cents
Percentage of total working and general expenses to total receipts.	91.63	92.26
Traffic receipts	£ 375,796	£ 384,832

A table in the report gives the total traffic receipts for the year 1899 at £749,153. In 1898 they were £471,649.

An interesting item in the horse account is this: "522 horses sold to War Office."

The company has an outstanding share capital of £1,109,211 and bonds to the amount of £157,700. The dividend declared was 2½ per cent on the stock.

CARD PARTY ON INTERURBAN CAR.

Mrs. E. E. Downs, wife of the general manager of the Citizens Traction Co., of Oshkosh, Wis., on February 20th entertained a whist club of which she is a member on board the interurban car "Winnebago." Tables were set in the smoking compartment for refreshments, while in the larger apartment lap-boards were provided so that the guests might play cards en route. The car left the Athearn hotel in Oshkosh at 2 p. m. and two hours were consumed in making the run to Neenah, where the afternoon was spent at cards and refreshments served. The return trip was made early in the evening.

CONSOLIDATION IN MASSACHUSETTS.

The manager of the Massachusetts Electric Cos., Mr. P. F. Sullivan, advises us that 13 of the street railway companies which passed under its control in June of last year have ceased to exist. They are the following:

Norfolk Suburban Street Railway Co., Norfolk Central Street Railway Co. and Needham & Boston Street Railway Co., which have been absorbed by and consolidated with the West Roxbury & Roslindale Street Railway Co.

Gloucester, Essex & Beverly Street Railway Co. and Rockport Street Railway Co., which have been absorbed by and consolidated with the Gloucester Street Railway Co.

Mystic Valley Street Railway Co., Reading & Lowell Street Railway Co., Salem & Wakefield Street Railway Co. and Woburn & Reading Street Railway Co., which have been absorbed by and consolidated with the Wakefield & Stoneham Street Railway Co.

Brockton, Bridgewater & Taunton Street Railway Co., Brockton & East Bridgewater Street Railway Co., Boston, Milton & Brockton Street Railway Co. and Taunton & Brockton Street Railway Co., which have been absorbed by and consolidated with the Brockton Street Railway Co.

EXCURSION ON THE DAYTON & WESTERN.

One of the accompanying engravings was made from a photograph taken in August, 1899, and shows the cars provided to transport an excursion party delivered to the Dayton & Western Traction Co. at West Alexandria, O., by the Cincinnati Northern R. R.

One thousand persons were in the cars shown in the picture and were bound for the Soldiers' Home at Dayton.

This company believes in advertising for excursion business and

our second illustration is reproduced from a poster recently put out by it. The original measures 18 x 32 in. and is printed in red, blue, yellow and black. The Dayton & Western road extends 25 miles west from Dayton and through a territory where it does not have to compete with team railroads. Since the property was described



A DAYTON EXCURSION PARTY.

in our issue of March, 1899, page 170, Mr. Valentine Winters has been chosen president and he now holds that office in addition to the general managership to which he was chosen a year ago.

This company is now equipping all its cars with four G. E. 57 motors instead of two of that size; it has abandoned electric brakes and adopted the system of the Standard Air Brake Co., using motor-driven compressors.

TUNNELS AND FRANCHISES IN CHICAGO.

All of our readers remember the bitter campaign waged between the street railways of Chicago and the city council over the granting of 50-year extensions of franchises under the Allen law passed in 1897; the agitation of the subject resulted in a failure of the extension ordinance to pass and later in the repeal of the Allen law by the Legislature.

At the present time the opening of the Drainage Canal and the desire of deepening the Chicago River to meet the requirements of the deep-draft vessels of the lakes will probably bring the question up again with prospects of an amicable settlement. The Chicago Union Traction Co. has three tunnels under the Chicago River which the city wishes to have lowered several feet; the company wishes to secure extensions to its franchise and permission to substitute the overhead trolley on its cable lines. It is quite certain that the street railway cannot afford to incur the expense of lowering the tunnels with only a few years of operating ahead of it. The city cannot afford to undertake the work itself and the Federal Government refuses to do anything towards improving the river until the tunnels are lowered.

We believe the general public would be highly pleased at the substitution of electricity for the cable and that outside of the City Hall there is practically no objection to the overhead trolley in the few down town blocks necessary for loops. The trolley has given no trouble on any of the present lines and there is no good reason why the entire system should not be made uniform. It would greatly facilitate the breaking of blockades and relieve the few present trunk lines, as electric cars could find exit from the congested district over several additional routes.

ACCIDENTS IN CLEVELAND.

During the year 1899, 115 damage suits for personal injuries were brought against the Cleveland Electric Ry., 50 against the Cleveland City Ry. and 30 against the various interurban roads. The amounts claimed ranged from \$100 to \$25,000, the aggregate being nearly \$2,500,000. Few of these went to trial, however, and the court dockets show that suits for amounts ranging from \$5,000 to \$25,000 were usually compromised for about \$150.

TRAMWAY SITUATION IN BOMBAY.

The municipal corporation of Bombay, India, is now considering the action which it shall take in the tramway question. The Bombay Tramway Co., which is operating its lines by animal traction, has made application to the city for permission to adopt electricity. According to the Tramway Act the municipality was given the right to purchase the company's property at the end of each seven years. The first opportunity was offered in 1894, and the city declined to purchase, being frightened at the value of plant and good will, which was then estimated at 7,750,000 rupees (at the present value of silver this is about \$2,000,000), and in doubt as to its ability to profitably operate the lines. The company, in view of the heavy expenditures it would be called upon to make in equipping its lines electrically, wishes the city to agree to forego its right to purchase till 1915.

At present the city has borrowed some 47,500,000 rupees, the debt limit being 54,000,000 rupees, and it would appear that there are very serious financial difficulties in the way of a purchase in 1901. On the other hand, it is contended that if the city waits till 1915 it will have a much greater sum to pay by reason of the extensions to the tramway system which will inevitably follow the adoption of electricity as a motive power.

CHICAGO LAND DAMAGE CLAIMS.

In the "Review" for June, 1899, page 376, was noted the decision of the Circuit Court in a suit for land damage brought against the Lake Street Elevated R. R., Chicago, by the Chicago Office Building Co., owning a building abutting on one of the streets occupied by the elevated road. The Circuit Court held that as the fee of the streets is in the city, and the city gave the railroad company permission to build its road, property owners sustaining damage had no right of action against the railroad.

This ruling was reversed by the Appellate Court on February 26th. The court said in part:

"While we are of the opinion that the construction and operation of an elevated railway in a street, for the convenience of the public and the transportation of persons from place to place in the city, is not an additional servitude imposed on the street, we cannot concede that the owner of property abutting on the street, who suffers special damage by reason of the construction and operation of the railway, cannot recover. Counsel assumes, erroneously, as we think, that if there is no additional servitude there can be no recovery. This doubtless was the rule prior to the adoption of the present constitution in cases where there was no direct injury to the corpus of the property. But such has not been the rule since the adoption of the present constitution, which provides that private property shall not be taken or damaged for public use without just compensation."

The case will be carried to the Supreme Court.

FREIGHT QUESTION IN MASSACHUSETTS.

James Means and others who had petitioned the Massachusetts Legislature for incorporation as the Boston & Brockton Freight Co., with powers to haul freight over the lines of the Boston Elevated Ry., the Quincy & Boston Street Ry. and the Brockton Street Ry., were last month given a hearing by the committee on street railways at which the street railways concerned presented their protests. The people of Brockton wish to secure lower freight rates to Boston than the steam roads will grant and seek to secure them by means of a street railway freight service.

In opposing the petition and bill it was argued that if a freight business was to be done it should be done by the street railways themselves under a general law, and not by special grant to one company. As to the proposed company, there certainly would not be room for freight and passenger service over the routes asked for. The bill was also faulty in many respects, particularly in taking control of the operation of cars from the street railways themselves.

Pres. John R. Graham, of the Quincy & Boston road, said that it would be impossible to operate his road, some of which was single tracked, safely and expeditiously, if the freight cars of another corporation were allowed to run over its rails.

Besides, it was absolutely necessary that his road have complete

control of its electrical power at all times. His road was ready to carry freight, and believed it could do it at certain times of the day without interfering with its passenger business, but he did not believe that the time had yet come when the people were ready for freight transportation over the streets.

He would cheerfully take the right to carry freight if the Legislature would give it to him, but the road had not asked for it because it was not believed that the right could be secured.

CINCINNATI, NEWPORT & COVINGTON.

The following is the statement of earnings and expenses of the Cincinnati, Newport & Covington Railway Co. for January, 1900, compared with January, 1899, furnished us by Mr. J. C. Ernst, president of the company:

	JANUARY.	
	1900	1899
Gross receipts	\$57,196.16	\$49,871.86
Operating expenses	23,136.59	23,392.47
Net earnings	34,059.57	26,479.39
Tolls, taxes, damages, etc.	12,479.00	14,176.23
Net profit	\$21,580.57	\$12,303.16
Ratio of expense to earnings:		
With tolls .....	.402	.6130
Without tolls .....	.4045	.4690

CONSOLIDATION IN NASHVILLE.

On January 21st the street railways of Nashville, Tenn., comprising the Nashville Street Ry., the Citizens Rapid Transit Co. and the Nashville & Suburban Railway Co., were all consolidated under the name of the Nashville Ry. The Cumberland Electric Light & Power Co. is also owned and controlled by the stockholders of the Nashville Ry. Under the laws of Tennessee street railways and electric light companies cannot consolidate, therefore the two companies are operated separately.

The officers of the two companies are as follows: T. Edward Hambleton, Baltimore, president; Thos. J. Felder, vice-president; E. G. Connette, general manager; N. P. Yeatman, secretary and treasurer.

General Manager Connette advises us that the street railway is now building 3½ miles of new track completing a double track line to Glendale Park, and has contracted for a number of new trucks and motors. A considerable sum will be expended in other improvements during the coming summer; Glendale Park will be beautified and the Casino remodeled so as to provide for a country club in the second story. The lighting company has contracted for another engine and additional boilers and alternating current generators.

ATTEMPTED HOLD-UP IN NEW JERSEY.

A conductor and motorman, employes of the Bergen County Traction Co., of Fort Lee, N. J., had an exciting experience one morning last month with two negro desperadoes, who attempted to rob the conductor. The negroes boarded the car at the Bogota terminus, and when approaching a long stretch of lonely road, one of them with a revolver started for the conductor, while the other armed with a heavy walking stick made for the motorman, who was running the car at moderate speed. The conductor saw the movements and instantly gave the emergency signal "full speed ahead," at the same time preparing to grapple with the man with the revolver. The negroes were not expecting the sudden jerk and were almost thrown to the floor, giving the conductor an opportunity to seize and disarm one of them and attracting the attention of the motorman, who turned and overpowered the second. There were no passengers on the car.

Mr. W. F. Sadler, Jr., secretary and treasurer of the Trenton (N. J.), Lawrenceville & Princeton Railroad Co., writes us that his company expects to be running in the spring. Several condemnation proceedings have delayed construction work longer than was anticipated.

FOREIGN FACTS.

Extensions to the Hull (Eng.) Tramways are projected.

The London United Tramways Co. will build extensions.

Additional lines are to be built by the Ipswich (Eng.) Corporation Tramways Co.

A bill has been introduced in the Prussian Diet for the construction of light railways in Prussia.

The Cape Town (S. A.) Electric Tramways Co., Ltd., has declared an interim dividend of 4 per cent.

Power to build 17 miles of electric tramways has been asked of Parliament by the Hastings (Eng.) Tramways.

The Han-Shin (Osaka-Kobe, Japan) Tramway Co. will increase its capital stock from 1,500,000 yen to 3,000,000 yen.

The Blackpool (Eng.), St. Anne's & Lytham Tramways Co. has a bill in Parliament providing for the double tracking of its line.

The Musselburgh (Scotland) Town Council has granted a franchise for an electric tramway between Musselburgh and Portobello.

The Wellingborough (Eng.) & District Tramroads Co. is promoting a tramway bill in Parliament. The route to be covered is 20 miles long.

The Anglo-Argentino Tramway Co., with offices at Calle Rivadavia 3583, Buenos Ayres, Argentine, will equip its system with electricity.

The Madras (India) Government is opposed to the Madras Municipality issuing bonds for the purpose of purchasing the Madras Electric Tramways.

Whitehaven, Eng., and the adjacent district is to have electric trams. Franchises have been granted to the British Industrials Co., Market St., Manchester, Eng.

A bill is being promoted in Parliament by the Great Grimsby (Eng.) Street Tramways Co. for permission to introduce electric traction and make extensions.

Electric traction is being rapidly extended to almost all the principal winter resorts of the Riviera, France. The tramways at Cannes, France, have been completed.

Concessions for electric railways from Samaden to Campoclogno, Switzerland, with branches, have been granted to Frote & Westermann, of Vogelsangstrasse, 50-4, Zurich, Switzerland.

The Sheffield (Eng.) Tramway Co. proposes to divide its car into two compartments by putting a sliding door across the interior, forming accommodations for first and second class passengers.

The gross receipts of the Patna (India) City Tramway for the year 1899 were 31,839 rupees, as against 31,346 rupees for the previous year. The expenses amounted to 27,242 rupees, leaving a profit of 4,597 rupees.

The new tramways committee of the Newcastle (Eng.) City Council has decided on the plans for the power station and equipment of electric tramways. Contracts have not been let. Mr. Hopkinson is electrical engineer.

It has been decided by the Middlesex (Eng.) County Council, of which R. M. Littler is chairman, to construct a system of light railways in the county, which, it is expected, will ultimately involve the expenditure of £3,000,000.

The cost of converting, for electric traction, the existing horse tramways owned by the Salford (Eng.) Corporation, is estimated at £1,940 per mile of track, and the total cost is placed at £414,753. Contracts have been let for the work.

Applications for laying an electric railway between Kanagawa and Kawasaki, Japan, has been presented to the Kanagawa Prefectural authorities for sanction, by Zensuke Tanaka and several other promoters of Yokohama, Japan.

The promoters of the recently organized Puerto Principe (Cuba) Tramway Co. are I. A. Kelsey, the prominent street railway capitalist of New Haven, Conn., and R. A. Bentancourt, W. G. Bushnell and S. C. Moorehouse, also of New Haven.

The authorities at Moscow, Russia, have decided to permit American manufacturers, who desire to bid for the construction of electric tramways in Moscow, to examine all the details of plans, specifications, conditions and terms. M. Teploff, Russian, consul-general at New York, can give further particulars.

From Calcutta, India, comes the statement that the negotiations between the Calcutta Tramways Co. (Ltd.) and the Town Corporation regarding the proposed agreement for electric traction have been brought to a successful conclusion. The company will issue £350,000 of 4½ per cent first debenture bonds to defray the cost of making the change.

The Durban (Natal, S. A.) Corporation is inviting tenders for the supply of material for 14.36 miles of electric railways and bonding 2.96 miles of existing track. Specifications may be secured from the London agents, Webster, Steel & Co., 5 East India Ave., London, E. C., by depositing £10 ros., which will be returned later. Bids must be in by April.

Consul General Richard Guenther, of Frankfurt on the Main, advises the State Department that the old horse car system in that city is being converted for electric traction. One line connecting the suburb of Sachsenhausen has been in operation by electricity for several months and work is in progress on the others. The overhead system with iron side poles is being used.

The first Chinese electric railway has been opened. It is four miles long, connecting the Pekin railway station at Machiapu and the South Gate of the capital. Its installation is interesting, as showing the disappearance of that official superstition that placed the steam railroad station for Pekin four miles outside the walls so as not to offend the Feng-shin, which is one of the gods or goddesses, we don't know which, that patronize the capital city.

A novel double-deck motor car has been purchased by the Dublin United Tramways Co. It is vestibuled at either end, and the staircases to the roof are enclosed within the vestibules, making it impossible for passengers to fall off. Access to the upper deck is through a hatchway above the vestibules. Around the edge of the roof is a strong railing, and the seats on top are provided with a cover. Complete protection is afforded to both motorman and conductor from bad weather, and the platform area is increased so as to accommodate parcels, etc. The seating capacity is 25 inside and 37 on top.

Berlin is the center at present of a number of electric transportation experiments. On the tramways between Berlin and the adjoining district of Charlottenburg, new storage battery cars are being tried, and the mayor and traffic committee have also approved a scheme for the construction of a system of underground electric railways similar to that in operation at Buda-Pesth. In addition to these, it has been suggested that by the substitution of electric for steam traction on the Berlin Metropolitan and Berlin Circle railways, the carrying capacity would be increased 260 per cent. and steps have been taken to bring this about.

CORRESPONDENCE

Spliced Cars.

Editor "Review": In view of the increasing popularity of long cars for city and of the fact that most roads now have an equipment of short cars your readers may be interested in a short description of the method of splicing small car bodies which was employed by the Omaha & Council Bluffs Railway & Bridge Co.

We took two 16-ft. bodies and removed the ends of each car with the exception of the end floor sills. The cars were exactly alike and all moldings, panels, etc., matched so that it was only necessary to draw the two parts together and fasten them with steel angles and straps. Steel angles 4 x 6 in. by 3/2 ft. long were then placed under the side sills; similar angles placed across the ends of the spliced car and securely bolted to the old sills. At the center of each of the old bodies, the distance between the two being about one-third the total length of the spliced car, oak cross sills 4 x 6 in. were put under the floor and mortised into the other floor sills. From these cross sills iron struts were extended, and two 1 1/2-in. iron truss rods carried from the steel angles at the ends over the struts on the cross sills. New platforms were placed on each end of the car, vestibuled, and so arranged that whenever the ends would drop down and get out of line, the ends of the bolsters carrying the platforms, which extended back to the truck beams, could be wedged at the outer end of the platform and the car thrown back into line.

On the first car so spliced it was found that the only weak point in the construction was at the junction of the vestibule and the car body, the platform sagging and pulling the joints apart over the end door of the car. This car did not have the steel under frame extended around the ends. The steel end sill remedied this difficulty and after five years' service the spliced cars are in as good condition as when they came from the shop.

It is my belief that if we were to ask a car builder to make a 45-ft. car for us today the whole construction would be probably one-third heavier than in our spliced cars, the present tendency being to increase the weight and strength of all parts. While I approve of this heavier construction as a general proposition, I find that our spliced cars, with a well-constructed floor and the other parts light, have a considerable advantage over more modern construction because of the less power required for propulsion. This is shown by the fact that our 45-ft. open cars seating 75 and often carrying 150 people with the steps loaded, do not take any more power than one of our closed cars, because of the latter being heavier in the trucks and body.

W. S. DIMMOCK,
General Manager.

Council Bluffs, Feb. 24, 1900.

Benefit Associations.

Editor "Review": I was quite interested in the data concerning mutual benefit associations organized among the employes of street railway companies. While associations of this sort have their drawbacks, still when wisely managed and controlled by the persons in charge of the company they are, in my opinion, beneficial. Of course there are always in the service some employes who will not join, but this very fact works for good, as it creates somewhat of rivalry and urges activity and enthusiasm in behalf of the association on the part of those who are members, in the face of adverse criticism. I do not believe that there should be any compulsion exerted either actually or morally on the part of a road's management to force employes to join such an association.

It is some times the practice of railroad companies to give to their employes at Christmas time, presents of various kinds. Such sporadic generosity often fails to accomplish the object desired, but a regular system of contributing to the welfare of a company's employes, such as is afforded by the giving to a mutual benefit association, largely under the control of the men, of a regular fixed amount, directs the money and benefits so contributed into channels of usefulness and help, and makes certain that those in actual need are made the beneficiaries. One association I have in mind is not only assisted by the company's regular contribution and the

dues of the members, but once or twice a year when some specific object, either social, educational or charitable is to be compassed, it gives a benefit entertainment under the control and management of the employes themselves, with a two-fold result of increasing the amount in its treasury and at the same time giving to the members, relaxation, and a closer social relationship.

The work connected with such an association does not fall heavily upon anyone, and is far less troublesome than perhaps some street railroad managers may imagine, for once instituted upon right lines, its conduct is easy. As a manager I am heartily in favor of mutual benefit associations both on theoretical grounds and as the result of my experience with them. Yours truly,

GENERAL MANAGER.

Sleet Wheels.

Editor "Review": For the benefit of those who may be looking for a first class sleet wheel, I would suggest that after all others have failed, just pull the wheel out of the harp and slide along without the wheel until the ice has been removed from the wire. The harp makes a good scraper and does no injury to wire or hangers, if the wheel is replaced as soon as the ice is removed. Thus you have a sleet cutter that you can bring into use on short notice, which is usually all the notice we get at such times. During the last sleet storm we had here I ran our 16-mile interurban line on schedule time, 40 miles per hour, and the ice was frozen on the wire; so it was impossible to get contact through any kind of a wheel. Yours truly,

E. E. DOWNS,

Vice-Pres. and Gen. Mgr. Citizens' Traction Co.
Oshkosh, Wis., Feb. 18, 1900.

WATCH FOR PICKPOCKET GAME.

Two pickpockets, well known to the police of Detroit, Mich., were arrested in that city a short time ago while trying to ply their trade in a crowded car, after a rather novel fashion. The two men boarded the car, and soon became engaged in a dispute that grew into a hand-to-hand fight. Several passengers interfered and after separating the two combatants, instead of permitting the men to leave the car, as they evidently wished to do, held them until they could be turned over to the police. In court several detectives recognized the prisoners and made the statement that the pair have been working their game for sometime, by starting a row in a crowded car and trusting to the resulting uproar and confusion to enable them or their accomplices to busy themselves with the pocketbooks and jewelry of the passengers. The men were fined \$5 and costs, with the alternative of six months in the house of correction.

HALIFAX TRAMWAY REPORT.

The report of the Halifax (N. S.) Electric Tramway Co., Ltd., for the year ending Dec. 31, 1899, shows a net profit of \$61,799, as against \$54,749 for the previous year. The gross receipts were \$203,936, of which \$120,697 were from the railway and the remainder from the lighting and power business. Operating expenses were \$112,137, being 55 per cent of the receipts. The number of passengers carried was 2,616,231, and the car-miles run, 613,942. The receipts per passenger were 4.59 cents. During the year the boiler house and coal sheds were enlarged and a new 250-h. p. boiler and some lighting generators installed.

The officers are: David MacKeen, president; John Y. Payzant and W. B. Ross, vice-presidents; B. F. Pearson, secretary.

ICE-SKATING RINK NOT A SUCCESS.

Mr. H. C. Higgins, president and manager of the Marinette (Wis.) Gas, Electric Light & Street Railway Co., in reply to an inquiry, writes as follows:

"We have no skating rink on our lines this winter. We did run a rink for two years some years ago, but as it was a losing investment (as the brass band adjunct took all our profits), we abandoned it. We could not seem to get a crowd without a band and as the band cost us \$20 a night we could not make both ends meet."

A. S. R. A. ANNOUNCEMENTS.

The 19th annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., Oct. 16, 17, 18 and 19, 1900.

Papers will be read on the following subjects

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions."

"Construction, Operation and Maintenance of Roads that Operate 20 Cars or Less."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidation of Street Railways and Its Effect Upon the Public."

"The Store Room and Store Room Accounting."

"Painting, Repainting and Maintenance of Car Bodies."

The building contains 50,000 sq. ft. of floor space, without a post or obstruction of any kind.

Friday, October 19th, has been set apart as a day for the examination of the exhibits; no session of the association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held Friday evening, when the officers-elect will be installed.

The headquarters of the association will be at the Midland Hotel.

Rates per day at the hotels will be as follows:

	American.	European.
Midland	\$3.00 to \$6.00	\$1.00 to \$5.00
New Coates	3.00 and upwards	1.00 and upwards
Savoy	2.50 to 6.00	1.50 to 3.50
Baltimore	3.00 to 5.00	1.50 to 3.00

All of these are in close proximity to the hall.

The income from the sale of space will go to the American Street Railway Association. The executive committee of the Association has fixed the price at 10 cents per sq. ft., and ruled that no space of less than 100 sq. ft. will be assigned, but applicants may have as many multiples of this quantity as they wish, all in one body. Payment for space should be made to T. C. Penington, secretary and treasurer of the American Street Railway Association, No. 2020 State St., Chicago. Application for space should be made to W. A. Satterlee, 15th and Grand Ave., Kansas City, chairman committee on exhibits. It should be stated in the application for space, the shape desired, number of feet wide and long, and the committee on exhibits will comply with the request, if possible. Cars, sweepers, and plows will be placed outside of the building under a porch which can be closed in with canvas.

It is earnestly requested that all exhibits shall be in place and all work finished by Monday evening, October 15th, which is the evening prior to the opening of the convention. Watchmen will be in charge of the building, so that the exhibits will be safe.

All articles intended for the exhibition shall be delivered at the building by the agent or owner, and at his expense, but the local committee has made arrangements with the Kansas City Transfer Co. to haul and deliver all shipments to and from the building at low rates, if directed in its care.

All goods should be marked to yourselves. Convention Hall, Kansas City, Mo., in care of Kansas City Transfer Co., sending it the bill of lading or advice that you have shipped goods in its care, giving particulars in regard to shipment, and they will be delivered on your space in the Exhibition Hall. Ship all goods early to insure delivery in time and prepay charges.

Articles will be placed on the proper space in the hall if marked with the number of space on the boxes. The numbers of the spaces will be mailed to exhibitors in ample time for shipment.

All electrical connections for power and extra light must be made at the expense of the exhibitor. Perhaps it would be well for the exhibitors to make arrangements to have the building open in the evening, as it is well lighted, and the electrical companies expect to make a large display.

Space should be applied for by September 1st. Assignments will be made as promptly as possible and exhibitors notified of their location. Exhibits of like character will be grouped together, and space will be assigned in the order of application.

The committee on exhibits will make contracts with carpenters,

electrical workers and laborers, at regular prices, so the exhibitor will not be overcharged for lumber, labor, etc.

Railroad rates will be the same as at former conventions, one and one-third fares for the round trip.

In order to increase the membership of the Association, and make 1900 the banner year, the executive committee, at a meeting held Feb. 5, 1900, passed the following:

"Resolved, That the payment of the membership fee of \$25 be waived to any company becoming a member of the Association prior to Oct. 1, 1900, provided the annual due of \$25 to October, 1900, be paid at the time application for membership is made."

CHANGES TO BE MADE AT CHATTANOOGA.

The officials of the Chattanooga (Tenn.) Rapid Transit Co. have decided to extend the service to the top of Lookout Mountain and will build three miles of new track to connect with the incline roads now running to the summit. The company expects to arrange for a carriage service at Chickamauga Park under its own supervision, and arrangements have been made with the Southeastern Passenger Association so that tourists will be permitted to stop over at Chattanooga for one day. According to these plans, it will be possible to go to the park, drive over it for half the day, return and go up on the mountain for the remainder of the day, visiting all the places of interest and return to the city on the Rapid Transit company's line. The price of this trip will not exceed \$1.

With the completion of the three-mile line mentioned, the Chattanooga Rapid Transit Co. will own 21 miles of track. At its power station there are installed one direct connected Hamilton-Corliss engine and a 550-volt Siemens & Halske generator, and two belted generators of 215 watts capacity.

ATLANTA CONSOLIDATION.

An injunction to prevent the Trust Company of Georgia, which controls the securities of the Atlanta Railway Co. and the Atlanta Consolidated Railway Co., from consolidating the two properties was granted in November last. The petition was filed in the name of the state by a property owner who claimed he would be injured by the consolidation.

February 27th the Supreme Court of Georgia reversed the judgment, and the consolidation may now be carried out.

The court, all concurring, held:

That portion of the constitution which denies to the general assembly "power to authorize any corporation to buy shares or stock in any other corporation" is not absolute in its terms; but it was designed only to prevent the General Assembly from authorizing one corporation to purchase shares or stock in another when doing so "may have the effect, or be intended to have the effect, to defeat or lessen competition in their respective business, or to encourage monopoly."

The Trust Company of Georgia is authorized by its charter to buy stock in other corporations.

The proposed control of the two railways by the Trust company is not a lessening of competition.

After the decision became public, Mr. Woodruff, president of the Atlanta Railway & Power Co., said:

"There are about 26 miles of the Atlanta Ry. practically isolated from the Atlanta Railway & Power Co. This means two fares when passengers go from one of these lines to the other. It is a fact that 25 per cent of the passengers on the Atlanta Consolidated ask for transfers to the Atlanta Railway Co., which, of course, cannot be furnished.

"It can be seen at a glance then how the public convenience and the public purse would be subserved by proper and needed physical connections which this decision would seem to give the power of making."

The Camden (N. J.) & Suburban Railway Co. presented to the city of Camden a bill for \$3.91 for damages to one of its cars which was struck by a fire truck. The common council instructed the clerk to inform the company that the city would stand half of the expense.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

NEW STATION AT BAY CITY.

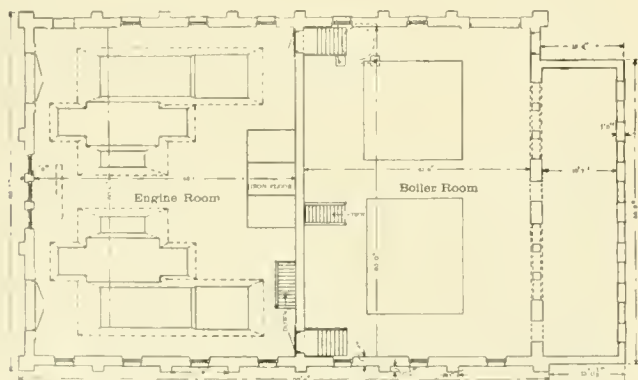
By the courtesy of Mr. E. S. Dimmock, general manager of the Bay Cities Consolidated Railway Co., of Bay City, Mich., we have received drawings showing the front elevation and the ground plan of the new power house which that company is now building, the contracts having been placed in December last. In exterior appearance and in general arrangement this station is similar to that of the Omaha & Council Bluffs Railway & Bridge Co. described in



NEW POWER STATION AT BAY CITY.

our May, 1899, issue, page 296; one marked difference, however, is that in the Bay City station mechanical draft will be used.

The plan shows the arrangement of the building, which is one story in height. The main portion is 65 ft. 7 in. wide and 96 ft. 8 in. long, these measurements being from outside to outside of pilasters. Adjoining the boiler room is a low roofed addition for coal which measures 15 ft. 4 in. by 55 ft. 5 in. outside and 13 ft. 7 in. by 52 ft. 11 in. inside. The exterior walls of the main building are 21 in. thick, with pilasters 12½ x 25 in. spaced about 12 ft. 4 in. c. to c. The exterior is to be of No. 1 hydraulic pressed brick. The interior



PLAN OF STATION.

finish in both engine and boiler rooms will be cream enamel brick.

The engine room measures 48 x 60 ft. inside and will be equipped with two tandem-compound condensing engines built by the Russell Manufacturing Co., which will be direct connected each to a Siemens & Halske generator of 550 kw. capacity. The Siegrist system of lubrication will be used. Other minor equipment includes Cochran separators, heaters and purifiers, Kelly & Jones valves and Laidlaw, Dunn & Gordon jet condensers and pumps. The Arluckle-Ryan Co., of Toledo, O., general contractor, was awarded the contract for the complete installation.

The boiler room is separated from the engine room by a 17-in. wall, and measures 41 ft. 4 in. by 60 ft. inside. The contract for boilers has been let to the Stirling Co.

The cost of the building and its equipment is estimated at \$84,000.

RELATIVE EFFICIENCY AND DESIRABILITY OF VARIOUS TYPES OF ENGINES ON CENTRAL STATION LOADS.

Abstract of a paper read before the Northwestern Electrical Association, by Prof. A. W. Richter, of the University of Wisconsin.

From the time of Savery and Newcomen, the steam engine, with a duty of but a few million foot pounds per hundred pounds of coal, has gradually advanced, until we have attained the high efficiencies of the present day. The very highest efficiencies reported are those of the Nordberg pumping engines at Wildwood, Pa., showing the remarkable duty of about 163,000,000 ft.-lb. per 1,000,000 B. t. u., and the performance of the Sibley College quadruple expansion engine with a reported consumption of less than 10 lb. of steam per i. h. p. per hour.

Such high economies have not been reached in power and lighting station engines and probably never can be, but there is no reason why, with modern appliances and with the gradual improvement in the efficiency of such appliances, results more nearly approaching these, should not be attained in station engines.

Considering the efficiencies quoted as standard, we must look upon the station engine as a very uneconomical machine; this is especially true of the street railway engines. The deficiency is due principally to the great fluctuation in load, added to the fact that the engines are usually underloaded, in order to enable them to carry the "peak" of the load.

The general improvement called for in station engines, as indeed in all other engines, is the reduction of

First: Cylinder wastes effected by

(a) The kind, size and style of engine and

(b) The introduction of the storage battery and other equalizing devices.

Second: Transmission losses from cylinder to dynamo.

Third: Losses and wastes in auxiliaries, piping, etc.

In discussing the style of engine for power and lighting purposes, time will not permit a discussion of all the details, but it is hoped that some of the principal points may be made clear. In order to meet the demands of the varying load on the engine, the work done in the engine cylinder must be varied, the changes being in all cases automatic. This is accomplished by throttling, as in the throttling engine, or by varying the range of cut-off, as in the automatic cut-off. The only advantage of the common throttling or slide valve engine is its cheapness. The workmanship is usually very poor, causing leaks and increased friction. This engine uses more steam for a given power than any other engine on the market, its consumption being about 60 lb. of steam per i. h. p. per hour; in some cases it even exceeds that amount.

The only circumstances that would make the use of this engine excusable, though probably not advisable, would be if all the exhaust steam were used for heating purposes. The great difficulty, however, is that seldom, if ever, can all the exhaust steam be utilized. Having then practically discarded the common throttling engine, we will consider for a moment the automatic cut-off, classified as to valve gear, we have the drop cut-off engines and those engines which have a positive valve gear. Considering speed as a basis, we have the high and low speed engines. We have also the condensing or non-condensing engines; the simple, compound, triple expansion engines, etc.

The principal types of the drop cut-off engines are the Corliss and some poppet valve engines. The advantages of these engines lie in the facts that the steam is admitted at a pressure almost equal to the boiler pressure. A more perfect steam distribution can be maintained for the different points of cut-off. The rapid motion of the valve at cut-off and admission causes less wire drawing at these points. All of these points result in an increased efficiency. The first cost of these engines is, however, considerable, as the valve gear is usually quite complicated. The action of the Corliss and other detachable valve gear engines limits their speed to that of slow and medium speed engines.

Passing on to the consideration of the high and slow speed engines, we find that all engines may be run direct connected. The high rotative speed permits the direct connection of engine and dynamo at less cost than the slow speed, as the reduction in speed necessitates an increase in the size of the dynamo and engine and in the amount of material used in their construction.

Increasing the speed of an engine reduces the time allowed for initial condensation, and, therefore, other things being equal, reduces the amount of steam condensed in the cylinder. On the other hand, high speed engines are usually constructed with a proportionately shorter stroke than are engines of less speed and with greater clearance and port areas, thus presenting more condensing surface to the inflowing steam. They are, consequently, more subject to internal wastes by cylinder condensation. High speed engines are more easily regulated and operate with less friction; they are, however, more subject to wear and to accidents. Accidents occurring with high speed engines are usually much more serious in results than with engines running at lower speeds. The slow speed engines are generally more economical in steam consumption, though some of the high speed engines, as the "Willans," show a remarkably good efficiency.

If it is desired to obtain the very highest engine efficiency, slow or medium speed engines should be used, while if the first cost is of prime importance, it might be advisable to use engines of high speed; but it should be remembered at all times that the cheaper engine usually increases the cost of boilers and auxiliaries. There is no reason, however, why the high speed engine should not be used for the necessary duplicates.

Condensing engines are more economical than non-condensing, because the temperature of the exhaust steam is less. As the effective steam pressure is greater for the same cut-off a smaller cylinder is required for the same power. With engines of equal power and cylinders of the same size, the steam can be cut off earlier in the cylinder of the condensing engine, consequently less steam is used per stroke, and, therefore, per horse power. The cylinder condensation and subsequent re-evaporation depends in part upon the range of temperature in the cylinder through which the steam acts. The compound engine has an advantage over the simple engine in that this range of temperature is reduced, the volume of each of its cylinders is less and the steam re-evaporated during expansion and exhaust in the first cylinder is again available for work in the next succeeding cylinder.

Compound engines are more generally used than triple expansion engines, not alone on account of first cost, but also because of the variable load; triple engines cannot attain a sufficiently greater economy to warrant their use in many cases. Of the compound engines, the tandem has an advantage in first cost, compactness and small friction. The cross compound has lighter stresses in its running parts, and has no dead center when the cranks are set at an angle of 90° .

Engines of the vertical type require less floor space and have less friction as compared to those of the horizontal type.

On several occasions the following question has been put to me by members of the electrical fraternity: "Is it advisable to place a heater in the exhaust of a condensing engine?" It seems that claims are occasionally made by unscrupulous agents that the feed water temperature can be raised to, say, 180° or 200° F. Suppose we have a pressure of 2 lb. absolute in our exhaust pipe, corresponding to a temperature of 126° F. It stands to reason that if a heater be introduced without changing the conditions, the temperature of the feed water leaving this heater must be considerably below 126° . Should the temperature of the feed water be higher, it would simply show that with the introduction of the heater sufficient resistance has been introduced to raise the temperature and pressure of the exhaust steam and consequently the back pressure on the engine. The loss occasioned by the rise in the back pressure

will, of course, be greater than the gain occasioned by the rise in the temperature of the feed water. This would be true even though the vacuum gage, which is usually connected directly to the condenser, may show no apparent change of vacuum.

With the possible exception of the rolling mill, the variation in load upon an engine is probably nowhere as great as in the electric station. This is especially true of the street railway engine, in which we have sudden changes of from a few amperes to the maximum output of the station. The lighting load offers no such great sudden changes, although here, also, the load varies considerably with different hours of the day.

Unless other means are provided, the engine must immediately respond to these variations of load; the engine must then be of a size to enable it to carry the heavy maximum load. It will at once be seen that for a greater portion of the time the station engine is an underloaded machine. This evil has been greatly mitigated by the introduction of the storage battery. In taking up the rapid fluctuations, the battery relieves the engine of this duty and makes the engine load more constant. We are told of tests in which the fluctuation of the engine load has been decreased to a remarkable degree.

In an article on "Electric Tramways with Stationary Accumulators," by Ludwig Schroder, we find that in speaking of the Remscheid Electric Tramway, he says: "The battery consists of 250 cells, having a capacity of 648 ampere-hours at a discharge rate of 216 amperes, though a current up to 420 amperes may be taken from them. Eight cars seat 16 passengers each, and there is standing room for 12 more. The current delivered to the line for factory motors and the tramway varies from 100 to 460 amperes on week days, the mean being 232 amperes; the current from the machine varies from 210 to 255 amperes. Without the factory load the current supplied to the lines varies from 0 to 375 amperes, its mean value being 135 amperes; the current from the machine varies from 115 to 150 amperes. The pressure varies from 495 to 510 volts. It has been calculated that at this station over 11 tons of coal are saved per week since the traction system was altered, but it is not only the coal consumption that must be considered. Two hundred horse power of dynamo output has been saved, and the battery that effected this saving only cost one-half as much as the machines which have been set at liberty and are now available for any further increase in the load."

In reports of the Chicago Edison Station, it appears that about 25 per cent of the peak of the load is carried by the batteries.

Many similar cases could be cited, but those given will be sufficient to illustrate the effect of the storage battery when introduced as a part of the station equipment.

The extreme fluctuations and the peak of the load being carried by the storage battery, the size of the engine can be reduced. The engine can be of a size nearly equal to the average load of the station. Its cylinder condensation could thus be reduced. As the fluctuation decreases, the triple expansion will show a greater commercial gain over the compound and simple engines. It will be possible to introduce larger units with an increased economy.

There is now and always has been a tendency toward the introduction of higher steam pressures. The time is probably not far distant when steam pressure of four or five hundred pounds will be used with a corresponding increase in the number of cylinders. All of these conditions will tend to increase the efficiency of the station, the greater the improvements, the more nearly will the efficiencies approach those of engines having perfectly constant loads, as our modern pumping engines.

With reference to friction losses it is evident that the direct connected system offers the highest efficiency. Efficiencies of 82 per cent between indicated horse power and electrical output are guaranteed and we also have reported efficiencies as high as from 84 to 85 per cent. The belting of dynamo direct to engine at times offers some advantages as it may provide better facilities for dividing the machinery into the most economical units, while the losses introduced by the belt are not very great. As the belt is flexible it responds somewhat to the sudden changes of the load, thus relieving the engine of sudden shocks. This of course is an advantage.

By placing the dynamos at different distances from the engine, several machines may be belted to the same engine pulley. The introduction of a jack or counter shaft, as was common practice in some of our older stations, causes additional and unnecessary losses. At the present time counter shafts are seldom employed. In many stations a change to a more direct method of transmitting

the work of the engine to the dynamo would show a decided financial gain even though it might be necessary to discard some of the machines in order to make such a change. With efficiencies ranging from 60 to 70 per cent as are occasionally reported, it is evident that a saving of from 15 to 20 per cent can be effected. Whether it is advisable to make changes and especially to what extent such changes should be made is a question which must be specially considered for each case.

(As an instance of what a small change may do, data of tests of a combined railway and lighting plant taken under different conditions were presented and it was shown that moving a small alternating machine formerly driven from the jack shaft to a position where it was connected to the engine pulley by a short belt reduced the commercial efficiency of the station from 3 to 5 per cent. The principal reason for this loss was that the short belt slipped at heavy loads and the generator could not carry the night load alone as it had formerly done.)

Since the efficiency of a station engine is so intimately connected with the efficiency of its auxiliaries, a few words in this connection will probably not be found out of place. It is a noted fact that auxiliaries are as a rule very wasteful in the use of steam; a steam consumption as high as several hundred pounds per h. p. hour having been observed. They are, of course, usually operated with a very much smaller steam consumption. It can be shown, however, that an electrically driven pump will, in a great many if not in all cases, show a very great improvement in efficiency. Suppose, for example, that we require 20 lb. of steam per engine i. h. p. per hour; if engine, dynamo, and motor each have an efficiency of 90 per cent we have an efficiency from engine cylinder to motor output of about 73 per cent corresponding to a steam consumption of 27.4 lb. per e. h. p. h. delivered by the motor. With a total efficiency of 60 per cent as compared to the mechanical efficiency of the ordinary steam pump, the steam consumption will be but 33 1-3 pounds per h. p. h. With an engine using 25 lb. of steam per i. h. p. per hour this amount will be increased to 41 lb., a steam consumption considerably below that of the ordinary feed pump. On the other hand the introduction of the motor will increase the first cost. Other things being equal, the more inefficient the main engine, dynamo, motor and transmitting device from motor to pump, and the greater the cost of motor as compared to the steam pump the less will be the gain occasioned by the introduction of the motor. When the exhaust from the steam pump is utilized the electrically driven pump has not so great an advantage. On the whole it would seem, however, that in many stations the electrically driven pump will show the greater commercial efficiency.

In choosing the most economical outfit for a station local conditions must largely govern, but the tendency should be in the following directions:

First: The introduction of the largest possible units in order to make the cylinder condensation, first cost per horse power, attendance, etc., a minimum.

Second: The choice of a style of engine giving as great a thermodynamic efficiency as local conditions will admit, it being borne in mind that, with the ordinary conditions, the compound condensing engine gives the greater commercial efficiency. For small units and for duplicates the vertical compound, condensing, direct connected high speed engines give excellent results. With several engines on the same circuit it would be advantageous to have all engines but one continually operated at rated capacity.

Third: The introduction of storage batteries, thus equalizing the load upon the engine. The size of the engine can be chosen more nearly equal to the average load, decreasing cylinder and other wastes. This with the introduction of higher steam pressures will make it profitable to introduce triple and quadruple expansion engines for the larger powers.

Fourth: The introduction of the direct connected system, thus reducing the transmission losses to a minimum.

Fifth: Great care should be exercised in the choice of auxiliaries since an uneconomical system of auxiliaries will often greatly reduce the efficiency of an otherwise economical plant.

The Brooklyn Rapid Transit Co., as announced in the "Review" last month, has made arrangements with the street cleaning department of Brooklyn for clearing snow from the streets, and will employ in addition to carts and trucks 50 flat trail cars, each holding 18 cu. yd. of snow.

IDE ENGINES FOR RAILWAY SERVICE.

A. L. Ide & Sons, of Springfield, Ill., are paying special attention to their 500-h. p. direct coupled four-ported compound engines, which are built after designs, drawn with the view of securing the greatest possible strength, economy and efficiency, under the heavy fluctuating loads found in street railway service. This concern is better prepared than ever before to fill contracts quickly and well, having recently made large extensions to its factory, placed electric cranes in the foundry and machine shop, built additional switches into the works, and installed a new three-wire system for lighting and independent motor work.

ELECTRICAL LABORATORIES OF THE UNIVERSITY OF ILLINOIS.

The electrical engineering laboratory of the University of Illinois is well equipped with alternating and direct current apparatus of various types and sizes, and has a large collection of the best measuring instruments.

A standardizing laboratory is equipped for accurately measuring current and electro-motive force, thus admitting at all times of ready calibration of the instruments used in the laboratory. An experimental telephone and signaling line has been erected, and several sets of receivers and transmitters have been provided for testing purposes. A high potential testing transformer, with a specially designed electrically heated oven, and other accessory apparatus, facilitate disruptive tests on insulators and insulating materials.

ENTRY OF INTERURBANS AT COLUMBUS, O.

The various interurban electric roads seeking an entry into Columbus, O., have decided to make no further attempt to come to an agreement with the Columbus Street Ry. for the use of the latter's track, but will endeavor to get an independent entrance. The interurban companies concerned are the following: Columbus, London & Springfield Ry.; the Columbus & Lancaster Traction; the Grove City & Green Lawn Street Ry.; the Columbus, New Albany & Johnstown Traction; the Columbus, Buckeye Lake & Newark Traction; the Chillicothe, Clarksburg & Columbus Ry.

The proposition from the Columbus Street Ry. asked the interurban roads to pay it 75 per cent of the receipts from local passengers and 10 per cent per annum on the cost of laying the third rail necessary to make a standard gage track.

FRANKLIN (PA.) ROAD SOLD.

The property of the Franklin Electric Street Railway Co., of Franklin, Pa., has been purchased by the Citizens' Traction Co., of Oil City, Pa., and the following officers elected: President, Daniel J. Geary; vice-president, William Hasson; secretary, F. W. Bowen; treasurer, James Hasson.

The Citizens' Traction Co. is a new corporation organized to build lines in competition with the Oil City Street Railway Co. and in addition to franchises in Oil City, has secured rights of way in Ronseville, Cornplanter Township, Siverly, Reno and other localities. Mr. John Fobes has been appointed general manager, with offices in the Blizzard Block, Oil City, and construction work will be started at once.

FROM SOUTH AFRICA.

A correspondent in Harper's Weekly writes as follows: "There is a car line propelled by sleepy mules, running from Kimberley along Dutoitspan Road to Dutoitspan, a suburb. The day I arrived in Kimberley I beheld the apparition, and stood mute. Tears—patriotic tears—gathered in my eyes; for, lo and behold! on the side of the car stood forth, in bold American letters, 'Battery to Central Park.' It was an old New York Broadway car, redolent with the perfume of Jake Sharpe—misunderstood man—and his aldermen. The world is small indeed, my masters!"

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO

NOT LIABLE FOR DRAGGING WOMAN BY SKIRT AFTER ALIGHTING.

Doyle v. Metropolitan Street Railway Co. (N. Y.), 60 N. Y. Supp., 475. Oct. 25, 1899.

According to the testimony of the plaintiff, she was a passenger on one of the cars of the defendant company, and, desiring to alight at a certain street corner, so signaled, and the car stopped. She alighted, and, after both feet were on the pavement, the car started, and dragged her along for about the width of two houses. She testified that her skirt was caught by some part of the car, how or in what manner did not appear. There was no evidence of any defect in the car. On the contrary, it appeared that the car was built in June, 1898, of the most approved form and pattern. Under these circumstances, the appellate term of the supreme court of New York holds that the judgment of the trial justice in favor of the defendant, on the ground that the plaintiff had failed to establish her case, was right, and should be affirmed, with costs.

NOT LIABLE FOR COLLISION WHERE DRIVER TRIES TO CROSS TRACKS AFTER WAITING FOR ONE CAR WITHOUT LOOKING FOR ANOTHER.

Devine v. Metropolitan Street Railway Co. (N. Y.), 60 N. Y. Supp., 520. Oct. 25, 1899.

While driving a horse and cart, the latter loaded with dirt, the plaintiff, seeing a south-bound car approaching, when he reached a double-track street railway, stopped and waited until that car had passed. Then he started on, and, too late to avoid a collision, discovered a north-bound car close at hand. The gripman on the latter car saw him stop, and continued on with his car, not seeing that he started on again until he emerged from behind the south-bound car not more than 10 or 12 feet away. Under the circumstances, says the appellate term of the supreme court of New York, in reversing a judgment which the plaintiff obtained and the general term of the city court of New York affirmed, no greater duty was imposed upon the defendant than was required of the plaintiff, and, it holds, the necessary inference was that the plaintiff failed to acquit himself of contributory fault, so that it was error to deny a dismissal of the complaint.

CHANGE OF PLANS DOES NOT RELEASE GUARANTYING COMPANY FROM LIABILITY.

Mathesius v. Brooklyn Heights Railroad Co. (U. S. C. C.), 96 Fed. Rep. 792. Oct. 4, 1899.

It is within the exercise of its legitimate powers, the United States circuit court, Eastern District of New York, holds, for a company which has employed a construction company to build a road for it to guaranty the payment of the price agreed to be paid by the construction company for appropriate plans it bought and labor necessary to make such plans effective. And while the court admits that the railway company may be at liberty to change its plan, it denies that it can do so at the expense of third persons, of whom it has engaged labor and material. So it holds that if the construction company engaged an engineer whose skill related to a system of construction adapted for the use of compressed air, the guarantying railway company would not be excused from paying for such engaged services upon the plea that it had concluded to employ an electrical plant, in the construction of which such engineer's ability would not be serviceable.

INSTRUCTIONS PERTINENT TO CASE WHERE ATTEMPT WAS MADE TO CROSS IN FRONT OF CAR.

Williamson v. Metropolitan Street Railway Co. (N. Y.), 60 N. Y. Supp., 477. Oct. 25, 1899.

Counsel for the defendant company asked the court to charge "that, if the jury find that both the plaintiff and the defendant were negligent, their verdict must be for the defendant." The court

said: "That is for the jury to decide." Again, counsel asked the court to charge "that if the jury believe that, at the time when the plaintiff started to cross in front of the defendant's car, it was evident to him that he could not pass in safety unless the motorman stopped or slackened the speed of the car, he is guilty of contributory negligence, and their verdict must be for the defendant." The court answered: "The jury has been charged as to negligence as to that point, and as to the power to stop the car." Lastly, counsel asked the court to charge "that, if the plaintiff saw the car, the negligence of the defendant cannot be predicated on an alleged failure to ring the gong." And to this the court replied: "That is for the jury to decide." The plaintiff got judgment. But that is reversed by the appellate term of the supreme court of New York. The legal propositions contained in the foregoing requests being applicable to the facts and circumstances disclosed by the testimony, and not being covered by the charge as given, the higher court holds that the defendant had a right to have them laid before the jury. As the testimony was undisputed that the plaintiff's driver saw the approach of the car, actionable negligence, the court particularly says, could not be established by proof of the fact that the motorman did not ring the gong.

COURTS CANNOT INQUIRE INTO MOTIVE OF LEGISLATIVE AND LOCAL ACTION ON FRANCHISES AND THE LEGISLATURE CAN CURE DEFECTS.

Kittinger v. Buffalo Traction Co. (N. Y.), 54 N. E. Rep. 1681. Oct. 10, 1899.

Mr. Chief Justice Parker, speaking for the court of appeals of New York, here states that, after considerable investigation of the subject, he feels warranted in saying that there is no case in any court of last resort in this country holding that the motive of legislation may be inquired into by the courts, and the legislation set aside, if, in the judgment of the court, it was induced by dishonest and corrupt motives.

The local municipal authorities, under the constitution, as supplemented by the provisions of the railroad law, it is recounted, have the power to determine upon what streets, if any, there shall be constructed a surface railroad; to which of two or more corporations, if so many applicants there be, it shall be given; the amount of the bond that may be required for the purpose of protecting the municipality against injury to the streets by their tearing up; and the many other conditions that experience has taught municipal authorities it is wise to impose in order to fully protect the public interests. In the exercise of this power the local municipal authorities are, by the constitution and the statute, clothed with sovereignty, and are, therefore, it is held, beyond the direction and control of the courts.

There is, it is further declared, no constitutional restriction upon the power of the legislature to validate and confirm consents to the construction and operation of street railroads, notwithstanding the failure to obtain the certificate required by section 59 of the railroad law. More specifically, the court holds that the legislature had the power, in the first instance, to have authorized the granting of franchises without the consent of the railroad commissioners; and that it also possessed the power by retrospective act to cure any irregularity which existed by reason of the refusal of the railroad commissioners to grant certificates.

Three members of the court dissent, maintaining that where a municipal body is charged with fraudulent use of power and collusion, and a consequent waste of municipal property, a case is presented for judicial inquiry.

NOT LIABLE TO SCHOOL BOY INJURED PLAYING WITH TRAILERS LEFT AT END OF LINE.

George v. Los Angeles Railway Co. (Cal.), 58 Pac. Rep. 819. Oct. 20, 1899.

This was an action brought to recover damages for personal injuries sustained by a boy of the age of 9 years and 6 months. The evidence disclosed that for two days preceding the accident the

company had left seven or eight small cars, commonly known as "trailers," at the end of the line on a certain street. It was the custom of the company to use the cars during the hours of time when there was the heaviest travel, and during the interval they were left at the point stated, for convenience. One of the public schools of the city was within one block of this point, and another within three blocks, and fully one-half of the pupils at these schools passed this place in going to and from these schools. On the day of the injury, a number of boys, including this one, left one of the schools at a little after three o'clock in the afternoon, and, on arriving at the cars, began to play with them by pushing them a short distance up the track, starting them down the grade, and jumping on and riding back. The only means which had been taken to hold the cars in place was to properly set the brakes on them. The employes engaged in operating the regular cars came to this point about every 15 minutes during the day. And that afternoon, a little before the accident occurred, the employe of the company in charge of the trailer cars was at the place, and made the boys leave the cars. He also set the one loose brake that he found. This boy had not been on the cars before. He was injured by being run over by the forward of two cars started down the grade, after he had jumped from the car step and tried to cross 10 or 20 feet in front of it and had his foot caught by a splinter of wood projecting from one of the cross-ties. Under these circumstances, the jury found a general verdict for the defendant, and the supreme court of California affirms an order denying the plaintiff's motion for a new trial. In passing, the court acknowledges it to be true that the right to so use the street must come from the city, and holds that the force of other instructions as to the care the company should exercise in so occupying the street was not weakened by an instruction that whether the defendant's trailer cars should have been permitted to stand on the track in the street during the hours of the day when they were not needed for carrying passengers was a question to be determined by the city authorities, and was a wholly irrelevant and immaterial question in this case.

DOES NOT THINK HOUSE INJURED BY CARS PASSING OVER SWITCH.

Starr v. North Side Traction Co. (Pa.), 44 Atl. Rep. 556. Nov. 6, 1899.

The mere appearance of some small cracks on the inside and outside of a house built with 13-inch brick walls which are not otherwise injured in any way, the supreme court of Pennsylvania does not consider would warrant taking off a compulsory nonsuit in an action brought to recover damages from a street railway company on the ground that the house was thus injured by the bumping of the cars over a switch 80 feet away.

NOT DEFENSES TO ACTION FOR INJURIES SUSTAINED BY INFIRM PASSENGER BOARDING CAR.

Post v. Hartford Street Railway Co. (Conn.), 44 Atl. Rep. 547. Nov. 7, 1899.

The plaintiff signaled a car to stop. It was night. The conductor did not see her nor her signal, but the motorman did, and stopped the car. The conductor was at the time engaged in the front part of the car. After the car had stopped a sufficient time for passengers to enter, the conductor gave the signal to start, and the car was immediately started. Up to this time the conductor, who had not left the front part of the car, had not seen the plaintiff, nor the woman who accompanied her. As a result of the start, the plaintiff was thrown to one side against the rear railing, and partly down upon the steps or platform. Immediately thereafter the conductor's attention was called to the situation. The car was at once stopped, and the ladies were assisted by him into the car. The plaintiff was at the time suffering from a spinal injury, caused by a fall upon the sidewalk nearly two years previously, and in consequence was unable to board a car without considerable difficulty and some assistance. But of this neither the motorman nor the conductor had any knowledge. The fall in attempting to board the car was one which would have meant little to a person in ordinary physical condition, but happening to the plaintiff in her then enfeebled state, it was the exciting cause for the aggravation of her spinal and nervous troubles, and resulted in an increase of pain, suffering, and disability for some considerable time.

Upon these facts, the trial court found that the defendant was guilty of negligence in starting the car in the manner above stated, that this negligence was the cause of the injury to the plaintiff for which a recovery was had in this case, and that the plaintiff was not guilty of contributory negligence. The supreme court of errors of Connecticut affirms the judgment for the plaintiff. It holds that under the circumstances it was the duty of the conductor to know, before giving the signal to start, that the plaintiff was either safely on board of the car, or so far free from the car that she could not be injured physically by putting the car in motion. He knew that the car had stopped to receive a passenger. Before he gave the signal to start, he knew the passenger had not boarded the car, and he did not know, and made no reasonable attempt to know, whether she was or was not in the act of getting on board. He thus failed, the court says, to perform a plain duty devolving upon him, and such a failure, under the circumstances disclosed, warranted a holding that the accident to the plaintiff was due to the defendant's negligence. And, in this view of the case, it holds that the fact that those in charge of the car had no notice of the plaintiff's infirmities was of no consequence. It also holds that it was no defense to her right of action against the company, if, after the accident and before trial, she obtained damages from the city for the sidewalk injury without disclosing that it had been aggravated by another injury and thereby practically recovered damages from the city for both injuries.

TO PROVE OWNERSHIP OF CAR.

Karrigan v. Ninth Avenue Railroad Co. (N. Y.), 60 N. Y. Supp. 682. Nov. 10, 1899.

One of the issues in a personal injury case being whether a certain car was owned and operated by the defendant, or the latter was legally responsible for such operation, the appellate division, first department, supreme court of New York, holds that a witness might be asked if he knew of his own knowledge that it was the car of the defendant, and that if the witness testified without having knowledge of the facts it was for this weakness to be shown upon cross-examination.

WAITING FOR TEAM TO PASS BEFORE ALIGHTING.

Hutchins v. Macomber (N. H.), 44 Atl. Rep. 602.

From the facts disclosed it appeared that the plaintiff, as she was about alighting from the rear platform of a street car, requested the conductor to wait a moment for a team to pass, which was approaching at a high rate of speed on the side of the car on which she was; and that, after it had passed, as she was putting one foot from the lower step to the ground, she was injured by the sudden starting of the car. Here, the supreme court of New Hampshire holds, was evidence from which the jury was warranted in finding that the plaintiff acted properly in waiting for the rapidly approaching team to pass, and in not exposing herself to injury by stepping in front of it; that, having requested the conductor to wait a moment for it to pass, and there being no objection on his part, she had a right to expect that he would wait a reasonable time for her to alight; and that she was in the exercise of due care in respect to the occurrence from which the injury arose. Wherefore, it maintains, a motion for a nonsuit was properly denied.

FAILURE TO RING GONG WHEN BOY STOPPED TO PICK UP PENNY DROPPED ON TRACK.

Frank v. Metropolitan Street Railway Co. (N. Y.), 60 N. Y. Supp. 616. Nov. 10, 1899.

In reversing the judgment which the plaintiff obtained in this case, the appellate division, first department, supreme court of New York, holds that if the boy, after starting to run across the track, stopped to pick up the penny which he had dropped, and as a result was injured, then no recovery could be had. Nor does it consider that it could be inferred that the gripman was negligent because he devoted his energies to the brake, and failed to ring the gong, assuming that the boy could have crossed safely but for his stopping to pick up the penny. With the boy suddenly stooping in front of the car, he could not be saved by ringing the gong, and the duty of the gripman was to give all his attention to stopping the car.

MAY MAKE CONDITIONS FOR GRANTING CONSENT.

Gaedeke v. Staten Midland Railroad Co. (N. Y.), 60 N. Y. Supp. 598. Oct. 3, 1899.

Where the power to give consent to the laying of the tracks of a street railroad in the highway is by law deposited with the highway commissioners, the appellate division, second department, of the supreme court of New York, holds that, while they may not make any unreasonable requirement a condition of granting such consent, and probably may not add other conditions where the statutes provide the conditions upon which the consent shall be granted, yet conditions which are for the benefit of the public, which are proper in character, and are not prohibited, either actually or explicitly, are properly exacted, and that in such a case it is proper to condition the giving of the consent upon an agreement of the company to issue transfers to its connecting lines.

DRIVER OF DRAG RESPONSIBLE FOR COLLISION.

Schlitz v. Nassau Electric Railroad Co. (N. Y.), 60 N. Y. Supp. 822. Nov. 21, 1899.

Where a driver of a "drag" or vehicle having seven cross seats, which was drawn by six horses, hitched in spans, knowing that cars were running upon each track at intervals of about a minute, and could have turned to the right, though his progress might thereby have been impeded, when a car came up behind and rang its bell for the vehicle to remove from the track, he was properly chargeable with negligence, the appellate division, second department, supreme court of New York, holds, in turning to the left, whether he saw a car approaching on the left track or not. It holds the driver chargeable with the knowledge that the transference of his horses and drag from one side of the street to the other would almost certainly bring him into contact with an approaching car, and, if a collision did not occur, the progress of the car would be impeded, and he would in any event infringe upon the paramount right of way which the moving car possessed.

NOT LIABLE WHERE LITTLE BOY RUNS ACROSS STREET TOO CLOSE CAR.

Hunter v. Consolidated Traction Co. (Pa.), 44 Atl. Rep. 578. Nov. 6, 1899.

The supreme court of Pennsylvania here affirms a judgment rendered for the defendant on a charge that the latter would not be liable for an injury to a little boy, who could not himself be charged with contributory negligence on account of his not being more than perhaps 6 or 7 years of age, if the jury found from the evidence that the company had not been guilty of any negligence, the boy being so close to the car when he ran across the street from the curb that it was not practicable for the motorman to stop the car in time to avoid the accident, in other words, if the jury found that the accident was unavoidable, and that the motorman did, under the circumstances, his whole duty; that immediately upon discovering the boy he did all that he reasonably could to stop the car and prevent the accident.

CARE MUST BE TAKEN TO STOP CARS AT SAFE PLACES.

Stewart v. St. Paul City Railway Co. (Minn.), 80 N. W. Rep. 854. Nov. 17, 1899.

The supreme court of Minnesota says that a street railway company is not responsible for the condition of the streets on which it operates its cars, but it is bound to exercise proper care to stop its cars for the discharge of passengers at a safe and suitable place for that purpose. Or, as the court expresses it in slightly different language in the syllabus prepared by it, while a street car company is not responsible for the condition of the streets on which it operates its cars, yet it is bound to exercise reasonable care to stop its cars for the discharge of passengers at a safe and proper place for that purpose. And, without stating just what the evidence in this case was, it holds it sufficient to justify the jury in finding that the defendant was chargeable with notice of a certain hole in the street, and was negligent in stopping its car in such close proximity to it that a passenger, in alighting in the dark, was liable to step into it.

NOT REQUIRED TO PAY FOR DEPRECIATION AND BUT REASONABLE INTEREST

Lakeside Railway Co. v. Duluth Street Railway Co. (Minn.), 80 N. W. Rep. 831. Nov. 22, 1899.

The supreme court of Minnesota says that the plaintiff built an extension to the defendant's street car line, and furnished cars for the same; and the defendant, by means of its own power house and power plant, operates such extension in connection with its own line. By the terms of the contract therefor, the plaintiff agreed to pay the actual cost of operating such extension, and of maintaining the same and keeping it in repair. Construing the contract the court holds that the plaintiff is not required to remunerate the defendant for any part of its loss caused by the depreciation of its power house, power plant, or car houses.

Taking up the further provision of the contract requiring the plaintiff to pay to the defendant "a fair proportion of the interest of the investment" of the defendant "in its power house and its equipment, and in car houses and equipment," the court holds that the plaintiff should pay a reasonable interest or income on the investment, and not the legal rate of 7 per cent per annum on the indebtedness of the defendant incurred in constructing such property, nor the rate of interest which the defendant then paid or is now paying on any such indebtedness.

METHOD OF STARTING CARS.

Dickert v. Salt Lake City Railroad Co. (Utah), 59 Pac. Rep. 95. Nov. 4, 1899.

However usual the method of a common carrier, such as a street railway company, in starting its cars, if that method is dangerous, and its use violative of the high degree of care which the carrier is required to observe regarding its passengers, and in the use of that method a passenger is injured, the carrier, the supreme court of Utah holds, is liable.

In an action for damages for personal injuries alleged to have been caused by the defendant starting one of its cars, on which the person injured was a passenger, in a reckless, careless, and negligent manner, the question for the jury, the court goes on to say, is whether or not in this particular instance the car was started in a negligent, dangerous, or improper manner; and it holds that an instruction which, in effect, charges the jury that, if the officers of the defendant, by experience, were satisfied in their own minds that the method used in starting the car was reasonably safe, the defendant would not be liable, is erroneous.

MERE RAPID APPROACH OF CARS DOES NOT CREATE LIABILITY FOR FRIGHTENING HORSE.

Marion City Railway Co. v. Buboise (Ind.), 55 N. E. Rep. 266. Nov. 23, 1899.

In a case where it thinks that it would seem almost a declaration against the right of the public to be transported by means of electric railways to hold the railway company responsible for an unfortunate accident arising from the frightening of a horse, the appellate court of Indiana holds that a street railway company cannot be held responsible for injury caused by a mere taking fright of horses at the appearance of a car approaching on the same street, and being operated in the ordinary manner, though it be approaching rapidly, where there is no reckless or wanton conduct indicating disregard of the safety of those so using the street for passage, or malicious purpose to injure them. No rights, it says, should be held to belong to such a company in this respect, except such as legitimately belong to the full enjoyment of the franchise; but the rights of others in the use of the highway must be enjoyed with such regard for the right to the concurrent use by the railway company as will not practically and unreasonably interfere with the rapid transit for which electric railways are intended and adapted. A rule prescribing the care which a street railway company should exercise for the safety of travelers in vehicles must be reasonable and practicable, having in view the purpose to be subserved and the means of accomplishing it.

STREET CARS NOT EMBRACED IN ORDINANCE RE-
QUIRING PERSONS RIDING OR DRIVING TO
CHECK UP AT CROSSINGS.

Citizens' Railway Co. v. Ford (Tex.), 53 S. W. Rep. 575. Nov. 14, 1899.

A city ordinance of Waco, entitled "Streets, Alleys and Sidewalks," provided that "on all crossings over the streets and alleys of this city from one pavement or sidewalk to another, preference shall be given to pedestrians, and it shall be the duty of any person riding or driving on any of said streets or alleys to check up or even halt, if necessary, when they approach such crossing, if persons on foot be passing thereon, so as not to obstruct, hinder or endanger such foot passengers or pedestrians on any such crossing."

In a personal injury case the question was raised, which the court of civil appeals certified to the supreme court of Texas for an answer, whether such ordinance applied to street cars operated by electricity, and required them to check up or halt, if necessary, when they approached such crossings, if persons on foot were passing, etc. The supreme court for its answer holds that street cars are not embraced in the terms of the ordinance.

After discussing at some length the ordinary signification of the words "riding" and "driving," and the effect of using them in the disjunctive form, etc., the supreme court says that the rule of construction is to ascertain the intent of the lawmaker, and, applying this rule to the language used, it thinks the motorman of a street car was not intended to be included in the phrase "any person driving." To justify the application of the ordinance to street cars, it goes on to state, it is not sufficient that the words might be construed so as to embrace motormen on street cars, but the language, as ordinarily used, must point them out as persons to be affected, with such certainty that, upon reading it, they would understand obedience to its mandates to be required of them.

ON COLLISION WITH FURNITURE WAGON AND DUTY
TO KEEP DOWN DAMAGES.

Blate v. Third Avenue Railroad Co. (N. Y.), 60 N. Y. Supp. 732. Nov. 10, 1899.

With a horse and a furniture wagon that was about 25 feet long, the plaintiff attempted to cross the street, in front of an approaching cable car, under circumstances warranting a jury finding that when he started he had reason to believe that he would be able to cross without a collision, and that, upon seeing the car, he increased his speed considerably, but that the car was not stopped, nor its speed slackened, although he was in plain sight, and that if the speed of the car had been slackened he would have succeeded in crossing without a collision, as he was able to get so nearly across that the car struck only the tailboard of his wagon. Such being the case, and in view of what it says is now established to be the reciprocal duty of a driver of a car towards one attempting to cross a street, the appellate division, first department, supreme court of New York, holds that the plaintiff was not guilty of contributory negligence as a matter of law, and that the jury was justified in concluding as a fact, not only that the plaintiff was not guilty of contributory negligence, but that the defendant failed in its duty towards him, and was guilty of negligence.

Furthermore, in affirming a judgment for the plaintiff, the court holds that while the rule is not doubtful that the party who claims to have suffered damage by the wrongful act of another is bound to use reasonable and proper efforts to make the damage as small as practicable, and is not entitled to recover for any damage which, by the use of such efforts, might have been avoided, yet a jury cannot say that he should or should not have taken the advice of any particular physician, nor that he should have obtained any particular kind of treatment. As to that he must himself be the judge. The jury is concerned simply with the affairs presented to it at the trial, and whether the damages then appearing to exist are the natural and probable results of the injuries, diminished by the efforts for a cure which a reasonably prudent man would have made. If the damages have not been kept down by means that a reasonably prudent man would have used, the jury must take that into account in reaching its verdict.

TROLLEY OFF AND ANOTHER CAR FOLLOWING.

Blanchette v. Holyoke Street Railway Co. (Mass.), 55 N. E. Rep. 481. Dec. 16, 1899.

The evidence in this case was such as to warrant a finding that the plaintiff, while a passenger on an open electric car of the defendant company, was thrown from the car by reason of its coming into collision with the rear end of another car of the company's. Damages were assessed in the sum of \$5,000.

On the trial the following instruction was asked: "The proximate cause of the collision or contact of the two cars was the throwing off by a passenger of the trolley of the first car, and the plaintiff cannot recover because of any injury to her as the result of the collision." This, the supreme judicial court of Massachusetts holds, was rightly refused, because the plaintiff's case rested entirely upon evidence of negligence on the part of the conductor after the trolley came off, and this negligence was nearer to the accident in point of time, and more closely connected with it as a cause, than the throwing off of the trolley, however or by whatever person it was thrown off.

The tracks of the railway ran through woods, on a down grade, with frequent curves. The curve just before the place of the accident was of such a kind that the motorman of the second car could see only about 150 feet ahead. A light rain had fallen, and the tracks were slippery, so that the brakes would not hold well. The second car left two minutes after the first. All this was known to the conductor of the first car, and yet, when the trolley came off, instead of letting his car go by its own momentum down the grade, he signaled to stop it, and when it stopped after going some distance, instead of giving warning to the other car which was approaching from behind, he proceeded to get on the top of the car to adjust the trolley; and the collision occurred. Evidence to this effect, the court holds, would warrant a finding of negligence on the part of the conductor.

Then, the defendant offered to show that it was not customary for the motorman to leave his post at the front of the car, and go back to give warning to any approaching car of the position of the car which is ahead, or for the conductor to give him any such directions. The evidence, the court holds, was rigidly excluded. It says that if the offer was to show the defendant's own custom in answer to a charge of negligence, the evidence was plainly incompetent. If it was to show a general custom on electric railways, the offer was to prove a negative, and it related to other railways as they were constructed, while it did not appear that there was any other electric railway situated as this one was, or that a trolley car came off on another railway in such a place. The situation was so unlike that of electric railways generally, that the absence of a custom on such railways to do that which ought to have been done at the place and under the circumstances of this accident was of no significance.

STATES CASE FOR PASSENGER ON FOOTBOARD IN-
JURED BY FIXED STRUCTURE.

West Chicago Street Railway Co. v. Marks (Ill.), 55 N. E. Rep. 67. Oct. 25, 1899.

A cause of action, the supreme court of Illinois holds, is stated by a declaration alleging that the plaintiff became a passenger on the defendant's cars, and the latter did not use proper care to see that the former should be carried safely; that it negligently ran its cars so near to a fixed structure that there was not room enough, unless standing very close to the car, when riding on the footboard, to be carried in safety; and that the plaintiff did not know of the fixed structure, and was not warned of it by the defendant, and, while using due care and caution for his own safety, was unavoidably struck and injured.

The Great Falls (Mont.) Street Railway Co. has refused to accept a franchise for an extension to its line, for the reason that the ordinance contains a clause making the franchise non-transferable.

A resolution has been introduced in the city council of St. Louis providing for a maximum fare of 3 cents to be collected from every passenger over 12 years old, and of 1 cent for every passenger under 12 years of age, who enters a car after every seat is occupied.

A TALE OF WOE.

One of the hardest rain storms experienced in the East in years swept across Massachusetts last month causing streams to overflow their banks, washing away dams and doing great damage to land and buildings. Reports from several street railway companies state that they suffered considerable destruction of property and in a number of places traffic had to be entirely abandoned for several hours.

At noon on February 13th cars on the Northampton Street Ry. were stalled by water flooding the tracks near the Williston Mills and at 1 o'clock the Northampton & Amherst Street Railway Co. had to abandon cars between Hadley and Amherst, as the rails were several inches under water. At Woodlawn a dam gave way, washing out a section of the line of the Holyoke Street Railway Co. In a short time afterward, however, the company had cars running in both directions from this point and passengers were transferred around the break. The dam which gave way was formed chiefly by an embankment about 15 ft. in height and 25 ft. or 30 ft. wide, on the top of which were the roadway and the street railway tracks. The cut was deep, and it took several days to replace the roadbed in its former condition.

The cars entering Orange, Franklin County, could not get into the square at the center of the town owing to the high water, and people living at the east end of the village had to walk around the outskirts to arrive at their homes.

The storm was particularly disastrous to the Greenfield & Turner's Falls Street Railway Co., and for a time its power station at Miller's Falls was threatened with destruction. As it was, cakes of ice carried away the wooden gate house and clogged the water wheels, causing a damage of about \$400. The company fortunately has a reserve steam plant, which enabled it to keep cars running through the storm. The Palmer & Monson Street Ry., the lines in the vicinity of Springfield, and all the roads along the valley of the Connecticut River, report washouts and damages to property amounting to several thousands of dollars.

From other sections of the country also come tales of disasters due to rains and snow. At Allegheny, Pa., one day last month, 20 passengers on a car of the Troy Hill line of the United Traction Co., of Pittsburg, had a narrow escape from being buried under a landslide caused by excessive moisture. The Troy Hill road is cut out of a hillside for a distance of about a mile. Part of this cut is held in place by retaining walls, some of them nearly 25 ft. high, but at other places there is no wall, and it was at one of the latter, near Prospect St., that the landslide occurred. The motorman of a car, while approaching the point, noticed that the recent rains and thaw had loosened the earth all along the hillside, but paid no special heed until he saw a great mass of earth suddenly break loose and start down the hill a few feet ahead of his car. Knowing he could not stop in time to escape being struck, he turned the current on full and succeeded in running from under the greater part of the stone and dirt. One edge of the slide struck the rear platform, but did no serious injury. The pile of earth completely covered the tracks and stopped all travel for some time.

Freshets near the headwaters of the Mohawk and Hudson Rivers caused those streams to rise and overflow their banks in several places. All the streets near the river at Albany were flooded and the United Traction Co. was compelled to resort to horses to keep cars moving on some of its lines.

The Stillwater branch, operated by the Twin City Rapid Transit Co., of Minneapolis, Minn., was tied up for a day by a recent snow fall. One of the heavy plows from the St. Paul-Minneapolis interurban line had to be sent over the branch to clear the tracks so that traffic could be resumed.

At Kansas City, Mo., the Metropolitan Street Railway Co. had a hard fight with snow and sleet early in February. It took five loads of salt, 70 wagon-loads of sand, a number of sleet cutting trolley wheels, all the snow sweepers on the system, and a large force of extra men to keep the road open.

A snow storm on February 22d compelled the street railway at Lacomia, N. H., to suspend operations for the day.

On the morning of February 26th there were serious blockades on nearly all of the Cleveland lines, but the lines were cleared before noon. The trouble was due to ice which in some places formed to a depth of several inches over stretches of track from 50 to 200 ft. long.

The storm of February 27th was very severe at St. Louis. Mr. W. C. Jenkins, of the St. Louis & Suburban Ry., writes us that the tracks of that system were covered with two inches of solid ice (not snow) and that there was an inch of ice on the trolley wires. The storm, with its after effect, meant 60 hours' continuous work, with but little sleep, for the men. The following comment from one of the St. Louis papers shows how well the work was done: "The Suburban Street Railway Co. is entitled to credit for the manner in which it did not let the blizzard shut it up. Any line can run in fine weather, but it takes forethought and management to face emergencies like the present." In appreciation of the manner in which the men fought the storm, Gen. Mgr. T. M. Jenkins issued the following bulletin: "For your faithful, manly and persistent work during the recent storm, which not only kept our lines from closing, but enabled us to operate cars of the Suburban lines proper, on almost perfect schedule time, a 10 per cent increase in the pay roll for the last half of February will be given you." This applied to all in the company's service, and included the men in shops, power houses, car houses, and on the cars.

The St. Louis Transit Co. fared even worse than the Suburban company, and was forced to entirely abandon one or two of its divisions for several hours. The chief source of trouble was the sleet and ice on the trolley wire, this being heavy enough in one or two instances to tear down the overhead work. The only way some of the lines were kept open was by placing a man on the top of each car to break the ice on the wires as they went along. Considerable delay was also caused by broken limbs of trees falling upon the track.

At East St. Louis, Ill., the East St. Louis Electric Ry. was greatly hampered by ice on the rails and during the night the wires on the Denverside division gave way under the weight of sleet, and cars were unable to operate until nearly noon the next day.

The fall of snow at Chicago during the storm of February 27th was the heaviest that has occurred since the Weather Bureau has kept records; it amounted to 11.4 in., the heaviest snow previously recorded being 11.2 in. The street railways by hard work succeeded in keeping all of the main lines open and traffic was delayed less than on some of the steam suburban roads where delays of from one to two hours were the rule on the morning of the 28th. This storm proved the Waterloo of many of the automobiles.

March 5th the street railway traffic in Milwaukee was badly demoralized by a blizzard. A car on the Milwaukee-Racine line was snowbound all day, and the 11 passengers on board had nothing to eat except the lunches of the train crew, which the latter divided with them.

This same storm reached Chicago later in the day; snow and sleet fell in the afternoon and evening, changing to rain at midnight. By the next morning the temperature had again fallen and another storm was predicted. On the evening of the 5th all the transportation lines in Chicago suffered.

At 8:15 p. m. the South Side Elevated was blocked by slippery rails at the incline at 16th St. and traffic interrupted for over three hours. About the same time the trains of the Lake Street Elevated struck ice on the Wabash Ave. side of the Union Loop, and they were not able to move until after 10 o'clock. The Metropolitan Elevated lines were stopped near Canal St., by the sleet on the rails, at 8:25 p. m., and were unable to move a train across the river for several hours.

The electric surface lines were able to give only a very irregular service, the trouble being ice on the wires and rails.

CHARGED WITH DEPRECIATING STOCK.

The special grand jury that has been investigating the circulation of false rumors resulting in the recent serious depreciation of Brooklyn Rapid Transit stock, has placed six men under indictment, and five of them have been arrested. The men taken into custody are Alfred R. Goslin, president of the Security Investment Co., 29 Broadway; H. J. Alexander, advertising agent, 11 Broadway; Eugene L. Packer, broker, 29 Broadway; Chas. Thomas Davis, editor of the Wall Street Review; and W. T. Allen, all of New York City.

THE THIRD AVENUE RAILROAD IN THE HANDS OF A RECEIVER.

The public press in all parts of the country has of late been teeming with statements regarding the financial condition of the Third Avenue Railroad Co. as though it were a matter of national interest as indeed it is a matter of universal commercial interest. The reports regarding the condition of the company include rumors of mismanagement and in some cases charges of fraud against the managing officials. The cause of the trouble, however, seems to be rather a mistake in judgment on the part of some of the largest stockholders, who were also the highest officials, they being unwilling to have the extra \$40,000,000 stock issued, that was authorized in July last and designed to pay for the extensive improvements that have been going on for a year or more. This unwillingness arose doubtless from a desire to retain a controlling position in the affairs of the company. The Third Avenue system of street railways includes the old Third Avenue lines proper, the main trunk line of which is on Third Ave. with the 125th St. cross town line and the 10th Ave. line, all of which was formerly operated by cable. The system also includes the Forty-second Street, Manhattanville & St. Nicholas Avenue Ry. Co., Dry Dock, East Broadway & Battery Railroad Co. and the Union Railway Co., the latter lines of which operate north of the Harlem River and include the street railway system of Yonkers. The improvements mentioned above include the change of the Third Avenue system proper from cable to underground electric traction, and the changing of the Forty-second Street system from horse to the underground electric system.

The work on the cable line was nearly completed, there being only about one mile at the upper end of Tenth Ave. that was about half finished, and the remaining work on the Forty-second Street system could have been finished in about three months. The cars on the Third Avenue lines proper and some of the cars on the Forty-second Street line have been operated by electric power for sometime, although there has been great delay in getting the cars and equipment, so that the returns from operation are just beginning to pick up and show such a gratifying increase in traffic as to justify the decision of the company in making the change from cable to electricity. Power for operating cars is derived from temporary stations that have been installed in or near the three cable power houses, but the main power house which is located near Kingsbridge and from which the entire system is to be operated is not yet completed, the foundations only being in. The cost of reconstruction has doubtless been excessively high as charged, but the conditions have been correspondingly severe. It was necessary to keep the lines running during the construction period and this required the installation of temporary tracks over the whole reconstructed portion. This with the higher price of material has helped to load the road with a debt out of proportion to the present earning power of the system. It is still a good property, however, the new construction being as good as the state of the art could provide, and the company will doubtless soon recover under the receiver's management.

The flurry in the price of securities began in December and the stock declined till it reached the selling price of $45\frac{1}{4}$, having fallen in one year from 230.

On February 28th, Judge Lacombe in the United States Circuit Court appointed ex-Mayor Hugh J. Grant as temporary receiver, the application being made by representatives of the Old Colony Trust Co. of Boston. The time of temporary receivership was made for two weeks and will terminate on the 14th of March, when Mr. Grant will doubtless be made permanent receiver. For some weeks before the receiver was appointed, efforts were made to reorganize the property. A banker's syndicate was proposed and also a stockholder's company that should lease the property, but the necessary sum for completing either of these arrangements, \$8,000,000 in cash, was not forthcoming. Soon after the appointment of the receiver, the principal officers resigned from the Third Avenue company and from the allied roads, Mr. A. J. Elias, president, and Mr. Henry Hart, vice-president, leaving their positions. Mr. J. Beaver was retained as treasurer of the Third Avenue system by the receiver and Mr. J. H. Robertson was continued as superintendent. Mr. Beaver was also made president of the Forty-second Street system and Mr. J. W. Lynch, former superintendent, president of the Dry Dock & East Broadway.

The receiver will doubtless issue receiver's certificates to pay off

the mechanic's liens that have been recently entered against the property and which will be a prior lien to the \$5,000,000 first mortgage bonds of the company, which have also fallen from 125 to 117.

Among the names of firms familiar in the street railway field that have filed mechanic's liens against the Third Avenue and also some of the controlled lines are: Noughton & Co., railway contractors, for machinery and services, the two liens amounting to \$2,879,691; the John A. Roebling's Sons Co., \$291,178 for materials; the Westinghouse Electric & Manufacturing Co., \$507,861 for electrical appliances and machinery; Westinghouse, Church, Kerr & Co., of New York, \$622,416 for engines, electrical appliances, etc.; Isaac A. Hopper, \$1,332,809 material and labor; John P. Kane Co., \$109,242 for cement, brick, and broken stone; the Lorain Steel Co., Loraine, O., \$548,205 for girder rails; Haskins & Coffin, \$2,800 for coal conveying machinery; the National Conduit & Cable Co., two liens, one of \$144,389 and the other \$83,234; the Pennsylvania Iron Works Co., \$48,732; the St. Louis Car Co., \$114,048 balance due for cars and trucks furnished; James Curren Manufacturing Co., \$9,581; the New Haven Car Register Co., \$6,048; the United Building & Machinery Co., \$65,813. It is said that some of these liens are duplicated, that is, that some of the larger companies have filed liens to include their obligations to some of the smaller ones, while the smaller ones have not neglected their interest but have filed their independent claims. The first lien was that of the National Conduit & Cable Co., filed February 23d.

Whatever may be said in regard to the financial affairs of the road, no word of complaint has been heard against the operating department, and the work of Superintendent Robertson in keeping the cars running during the period of reconstruction and the general supervision that he has been required to have over the new designs and plans challenge the admiration of all who understand street railway management. In company with the consulting engineer, Dr. Louis Dumeau, he has designed the cars and the mechanical features of the street construction. As an evidence of the economical management of the operating affairs, one has but to refer to the last annual report of the Railroad Commissioners of the State of New York and compare the published results with that of some of the neighboring systems. The Brooklyn Heights system reports the cost of operation at 12.94 cents per car-mile, and the total expenses per car-mile, including fixed charges are 20.40 cents. The Metropolitan Street Railway Co. reports cost of operation 15.09 cents per car-mile and total expenses including fixed charges 25.86 cents, while the report of the Third Avenue system shows 10.74 cents for operating and 13.88 cents total.

The last annual report of the company, up to Sept. 30, 1899, shows the securities and indebtedness of the company as follows: Capital stock, \$12,000,000; funded debt, \$5,000,000; net floating debt, \$12,866,215.

Construction work on the Phoenixville (Pa.) & Bridgeport Electric Ry. will be commenced at once. This will make a complete electric line from Philadelphia to Spring City.

It is reported that on a number of interurban electric lines in Connecticut, including the third-rail section of the New York, New Haven & Hartford R. R., a sweeping reduction in fares will be made in the early summer.

For the six months ending Dec. 31, 1899, the Union Traction Co., of Anderson, Ind., reports gross earnings of \$222,895; operating expenses, including taxes, \$112,640; net earnings, \$110,255; other income, \$20,439; total, \$130,694; interest on bonds, \$109,820; surplus, \$20,874.

Suit has been brought against the Toledo (O.) Traction Co. by the city of Toledo, to recover 1 per cent of the gross receipts of the road since March, 1889. In that month a franchise was granted that has since been acquired by the Toledo Traction Co. and it is on a clause of this franchise that the suit is based.

H. D. Laughlin has bought the patents on the Moore street railway truck from C. E. Moore and W. H. Carter and will organize a company to make these trucks, using the plant of the American Brake Beam Co. It is rumored that Mr. Carter will be connected with the new company. These trucks, several hundred of which are used on the Chicago City Ry., were described in our issue of March, 1899, page 178.

INSULATING FORMS FOR THIRD RAIL INSULATORS, RHEOSTAT BLOCKS, ETC.

The illustrations herewith show forms of insulators for various special purposes which are made of reconstructed granite, a material that is a good insulator and is strong both in tension and compression. This material is a high grade of Maine granite, which in the process of manufacture, is pulverized, mixed with a binding clay, molded into the desired form and vitrified in kilns at a high temperature. The material undergoes important chemical changes, so that the product when put upon the market has such insulating qualities that the designs for third rail work have stood up under test made at Niagara Falls to a voltage of 56,000 even after being soaked in water. The product is not only fireproof, but is not injured or affected by heating to a high temperature and then suddenly cooling. Neither is it affected by the lowest temperature that can be produced by liquid air. It resists acids and alkalis, does not contain or absorb moisture, and has a crushing strength of

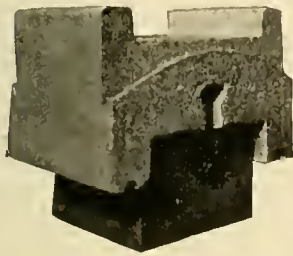


FIG. 1.



FIG. 2.

14,565 lb. and a tensile strength of from 680 to 700 lb. per sq. in. The material is not only adopted for third-rail insulation, but is now being employed for a general line of insulators for electric railway purposes.

Fig. 2 illustrates a three-channel rheostat block. These are made in three or six channel sizes or in any desired size. The material is specially valuable for rheostat and controller blocks, as it will not receive or hold an electrolytic deposit of copper upon its surface, a feature that causes short circuits with some other materials. It is also a good arc blow-out, and is designed as an arc arrester for street car controllers. Reconstructed granite can be as readily molded into switch bases, lamp sockets or other form of insulating blocks as well as porcelain material. These blocks have been employed on a number of elevated railways for insulating the third rails, and have sustained all the claims made for them. For this use the style shown in Fig. 1 is mounted on a wooden block and attached by means of strips of metal or fibre, as in the illustration; each wooden block is provided with a lag screw by means of which the device is firmly attached to the end of the tie.

The works of the Reconstructed Granite Co. are located at Norristown, Pa., where they occupy large buildings with an area of seven acres of ground. The New York office is at 17 Dey St., and is under the management of Mr. W. Courtenay, president of the company, who will gladly furnish information desired.

TRANSFER SUIT AT DETROIT.

Detroit has another street railway suit in the Federal courts. In January the city council passed an ordinance to compel the Detroit Electric Railway Co. (the 3-cent line) to issue transfers on transfers, the old ordinance of the company only calling for transfers on tickets. The company claimed that this was a reduction in the rates of fare and on March 1st secured an injunction from Judge Swan, of the United States District Court, restraining the city from enforcing the ordinance. The court announced that it would hear arguments on the permanency of the injunction March 14th.

The city council instructed Corporation Counsel Flowers to appear for the city and defend its interests, but that official politely stated that the city had no legal right to reduce the rates of fare and that he did not care to father a losing case. The council will, therefore, have to employ outside counsel.

NEW CARS FOR SOUTH SIDE ELEVATED.

The South Side Elevated Railway Co., of Chicago, has let contracts for the construction of 50 new elevated railway cars, which, when finished, will represent the highest development of the car builder's art.

The order for the coaches was secured by the Jewett Car Co., of Newark, O., through its Chicago representatives, Hanna & Gray, Marquette Building, Chicago. The general dimensions will be: Length over platforms, 46 ft. 5¾ in.; length over sills, 39 ft. 4 in.; height of platform above rail, 3 ft. 6 in.; weight complete without motors, but including trucks, 50,000 lb.

The car bodies are to be finished throughout in mahogany with plate glass windows, Pantasote curtains on fixtures furnished by the Curtain Supply Co. They will have spring seats and backs, covered with rattan. They will be mounted on Peckham "L" special trucks, fitted with Christensen air brakes and Van Dorn couplers. A separate cab is to be provided for the motormen, as on the cars now running over the road.

The platform gates will be different from those now in use. They will be worked by means of a lever as at present, but will extend from the platform floor clear to the hood of the car, making, when closed, practically a vestibuled train. This departure was made primarily to prevent passengers from catching on to the gates after the train has started.

EXPERT INVESTIGATION AT CLEVELAND.

Both the Cleveland Electric Railway Co. and the Cleveland City Railway Co. have applied for extensions to their present franchises which expire within the next four or eight years, the exact date being in dispute. The city appointed a franchise commission to handle the question of compensation, fares, etc., and after holding several sessions, this commission decided to make a thorough investigation of the books of the Cleveland City Railway Co. for the purpose of determining six points regarding the company's affairs, i. e., the amount of capital stock, the total investment, the gross receipts, the cost of carrying passengers and the probable increase of business in the next 25 years. The officers of the City railway promptly notified the commission that any responsible experts who should be appointed would have free access to the company's books, and they would be aided in every way to arrive at the true state of affairs. In accordance with this, the city council, on February 26th, passed a resolution appropriating \$2,000 to defray the expense of employing experts to make the examination, and the commission has appointed to do the work John W. Langley, of Case School of Applied Science, of Cleveland, and Richard Tregaskis, a prominent street railway accounting authority of Detroit. It is expected the report of the experts will be ready in about a month.

SIGNAL LAW PROPOSED IN OHIO.

In addition to the bills pending in the Ohio Legislature that were mentioned last month, page 71, there is one amending the existing law relating to the authority of county and city officials to compel electric and steam railroads to place danger signals at crossings. The bill defines what shall constitute a dangerous crossing, and provides that all such shall be so regarded where the road is on a level with the railroad crossing it. The measure attaches a very heavy penalty for the failure of the railroad company to comply with the order to erect some modern danger signal or provide gates, within the time prescribed by city councils or boards of county commissioners, after proper notification of the action of the authorities shall have been given requiring them to do so. For failure to comply with the law in this respect the company subjects itself to a penalty of \$500, with an additional \$10 for each day thereafter while the neglect continues.

Mail cars will be put on the Exeter (N. H.), Hampton & Amesbury Street Ry. between Exeter and Amesbury, Mass.

The Worcester (Mass.) & Marlboro Street Railway Co. has been granted the right to carry baggage on its regular cars to and from Worcester.

HALF FARES.

Denver, Col., is to have a street railway mail collecting and distributing system.

Telephones will be placed in all the elevated stations of the Brooklyn Rapid Transit Co.

The Louisville (Ky.) Railway Co. paid its taxes for 1900 with a check for \$70,125.22.

A new electric railway between Elyria and North Amherst, O., has been opened to traffic.

Press reports state that the women of Ortonville, Mich., have raised \$600 for a new electric road.

Construction work is about completed on the Caseyville, Collinsville & East St. Louis (Ill.) Electric Ry.

Over 150 new open summer cars are being built by the Union Traction Co., of Philadelphia, at its own shops.

A second unsuccessful attempt to wreck a car at Columbus, O., by placing a large stone on the track was made recently.

The Metropolitan Elevated Railroad Co., of Chicago, has declared a dividend of 2½ per cent on the preferred stock.

The Tri-City Railway Co., of Davenport, Ia., has voluntarily increased wages of motormen and conductors, 10 per cent.

The Montreal (Can.) Street Railway Co. has asked the city council for permission to place all of its feed wires under ground.

Twenty carloads of structural iron for the northern terminus of the Northwestern Elevated of Chicago have arrived from the mills.

The Echo Mountain House, at the head of the long inclines of the Mount Lowe Ry., up Mount Lowe, Cal., was destroyed by fire last month.

The City & Suburban Railway Co., of Portland, Ore., is installing a new 400-h. p. corliss engine, which will enable it to increase its service one-third.

The strike of members of the Building Trades' Union in Chicago has resulted in a number of fights in street cars between non-union men and union pickets.

The Lakeside Street Ry., until recently operated by the Duluth (Minn.) Street Railway Co., has been purchased by Thomas Lowry, of Minneapolis.

The Wilmington (Del.) & Chester Traction Co. has decided to adopt a 12-hour swing system, with wages at \$1.90 for the 12 hours, an increase of 6 per cent.

A half-hourly all-night service has been instituted by the Capital Traction Co., of Washington, D. C. This is the first time the capital city has had owl cars.

The Metropolitan Street Railway Co., of New York, reports for the last quarter of 1899 \$3,565,682 gross; increase, \$472,926, and \$1,807,661 net; increase, \$182,485.

The Board of Railroad Commissioners of New York has given the United Traction Co., of Albany, authority to increase its capital stock from \$4,000,000 to \$5,000,000.

In the counties of Queens and Nassau, New York, street railways may not be built in macadamized public highways without a majority vote of the town electors, and a bill has been recently introduced

in the Legislature to except incorporated villages in Nassau County from this act.

The Union Traction Co., of Philadelphia, has let the contract for the building of a new car barn at West Philadelphia, to F. T. Maguire, of that city. The contract price is \$20,000.

The summer pavilion at Wenona Beach, owned by the Saginaw (Mich.) Consolidated Street Railway Co., was totally destroyed by fire recently, causing a loss of \$16,000.

The colored people of Savannah, Ga., have petitioned the Savannah, Thunderbolt & Isle of Hope Street Railway Co. to provide a pleasure park, exclusively for their race.

The Syracuse (N. Y.) Rapid Transit Co. is having considerable trouble with counterfeit silver pieces which are being passed on the conductors in unusually large quantities.

The Washington (D. C.) Traction & Electric Co. has removed its offices from the old location at East Capitol and 15th Sts. to the Loan & Trust Building, at 9th and F Sts. N. E.

The Union Traction Co., of Philadelphia, contributed \$2,500 to the Republican National Convention fund for defraying the expenses of the convention to be held in that city.

A serious personal conflict recently arose between a Milwaukee street railway conductor and a passenger over the time of day, the question having reference to the validity of a 4-cent ticket.

The Cleveland, Painesville & Eastern Electric Railroad Co. does not permit its motormen to make use of the electric brakes on its cars within the city limits, except in cases of emergency.

The common council of Montreal has passed a resolution compelling the Montreal Street Railway Co. to operate cars on a two-minute instead of a five-minute headway during business hours.

It is announced that the Seattle (Wash.) Electric Co., owning four out of the six street railway systems in the city, will spend \$2,000,000 in improvements and extensions during the next two years.

An attraction at Idora Park, Youngstown, O., next summer, will be an aerial railway from which are suspended small carriages controlled and propelled by one person, after the fashion of a bicycle.

We are indebted to Mr. T. J. Nicholl, general manager of the Rochester (N. Y.) & Sodus Bay R. R., for a number of fine half-tone engravings from photographs of places of interest along the route.

Several suits, growing out of the combination of the street railway properties forming the Cleveland City Ry., are being tried. The disagreement arises over the transference of various blocks of the stock.

The Chicago City Railway Co., on a number of its line, is putting an extra man on each car during rush hours, whose only duty is to prevent boys from jumping on to the platforms and buying and selling transfers.

An electric railway from Rochester, N. Y., to Canandaigua, with a branch from Pittsford to Fairport, is said to be a probability of the not distant future. John Winter and A. L. Parker, of Detroit, are known to be interested.

Early in the spring the Chattanooga (Tenn.) Rapid Transit Co. will commence putting the park at McFarland Lake in shape. The lake, it is understood, will be enlarged, and swings, pavilions, etc., will be placed on the grounds.

An increase of 5 per cent in wages of motormen and conductors went into effect March 1st on the lines of the Wilmington (Del.) &

Chester Traction Co. This will make a difference of 10 cents a day on a 12-hour run, bringing the wages of the men from \$12.60 to \$13.30 for seven days' work.

Water power controlled by the city of Marquette, Mich., will probably be rented for operating in future the cars of the Marquette City & Presque Isle Railway Co. This company will retain its present steam plant for use in case of emergency.

The Columbus (O.) Street Railway Co. has asked for a 25-year extension of one of its important franchises which expires this year, and also for permission to connect its old lines with the newly acquired lines of the Columbus Central Railway Co.

The Worcester (Mass.) & Suburban Street Railroad Co. will sell all its old summer cars, and has ordered 24 new ones. These will be of the combination open and closed California type, with all the latest appliances for the safety and comfort of passengers.

The Omaha (Neb.), Council Bluffs & Suburban Railway Co. has arranged for a bond issue of \$600,000; dated Jan. 1, 1900, due in 20 years, but redeemable Jan. 1, 1906; interest, 5 per cent per annum; trustee of mortgage, Royal Trust Co., of Chicago.

Atlanta, Ga., is to be one terminal of a new 45-mile interurban road. The line will run to Douglasville, Ga., traversing a portion of the country made famous by Sherman's march to the sea. At Austell, Ga., a park of several hundred acres will be developed.

To protect the smaller animals and birds in the Cincinnati Zoo from rats and cats, two moderately heavy copper wires are stretched around the cages and at night current from the electric light wires is turned on. Hardly a night passes that a rat is not killed in this way.

The Twin City Rapid Transit Co. is engaged in repairing 30 of its old cars that have been out of use for some years and in completing 20 double truck cars that were commenced last summer and on which work was suspended because of the difficulty in securing steel.

The mayor of Little Rock, Ark., has officially notified the officers of the Little Rock Traction & Electric Co. that unless immediate steps are taken to improve and repair the plant, rolling stock and track, he will proceed at once to have its charter revoked and declared void.

The final arguments in the suit brought by the Peoria (Ill.) Water Co. against the street railway companies of Peoria, for damages to water mains by electrolysis, have been submitted before Frank L. Wean, special master in chancery. A report is expected at an early date.

A total of 1,961,400 passengers were carried by the South Side Elevated R. R., of Chicago, for the month of February, last, or an average of 70,050 a day. This is a gain of 16 per cent over the corresponding month of 1899, which was itself a gain of 14½ per cent over February, 1898.

The contract for a power house at Elsmere, Del., has been let by the Wilmington (Del.) & Brandywine Springs Railway Co. to William H. Greenwalt & Son, of Wilmington, who are to erect the building for \$5,000. Three boilers, three engines and three generators, for which contracts have been signed, will be installed.

Owing to the urgent demand made by the local liquor dealers of Adrian, Mich., for a rigid observance of the Sunday laws, the street railway company and all the hack lines in the city suspended operation on Sunday, February 18th. It is believed the liquor men are trying to get square for recent interference in their business.

The presidents of the New Orleans & Carrollton Railway Co. and the New Orleans Traction Co. have each been fined \$10 for violation of a city ordinance, requiring street railway companies to

put their feed wires underground. In each case an appeal bond was taken and the validity of the law will be fought in the higher courts.

The Brooklyn Rapid Transit Co. in accordance with a recent decision of the courts has put into effect an optional transfer arrangement between the surface lines and the elevated roads, instead of the system requiring passengers on the outlying branches to change to the elevated line in order to reach the heart of the city.

President Lowry, of the Twin City Rapid Transit Co., of Minneapolis, in his annual report for the year ending Dec. 31, 1899, states: "The surplus earnings for the year were \$737,578, an increase of 49 per cent, after paying quarterly regular dividends on preferred stock. The surplus for common stock was \$550,025 on August 15th.

The South Bend (Ind.) Power Co. has been incorporated to build a dam across the St. Joseph River at Bertrand, four miles north of Niles, Mich. Power will be generated at this point for operating an electric railway to be built from South Bend to LaPorte and Michigan City, in Indiana, and from South Bend to Niles and Benton Harbor.

All the property and franchises of the Nassau Electric Railroad Co., of Brooklyn, have been leased to the Brooklyn Heights Railroad Co. for 999 years, upon the same terms, it is understood, as expressed in the one year lease under which the former road has been operated since Apr. 1, 1899. This lease provided for an annual rental of \$150,000 and payment of all fixed charges and taxes.

Residents of Jefferson Park, Avondale and Mayfair, northern suburbs of Chicago, have petitioned the city council to secure for them a 5-cent fare to the business district, via the lines of the Consolidated Traction Co. and the Union Traction Co. The council is considering an ordinance remitting all compensation requirements on certain lines on condition that the companies will reduce the fare.

Preliminary conferences looking to a consolidation of the New Brunswick City Railway Co., the Brunswick Traction Co. and the New York & Philadelphia Traction Co. under the name of the latter have been held. This would give the consolidated company a line as far as Irvington, a suburb of Newark, N. J., and be a great step in the completion of a New York-Philadelphia electric line.

It is proposed to repeal the New York law forbidding the building of railroads on the Albany and New York post road, and it is stated a syndicate in which John D. Rockefeller, Levi P. Morton and J. Pierpont Morgan are reported to be interested, will build electric lines, connecting the prosperous towns along the Hudson, and forming a continuous electric railway from New York to Albany.

The Appellate Division of the Supreme Court, Borough of Manhattan, on February 23d, rendered a decision vacating the reassessment of the capital stock and surplus of the Manhattan Elevated Railroad Co., of New York, for 1894, and the assessment is ordered stricken from the roll. The decision absolves the company from paying such taxes for not only 1894, but for all the years from then up to and including 1898.

The Ashland & Catlettsburg Street Railway Co. is extending its line from Catlettsburg, Ky., to Huntington, W. Va. When this branch is completed, the system will comprise 20 miles of track. The company has also just let the contract for the construction of a new opera house at Clyffeside Park, which will seat 2,000 people and will be one of the best equipped, up-to-date opera houses in northeastern Kentucky.

A consolidation of the Bergen County Traction Co., of Fort Lee, N. J., and the Ridgefield & Teanock Railway Co., has been perfected, and a new company formed to be called the New Jersey & Hudson River Railway & Ferry Co. The plans include the building of extensions, establishment of a pleasure park at Edgewater-on-the-Hudson, improvement in the ferry service, etc. Frank R. Ford is general manager of the system.

AN INTERESTING STREET CAR.

The accompanying illustration shows an interesting novelty, being a combined passenger and freight car and an electric locomotive as well. The car body is 29 ft. long by 8 ft. wide and is carried on a No. 21-E, Brill truck of 7 ft. 6 in. wheel base. The front end is vestibuled with a door at the left side which forms the main entrance to the passenger compartment; this compartment is 11 ft. 6½ in. long with six reversible back seats spaced 2 ft. 5 in. between centers. The only passengers which it is intended to carry are workmen to and from their labor and the single entrance and stirrup step are sufficient.



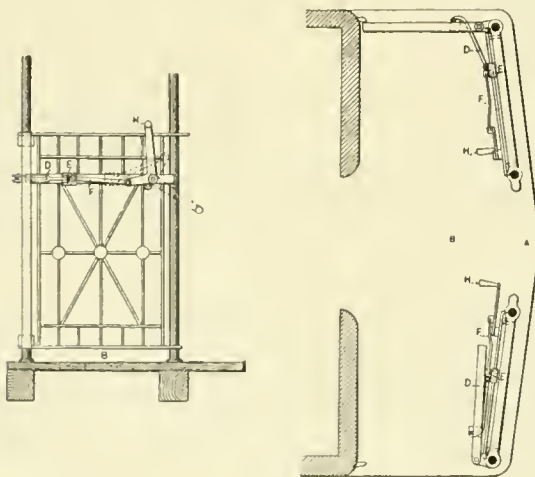
COMBINATION CAR AND LOCOMOTIVE.

The freight compartment is 17 ft. 5½ in. long with side doors in the center of the car, 3 ft. 6 in. wide. This compartment is also reached by a door from the passenger compartment and is provided with folding seats along the sides and bulkhead. With its two motors the weight of the car is 19,850 lb. This car, which was built by the J. G. Brill Co., is a very pretty illustration of the flexibility and adaptability of the electric locomotive; it is equipped with an M. C. B. coupler for handling standard steam cars and also has a radial draw bar for street cars.

GOLD CAR HEATERS AND PLATFORM GATES.

The illustrations herewith show the Gold platform gate which has been applied to the entire equipment of passenger cars on all elevated railways, as well as to many surface lines. Gates are a necessity on elevated cars, and the desirable features are simplicity and ease of operation, and a lock such that when the gate is shut it cannot be opened by pressure either from the outside or inside.

The various parts in the engraving are indicated as follows: B,

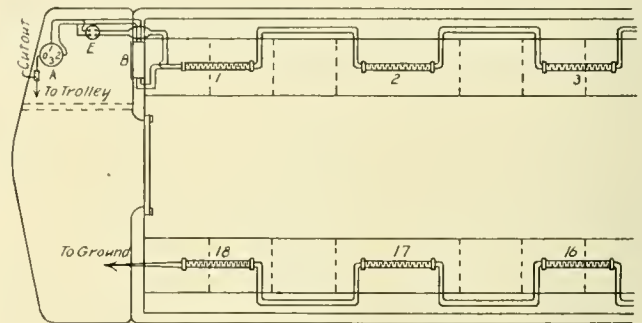


GOLD PLATFORM GATE.

platform; D, link to door; E, slide; F, link; H, handle. The left hand view shows the gate, closed, in elevation and the dotted lines indicate the position of the levers when open. On the right hand is a plan of a platform showing one gate open and one closed. When the gate is closed the hand lever is past the dead center and effectually locks it in position.

Since the first gate lock was produced no change whatever has been made in the construction, and it is operated satisfactorily on the elevated roads in New York, Chicago, Brooklyn and the London Underground, where it has never been the cause of an accident of any kind. These gates are now made and sold by Edward E. Gold, president of the Gold Car Heating Co., Frankfort and Cliff Sts., New York.

During the past year the Gold Car Heating Co. has made a number of improvements in its electric heaters and has perfected a system for elevated railways which will commend itself for simplicity and efficiency. The illustration shows one end of an elevated car equipped with 18 Gold standard heaters in the body of the car and 2 "Improved" panel heaters, in the motorman's compartments, 1 at each end. With this improved system three intensities of heat are provided, the regulation being by means of the 3-point switch A. When the switch is turned to point 1, current is passed through one-third of each heater in the car; point 2 puts two-thirds in circuit, etc. The heater B in the motorman's compartment is connected to the general system wiring, so that it is



IMPROVED GOLD CAR HEATING SYSTEM.

controlled by the shunt switch "E," and may be twisted off or on at will. When in circuit current passes through one-third, two-thirds, or the whole of B, according as the regulator A may be set. The heaters in the body of the car are suspended underneath the seats about half way between the floor and seat.

The illustration shows the arrangement as adopted for the Brooklyn Elevated cars; the Gold standard heaters are used by the South Side Elevated, Chicago.

IMPROVEMENTS AT WICHITA, KAN.

We are in receipt of a letter from Mr. S. L. Nelson, the newly appointed manager of the Wichita Railroad & Light Co., giving some of the details of the work planned at that city. The company will rebuild 4½ miles of track with 7-in. 60 and 70-lb. T-rail, and about five miles with re-rolled 50-lb. T-rail; it will also rebuild the remaining 8 or 10 miles of track with the present 35-lb. T-rail, using new ties. Atlas rail joints for both the new and old rails have been purchased and the first shipments arrived March 5th. The company has ordered 12 new closed car bodies, 10 of which will be 16 ft. long and two 18 ft. 6 in. long; also 10 seven-bench center-aisle open cars. These will all be of the latest pattern, and are under construction at the works of the Jewett Car Co., of Newark, O. They will be mounted on Peckham 7-B trucks, equipped with G. E. 800 motors.

For street railway purposes, the company is installing three Stirling boilers, aggregating 800 h. p., one Westinghouse 250-kw. direct connected generator and one 360-h. p. tandem compound condensing Russell engine. For the street lighting plant, there are being placed in position, temporarily, two A. S. 8-120-900-2,300 volt, 60 cycle single phase generators, to operate 185 enclosed type series arc lamps, but this installation will later be changed for a 300-kw., 150 r. p. m. mono-cyclic generator.

Mr. L. O. Williams, late superintendent of the Springfield (O.) R. R., is now in charge of the installation of the steam and electric plant, and Mr. W. R. Morrison, formerly assistant manager of the Bay Cities (Mich.) Consolidated Railway Co., will be in active charge of the track work.

CHANGES IN WELL-KNOWN SUPPLY

McGill, Porter & Berg, successors to McGill, Pomeroy & Co., have moved into their new office and store room at 309 Dearborn St., Chicago, where they will make a specialty of electric street railway and electric manufacturers' supplies, representing the following manufacturers as territorial agents: Ohio Brass Co., Cutter Electric & Manufacturing Co., Speer Carbon Co., Horsburgh & Scott, Chicago Mica Co., Frank Ridlon Co., and Ham Sand Box Co.

Mr. J. H. McGill has been actively engaged in the electric supply business since 1890, when he was employed as stock man by the Electric Supply Co., afterwards the Ansonia Electric Co. At the time of that company's failure in 1893 he held the position of traveling salesman. After the dissolving of the Ansonia Electric Co. he secured a position as salesman with the Peru Electrical & Manufacturing Co., but resigned this to take a like position with the Sunbeam Lamp Co. When the latter company was obliged to discontinue temporarily, pending patent litigation, he opened an office in Room 1533 Monadnock Building, as Western sales agent for the Peru Electrical & Manufacturing Co. To this agency was soon added that of the Ohio Brass Co. In March, 1897, his business



J. H. MCGILL.



J. W. PORTER.

was consolidated with that of J. G. Pomeroy, agent for the Adams Bagnall Electric Co., under the firm name of McGill & Pomeroy. The business increasing, they moved to 317 Dearborn St., and to their business as manufacturers' agents added that of dealers in street railway supplies.

Mr. J. W. Porter came into the firm, May 1, 1899, having purchased Mr. Pomeroy's interest. Mr. Porter has been in the electrical business since 1891. He was with the Edison General Electric Co., in the engineering department, erecting street railways before the formation of the General Electric Co. At this time he went with the Electric Supply Co., Chicago, and remained until the affairs of this concern were wound up in 1893, since when he has been in the electric lighting field as the manager of a central station in Chicago.



MAX A. BERG.

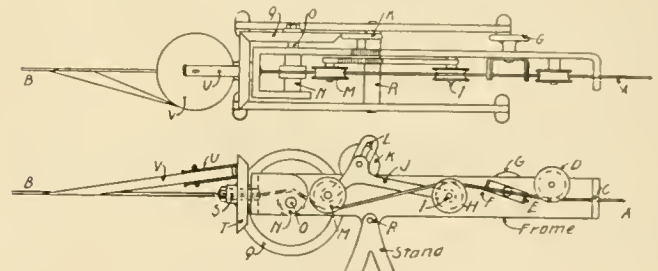
Mr. Max A. Berg, recently assistant secretary in the railway department of the Ohio Brass Co., Mansfield, O., returns to Chicago, his native city, to become the third member of the new firm. He began his career in the electrical business in 1889 with the Electrical Supply Co., and in 1893 when the Supply company went out of business he held the position of manager of the railway department, and assistant to the manager of the company. During the past four years Mr. Berg has held a very responsible position with the Ohio Brass Co. and is thoroughly familiar with the details of the street railway supply business in its various branches. He is very well and favorably known, and has a wide acquaintance among street railway men and the supply trade.

The new firm makes a strong combination of enterprising and popular young men, all of whom have a large acquaintance with both street railway men and their wants. They are determined to please their customers in every possible way, and have every reason to largely increase a business already prosperous and growing rapidly.

MACHINE FOR CLEANING AND RE-INSULATING WIRE.

We are indebted to Mr. F. W. Henninger, of the Detroit Citizens' Street Railway Co., for the following description of a very ingenious machine invented by him. The device takes wire the insulation of which has been injured, strips it and re-insulates it ready to be again used. While it was designed for use in rewinding the fields of railway motors, its application is not limited to this purpose. Mr. A. B. du Pont, general manager of the Citizens' road, advises us that this machine has greatly reduced the cost of motor repairs on his road.

The description and method of operating are as follows: The reel of wire or "field" is placed at the right near A; the wire passes through a hole in the end of the frame C, under the guide wheel D, over the end of the cleaner E, and under F, over the guide wheel H, and under the tension wheel M, over the driver N, and through the arbor S, and thence on to the new field to be wound. The wheel D is fastened on to the frame by means of a stud and is stationary. The cleaner EF is held in place by the hand wheel G, and is so arranged that it can be turned at any angle desired producing any desired pressure upon the wire. To the same stud upon which the guide wheel H is fastened, the arm J swings as a hinge, and the other end slides in the slot L and is held in place by the hand wheel K, adjustable so that any desired pressure can be produced on the driver N. The friction bevel wheel T is on the same shaft as N, and engages the bevel wheel U to which a U-shaped frame V carrying the tape W is fastened. As the wire passes over N motion is imparted to T, which wraps the tape around the wire as it passes through the arbor S and on to a new field. The frame is fastened to the stand by means of a trunion, so as to adjust itself to any irregularities in the wire. The cleaner is made of tempered steel, and the end E cleans the under part of the wire and the end F the upper part. In the latest design the driver N is made



RE-INSULATING MACHINE.

up of a double pulley, one being a little larger than the other and movable on the shaft O, so that two different speeds can be given winding mechanism.

Mr. Henninger states that the company uses a special tape made exclusively for this purpose, and believes it is a better insulation and lasts longer than ordinary cotton fiber, and it is not so easily displaced, and being interwoven, is more rigid and durable. The time required to wind a field with this device is no greater than one wound with ordinary insulated wire except the few moments that are required to replace the tape.

HIGH PRICES BLOCK NEW ROADS.

We are in receipt of a letter from Mr. John Patterson, secretary of the Hamilton Electric Light & Cataract Power Co., of Hamilton, Ont., stating that owing to the prevailing high prices of rails, wire and supplies, construction work has not been started on the two roads to be built by his company, plans for which were given on page 868 of the "Review" for Dec. 15, 1899. The company may possibly do some grading this spring, but it is expected the price of rails and other material will come down very considerably before long, and then work will be commenced in earnest.

PERSONAL.

MR. WILLIAM GARRETT, of Cleveland, will become consulting engineer for the Bethlehem Steel Co., of South Bethlehem, Pa.

MR. LOUIS HARTMAN has been appointed receiver of the New Albany (Ind.) Ry., succeeding Mr. John McLeod, recently deceased.

MR. ELMER P. MORRIS, of New York City, is in Cuba on business connected with his recent large shipment of tramway material to Havana.

MR. JOHN I. BEGGS has been chosen a director of the Milwaukee Electric Railway & Light Co., succeeding Mr. A. Marcus, of New York.

MR. MARK B. THOMAS, formerly manager of the Hamilton (Ont.) & Dundas Ry., has been appointed to a responsible position with the Cataract Power Co.

MR. C. G. WINGATE is superintending the construction of the Branford (Conn.) Electric Ry. He was formerly superintendent of the Huntington (N. Y.) Street R. R.

MR. JAS. LAPPIN has left the position of electrician for the Metropolitan Railway Co., of Toronto, Ont., to take a place with the Canadian General Electric Co., of Toronto.

MR. J. J. O'KEEFE, formerly chief supervisor for the Chicago City Ry., was, on February 1st, appointed to a similar position with the Metropolitan Street Railway Co., of Kansas City, Mo.

MR. A. E. BLANCK has returned to his home in Battle Creek, Mich., from Galesburg, Mich., where he has been building the new power station for the Michigan Traction Co., of Kalamazoo.

MR. FRANK ARNOLD, of Watertown, N. Y., formerly engaged on the R. W. & O. division of the New York Central R. R., has been appointed manager of the Oswego (N. Y.) Traction Co.

MR. C. E. MOORE, formerly master mechanic of the Chicago City Ry., has been appointed superintendent of the Simplex Railway Equipment Co., of Chicago, entering on his duties March 1st.

MR. E. EUGENE HAWKINS, JR., assumed the duties of general superintendent of the New Platz (N. Y.) & Poughkeepsie Traction Co., on Feb. 15, 1900, succeeding Mr. C. C. Southard, resigned.

MR. H. E. BRADFORD, formerly superintendent of the Marlborough (Mass.) Street Ry., has succeeded Mr. E. P. Shaw, jr., as secretary and treasurer of the Worcester (Mass.) & Northboro Street Railway Co.

MR. W. W. GURLEY, a well known lawyer of Chicago, was last month made general counsel of the Chicago Union Traction Co., succeeding to the title as well as the position formerly held by Mr. Henry Crawford.

MR. JOHN H. FOWLER, who has been connected for some years with Naugle, Holcombe & Co., of Chicago, has opened an office in the Fisher Building, Chicago, and will make a specialty of telephone and telegraph poles.

PROF. REGINALD A. FESSENDEN has resigned his chair in the electrical engineering department of the Western University of Pennsylvania, at Allegheny, Pa., to accept a position in the Weather Bureau, at Washington.

MR. WILLIAM B. GIVEN, last month tendered a dinner to all the gentlemen that were associated with him in the organization of the Conestoga Traction Co., which controls all the street railway lines in Lancaster, Pa., and vicinity.

MR. DAVID A. JENKINS, car inspector of the Springfield (O.) Street Railway Co., has been appointed superintendent of the road in place of Mr. L. O. Williams, who has accepted a position with the street railway company at Wichita, Kan.

MR. THOMAS RODD, consulting engineer of the Westinghouse interests and chief engineer of the Pennsylvania Steel Co., sailed for Europe last month, taking with him the plans for the new plant of the British Westinghouse Co., at Manchester, Eng.

MR. J. M. HOLLISTER, president of the Chicago Electrical Association, left for Paris on March 14th. Mr. Hollister will be the engineer in charge of the preparations for the exhibit of the Western Electric Co., at the Paris Exposition, and will remain there during the Exposition.

PROF. D. F. A. C. PERRINE will be connected with the new Stanley Electric Manufacturing Co., of Pittsfield, Mass., in an important position. Professor Perrine has been for some time at the head of the electrical engineering department of the Leland Stanford Junior University.

MR. GILES S. ALLISON, whose name is familiar in street railway supply circles, has associated himself with Valentine & Co., of New York City, the well known makers of first-class varnishes. Mr. Allison was formerly with the Hildreth Varnish Co.

MR. PAUL D. CABLE, formerly with the Commercial Electrical Co., of St. Louis, has taken the management of the electrical department of the Rumsey V. Sikemeier Co., of St. Louis. Mr. Cable takes with him to his new position many years' experience in the same line and a thorough knowledge of the electrical field.

MR. A. E. LE ROSSIGNOL, of Newcastle-on-Tyne, Eng., who has been in this country for several weeks investigating American electric transportation practice, has returned to England. The Corporation Tramways of Newcastle-on-Tyne, of which Mr. Rossignol is engineer, are about to be converted to electric traction.

MR. CLINTON L. ROSSITER, of Brooklyn, was a recent visitor to Chicago, for the purpose of studying certain methods employed by the Chicago elevated roads. Electricity on the Brooklyn elevated lines has not proven entirely satisfactory, and Mr. Rossiter expected to obtain several suggestions as to ways of remedying the defects.

MR. H. H. VREELAND, president and general manager of the Metropolitan Street Railway Co., of New York City, was the recipient on St. Valentine's Day of a check for \$100,000. The check was the gift of individual members of the Whitney syndicate, that practically owns the Metropolitan road, and was bestowed as a token of their appreciation of the work accomplished by Mr. Vreeland, in bringing the property to its present high state of development.

MR. C. S. DRUMMOND, of the board of directors of the British Electric Traction Co., of London, was a "Review" caller recently. He has been in Chicago, investigating local electric transportation systems and purchasing equipment for the 51 roads his company operates, having just returned from a visit to Nelson, British Columbia, where a 13-mile electric line is in process of construction, being the first of a series of projected trolley roads the English corporation will establish in the queen's domain on this continent. Speaking of British traction affairs, Mr. Drummond said: "We have, of course, not reached the stage of progress and development attained in America, but the surest evidence of our intention to do so is the fact that we are importing the great bulk of our equipment from the United States."

MR. H. MILTON KENNEDY, who was probably the first man in this country to hold the position of general passenger agent on a street railway system, has severed his connection with the Brooklyn Rapid Transit Co., to enter a wider field of work. Mr. Kennedy held the office of general passenger agent for the Brooklyn Heights Railroad Co. for some time, and when the consolidation was made,

he was continued in the same position with the Rapid Transit Co. In this capacity he had entire charge of all the advertising of the pleasure resorts to which the company's lines ran, and he was constantly devising ways for encouraging and developing what is known as the strictly pleasure traffic of the system. In this work he was peculiarly successful.

MR. G. P. FRANCIS has accepted a position as chief engineer of the suburban lines of the Union Railroad Co., of Providence, R. I. Mr. Francis was the architect who designed and superintended the construction of the magnificent new railway station in Boston, known as the South Terminal Station. He was in charge of the work from the first survey to the completion of the structure, a period of three years.

OBITUARY.

MR. EDWIN N. LEWIS, whose name is widely known in railroad circles, died in Chicago February 16th. He was manager of the Railway Master Mechanic and the Official Railway List.

GEN. JOHN McNULTA, receiver of the Calumet Electric Street Railway Co., of Chicago, died suddenly at Washington, D. C., February 22d, from an attack of angina pectoris. General McNulta was born in New York City in 1837 and moved to Bloomington, Ill., in 1857. He served during the Rebellion in the First Illinois cavalry, rising from the ranks to colonel and brevet brigadier-general; at the close of the war he resumed his legal studies and since then has engaged in the practice of law. He served four years in the Illinois Senate and one term in Congress. General McNulta's greatest claim to fame is his record as a financier and manager of large properties, having been receiver of the Toledo, St. Louis & Kansas City R. R., of the Wabash R. R., of the whisky trust, and of the National Bank of Illinois, the principal asset of which was the Calumet Electric Street Ry. Since 1895 he resided in Chicago, being a law partner of John D. Hood. He was president of the Naval Reserve Association, the Loyal Legion, and the Society of the Army of the Tennessee, and a member of most of the prominent clubs in Chicago. He leaves a widow and four children.

NEW PUBLICATIONS.

THE UNIVERSITY OF ILLINOIS, at Champaign, Ill., has published a handsome souvenir of the college in the shape of a pamphlet containing half-tone cuts of the grounds and exterior and interior views of the buildings.

"THE EMPIRE OF THE SOUTH," published by the Southern Railway Co., is a book of nearly 200 pages, printed on heavy coated paper and profusely illustrated with fine engravings, describing the resources and developments of the South.

"SCIENCE ABSTRACTS" has completed its second year, and we note from Vol. III, Part 1, which has just been received, that new sections dealing with "Steam Plant, Gas and Oil Engines" and with "Motor Cars," have been added. This extension of the field covered will greatly add to the value of the publication. The index to Vol. II is a pamphlet of nearly 100 pages. "Science Abstracts" has heretofore covered only the field of physics and electrical engineering, being issued monthly under the direction of the Institution of Electrical Engineers and the Physical Society of London. Publishers, E. & F. N. Spon, Ltd., 125 Strand, W. C., London; Spon & Chamberlain, 12 Cortlandt St., New York. Price, 18. per number.

"GENTSCHE'S ELECTRIC RAILWAY GUIDE," Vol. I, No. 1, of which was issued last month, is a monthly publication, containing time tables, rates of fare and information regarding the express and freight carrying facilities of suburban and interurban electric lines in Ohio and Michigan. According to the announcement made in the first number, the scope of the guide is to be increased so as to include interurban roads in Indiana and also Illinois. The aim is to make the guide of general benefit to the public, especially to commercial travelers. It is published by the Gentsch Publishing Co., 29 Monroe Ave., Detroit, Mich.

NEW RECEIVER FOR THE CALUMET.

Mr. Edwin A. Potter, president of the American Trust & Savings Bank, of Chicago, has been appointed receiver of the National Bank of Illinois and the Calumet Electric Street Railway Co., succeeding the late Gen. John McNulta. The selection was made as the result of a conference between Charles H. Dawes, comptroller of the currency, Judge Grosscup, and the parties most deeply interested, and is entirely satisfactory to all concerned in the receivership. Mr. Potter will take charge of both the bank and the street railway company, as the chief remaining assets of the bank are the securities of the Calumet Electric Street Railway Co., in which it has over \$3,500,000 invested.



E. A. POTTER.

Mr. Potter was born in Bath, Me., Sept. 18, 1845. His grandfather and father were both natives of the same state. His father was in the lumber and ship building business, when, in 1872, Abram French & Co., of Boston, opened a branch house in Chicago, they placed Mr. Potter in charge. Mr. Potter continued in this business until 1879, when the firm of French, Potter & Wilson, dealers in glassware, was formed. This firm dissolved in 1889, and he immediately formed the partnership of Lyon & Potter, dealers in pianos. In 1897 this partnership was also dissolved, and in January, 1898, Mr. Potter was elected president of the American Trust & Savings Bank, which position he now holds. Under his direction the bank has grown with a rapidity remarkable even in Chicago, and is known as one of the most substantial in this city. It is trustee for a large number of corporations, including many street railways. Its newly occupied banking quarters, La Salle and Monroe, are among the finest in the city.

BONUS FOR LONG SERVICE.

Under date of Feb. 27, 1900, Gen. Mgr. E. P. Vining, of the Market Street Railway Co., San Francisco, published the following order:

Notice is hereby given that the board of directors of this company has today adopted the following resolution:

"In recognition of and as a special reward for faithful service the board of directors of the Market Street Railway Co. does hereby authorize the general manager to pay a bonus at the end of each month to conductors, motormen, and gripmen, beginning with the month of March next, in accordance with the following scale:

"To all such employes who on Jan. 1, 1900, had been in the employ of this company, including its constituent companies, for 5 years, 1 cent per hour; for 10 years, 2 cents per hour; for 15 years, 3 cents per hour; for 20 years, 4 cents per hour. The above regardless of whether said length of service was continuous or not.

"The list of such employes will be revised on the first day of January of each year, so as to add thereto the names of men who at that time shall have completed terms of continuous service as above stated, attention being called to the fact, that hereafter no new names will be added except for continuous service.

"The board reserves the right to annul, rescind or amend this resolution at its pleasure."

On and after Mar. 1, 1900, no new service stripes will be authorized except in conformity with the terms above stated, that is to say, on January 1st of each year, conductors, motormen and gripmen who have then completed the above-mentioned terms of continuous service will be authorized to wear service stripes accordingly.

A dispute has arisen between the Washington (D. C.), Alexandria & Mt. Vernon Railroad Co. and the Anacostia & Potomac River Railroad Co. over the joint use of the conduits and tracks on 14th St. between E and B Sts.

OPENING OF MEXICO CITY'S ELECTRIC LINE.

We are indebted to Modern Mexico for the following description of the opening of the new electric system of Mexico City and the accompanying view of the first car operated:

"Mexico City's first electric street cars have been running since January 31st, and the novelty is wearing off. For a week after they were started, however, they were the object of greatest wonder and amusement to the lower classes. People not only stopped to watch them go by, but crowds of small boys and Indians followed them at full speed until their breath gave out. Then their places were taken by others, and the cars went through town for a few days with a motley escort following each one. The formal opening of the line was conducted with due ceremony. Minister Mariscal, the Mexican secretary of foreign relations, turned on the current. Our illustration presents a clear idea of the inaugural train. On the platform of the first car Secretary Mariscal is to be seen starting the car. At his right is the Russian minister, and behind him the



FIRST ELECTRIC CARS IN MEXICO CITY.

Japanese minister. Behind the secretary is Captain Porfirio Diaz, son of the president. At his left is Captain Pablo Esandon. The gentleman next is Sr. J. D. Casanus, of the board of directors of the district railways, and behind him is Mr. A. E. Worswick, resident engineer of the company, who has had charge of the construction for the new electric traction. On the ground, with one hand on the car, is Hon. Chandos Stanhope, who has recently arrived from England to take charge of the company's business here as managing director. Beside him is Sr. Thomas Moran, secretary of the Mexican board of directors. Just behind these two gentlemen is to be seen Gen. Mariano Ruiz. Many prominent people occupied the cars.

"Two important lines are now being operated entirely with the electric service, and the new system gives the best of satisfaction. The cars are comfortable and make excellent time. The company is equipping other lines as fast as possible. A number of double-deck cars will shortly be added to the city service."

WISCONSIN VALLEY ADVANCEMENT ASSOCIATION.

We are in receipt of a letter from Mr. Lester A. Rose, of Wausau, Wis., giving considerable information regarding the plans of the Wisconsin Valley Advancement Association, which was organized three months ago to exploit the advantages, and promote the development of the Wisconsin River Valley, from Eagle River to Grand Rapids and Centralia. This section of territory is attracting the attention of capitalists to a rapidly increasing extent and is enjoying an era of progress that is best characterized as a "boom." It has a population in six counties of more than 140,000 people, of which 50,000 live in cities.

Perhaps the greatest resources of the Wisconsin Valley are in the forests of hard and pulp woods, recent investigation revealing the fact that there are from 12,000,000,000 to 14,000,000,000 feet of hemlock and other paper pulp woods, easy of access to abundant water power, and in addition there are billions of feet of hard woods, as curly birch, bird's eye maple, red oak, ash and butternut.

The Advancement Association intends to establish logging camps, develop electricity from the 100,000 h. p. of water power it is estimated are available from the various waterways, build mills and factories, open up granite quarries, etc. One of its most extensive plans, however, is the building of an electric railway from Eagle River to Nakoosa, a distance of 140 miles, and passing through the cities and towns of Rhineland, Tomahawk, Merrill, Wausau, Mosinee, Stevens Point, Centralia and Grand Rapids.

The gentlemen interested in this enterprise include some of the leading business men of the West, whose names are a guarantee that any work undertaken by the association will be pushed through to successful completion. W. H. Bradley, the president of the organization, is the founder of the town of Tomahawk, Wis., a prosperous place of 4,000 inhabitants, the center for four railroads, and possessing water works, electric light plant, gas works, paper mills and one of the largest lumber concerns in Northern Wisconsin. In laying the foundation for this city, Mr. Bradley, 12 years ago, went back into the pine forest, built a \$50,000 hotel, and with this as a nucleus, commenced erecting buildings and opening up the surrounding country by building railroads in different directions. The growth and development of the place have been phenomenal.

The other officers are: Vice-President, W. E. Brown, of Rhineland, Wis.; secretary, Lester A. Rose, of Wausau, Wis.; treasurer, Ernest Oberbeck, Centralia, Wis. The board of directors includes D. E. Riordan and N. A. Coleman, of Eagle River; C. C. Yawkey and A. O. Jenne, of Hazelhurst; R. C. Thielman, of Tomahawk; D. L. Plumer and A. L. Kreutzer, of Wausau; H. M. Thompson and Chas. Gardner, of Mosinee, and many others.

CHICAGO CONSOLIDATED.

The offer made to the holders of the stock of the Chicago Consolidated Traction Co. by the Chicago Union Traction Co., which was published in our issue of January last, page 50, has been accepted by the owners of \$13,000,000 of the \$15,000,000 of Consolidated stock. The arrangements for the sale were perfected on February 24th. The holders of Consolidated stock who consented to sell will receive one-half of its face value in 4½ per cent bonds of the Union Traction company.

Mr. Yerkes thus retires from active interest in the Chicago surface lines.

This sale gives the Union Traction control of all the surface lines on the North and West Sides, except the Suburban R. R., and brings the total mileage of the system up to 507.7 miles. It is understood that the Suburban (56 miles) will be acquired later. There are also unconfirmed rumors that the Union Traction is seeking to obtain control of the Chicago General Ry.

LONG INTERURBAN IN OHIO.

The Columbus, London & Springfield Railway Co. has been incorporated with a capital stock of \$1,000,000, to build an electric line connecting Columbus and Springfield, O. In its application to the council of Columbus for a franchise within the limits of that city, the company offers to give 3-cent fares night and morning for the benefit of working people, and interchangeable transfers to all connecting lines. It also proposes to pay the city from 2 to 5 per cent of the gross receipts per annum.

Mr. H. A. Fisher, general manager of the company, writes us as follows:

"The route between termini has not been definitely located, but will probably touch London. It will be 60 or 90 days before we will be ready to let contracts. The railway will be 45 miles long, and the roadbed will be constructed in a most substantial manner, with a view of making fast time, the limited trains covering the distance in 1 h. and 30 min. We will carry mail, express and all kinds of freight. Our terminus in Columbus is in the shape of a loop around Capitol Square, and in Springfield we will have a loop

CHAS. J. MAYER,
President.

A. H. ENGLUND,
Sec'y & Treas.

THE MAYER & ENGLUND CO.

10 SOUTH TENTH STREET,

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Electric Railway Material and Supplies of Every Description.

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R. D. Nuttall Co., Gears, Pinions, Bearings, Trolleys, Etc.	Allegheny, Pa.	The International Register Co., Single and Double Fare Registers.	Chicago, Ill.
Van Wagoner & Williams Hardware Co., Dropped Forged Copper Commutator Segments.	Cleveland, O.	W. T. C. Macallen Co., Standard Overhead Insulating Material.	Boston, Mass.
The Protected Rail Bond Co., "Protected" Flexible Rail Bonds.	Philadelphia.	Bradford Belling Co., "Monarch" Insulating Paint.	Cincinnati, O.
American Electric Heating Corporation, Electric Car Heaters of Every Design.	Boston, Mass.	Sterling Varnish Co., Sterling New Process Insulating Varnish.	Pittsburg, Pa.
Chisholm & Moore Manfg. Co., Moore's Chain Hoists.	Cleveland, O.	Garton Daniels Electric Co., Garton Lightning Arresters.	Keokuk, Ia.
New York & Ohio Co., "Packard" Incandescent Lamps.	Warren, O.	D. & W. Fuse Co., Enclosed Non-Arching Fuses.	Providence, R. I.

Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

We carry the largest stock in this country of Strictly Electric Railway Material.

We are now occupying our entire building, five floors and basement.

Special Attention Given to Export Business.

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around Fountain Square. The cars will be 45 ft. long, with smoking compartment, toilet room, state room, buffet, air brakes, Baker heaters, and other modern appliances."

The officers are: President, Charles E. Wentworth; first vice-president and treasurer, J. G. Webb; secretary, Emmett Tompkins; general manager, H. A. Fisher; general counsel, Merrick & Tompkins. The general manager's office is at Columbus, O.

RUMORED CONSOLIDATION AT PITTSBURG.

Application has been made for a charter by a new company, to be called the Union Traction Co., of Pittsburg, and which it is understood is to be formed for the purpose of consolidating all the street railway properties in and around Pittsburg. It is announced the president of the consolidation will be Senator C. L. Magee.

It is further stated that the Castle Shannon R. R., an eight-mile, narrow-gage coal and passenger road, operated by steam, and also 500 acres of fine coal land have been purchased by parties interested in the deal. This will give the consolidated system an abundant supply of good cheap fuel entirely under its own control.

NEW ROAD IN DELAWARE.

On February 22d, actual construction work was commenced on the Delaware General Electric Ry. by the driving of a silver spike at Dover, Del. The incident was made the occasion for interesting ceremonies, which were witnessed by about 1,500 persons. Several addresses were made and an elaborate dinner was served at a leading hotel.

The road, which will have both a freight and a passenger service, will be about 45 miles long, passing through a number of Delaware towns, and reaching an estimated population of 35,000 to 40,000 people. It will open up land for grain and fruit that has not hitherto been under cultivation, because of lack of facilities for quickly handling the product.

AN ECHO FROM THE CLEVELAND STRIKE.

Members of the Cleveland fire department have petitioned the Cleveland Electric Railway Co. to repeal the order issued soon after the strike was declared last summer denying the right of firemen in uniform to ride on its cars free. Up to that time employes of the fire department had been granted the courtesy of riding gratis when in uniform, but at the time of the strike, the firemen took an active part in the boycott and refused to ride on the cars at all. The company now takes the position that if the men were not willing to ride when there was trouble on the lines, they should not ask for favors after the trouble is settled.

SOUVENIR MEMORANDUM BOOK.

The Star Lubricating Oil Co., of Cleveland, O., has been sending out as a souvenir, a useful pocket memorandum book, containing space for notes for every day in the year, and in addition a quantity of valuable general information as rates of postage, U. S. Weather Bureau signals, interest tables, coins, weights and measures, etc. A chronology of the Spanish war is also included. The company will be pleased to send a copy of the book on application.

This little souvenir calls attention to the fact that "Excelsior" boiler compound, made by the Star Lubricating Oil Co., contains no oil or acid and destroys oil and grease in boilers.

E. B. Hutchinson, the expert accountant, Detroit, Mich., is making a specialty of reports on street railway properties. It was he who made the report to the Detroit Street Railway Commission recently, and on which their report was based. The commissioners spoke very highly of Mr. Hutchinson's work and complimented it in their published report.

Frank Morrell, one of the well known sales agents in street railway supplies, has taken the eastern agency for the McGuire company, with headquarters at No. 15 Cortlandt St., New York City, where he will be glad to see all his old friends.

ECHOES FROM THE TRADE

THE J. A. FAY & EGAN CO., of Cincinnati, O., has declared the regular quarterly dividend of 13 $\frac{1}{4}$ per cent on the preferred stock and also a 13 $\frac{1}{4}$ per cent back dividend. Both were payable February 20th.

CONSUL-GENERAL J. G. STOWE, Cape Town, South Africa, advises the State Department that many tenders for bridge work, electrical and railway material, and machinery are open for bids.

THE KUELL AIR BRAKE CO., of Battle Creek, Mich., has been incorporated to manufacture air brakes for street cars. The incorporators are W. F. Kuell, J. E. Linihan, R. F. Hoffmaster, W. H. Hoffmaster, H. F. Beckman.

THE BERLIN IRON BRIDGE CO., of East Berlin, Conn., has increased its capital stock to \$750,000. The following board of directors has been elected: Chas. M. Jarvis, Frank L. Wilcox, S. H. Wilcox, H. H. Peck, Geo. H. Sage, D. E. Bradley, and S. N. Robinson.

THE AMERICAN ELECTRICAL WORKS, of Providence, R. I., sent to the trade on Washington's Birthday another one of their series of holiday remembrances. It consisted of a steel plate portrait of Martha Washington and a sketch of the principal incidents of her life.

THE JEFFREY MANUFACTURING CO., of Columbus, O., makes coal washing machinery, retarding conveyors, steam coal tipples, elevating-conveying machinery and coal mining machinery. It calls attention to its products in a newly issued catalog, which will be sent on application.

THE NEW YORK AIR COMPRESSOR CO., 120 Liberty St., New York, has issued a handsomely illustrated catalog descriptive of steam-driven and belt-driven compressors. This company states that its machines are the only ones on the market which were designed expressly for the higher pressure now in vogue.

THE CROSS OIL FILTER, made by the Burt Manufacturing Co., Akron, O., has been selected for use in the power house of the U. S. Machinery Exhibit at the Paris Exposition. The Burt Co. will also make an independent exhibit of its filters at the Exposition, and has just made a superbly finished shipment for that purpose.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. is building extensions to its Pittsburg plant that, when finished, will give it one of the largest factories in the world, one room of which will be 1,206 ft. long x 370 ft. wide. The company declared a quarterly dividend of 1 $\frac{1}{4}$ per cent on its common stock, payable February 20th.

THE CONSOLIDATED CAR FENDER CO., of Providence, for its "little reminders" this month sends out a neat folder bearing a clipping from the New York Sun of Dec. 7, 1890, giving an account of how a woman was picked up uninjured, by a Providence fender, attached to a car of the Metropolitan Street Railway Co., while the car was running at high speed.

THE SPEER CARBON CO., of Saint Marys, Pa., is making a carbon that, judging from the repeat orders that are coming in from all sides, must be nearly perfect. The company's abundance of capital, thoroughly equipped factory, and natural-gas heated ovens, together with the experience of its general manager, J. S. Speer, place it in a position to supply the best products at lowest prices, consistent therewith.

THE RITER-CONLEY MANUFACTURING CO., of Pittsburg, Pa., has been awarded a contract for 1,300 tons of structural steel and plate work for the Glasgow Tramways. It is for the complete equipment of the power plant, and includes the erection of power house, smoke stack, coal and ash, tanks, boilers, etc. This company has done similar work for Dublin and Bristol tramways, and maintains an erecting force abroad.

THE COMPRESSED AIR MOTOR CO., Monadnock Block, Chicago, has issued a handsome illustrated catalog descriptive of motors made by it, and giving details concerning the operation of air driven street cars in various cities, particularly those in Chicago and New York. During the blizzard of February 3d and 4th, this year, the air cars on the Chicago Union Traction lines ran satisfactorily under most disadvantageous conditions.

THE GOHEEN MANUFACTURING CO., of Canton, O., maker of carbonizing coating for the protection of iron and steel construction work, and also dealer in technical paints for all purposes, including red lead, white lead, carbon, asphaltic, iron oxide, magnetic galvanum, etc., has issued a pamphlet on the preservation of wood, steel and galvanized surfaces, taking up the subject from a scientific standpoint and giving the effects of various substances on those materials.

THE CROUSE-HINDS ELECTRIC CO., of Syracuse, N. Y., will doubtless have many weddings on its hand during the coming year, as invitations have been sent to interested parties asking each and every one to be the bridegroom at the marriage of the "Syracuse Changeable" electric headlight to an up-to-date railway manager, which is scheduled to occur on some bright morning during the year. One advantage of the proposition is that the bride will be sent on 30 days' trial.

THE STANDARD UNDERGROUND CABLE CO., of Pittsburg, through its representative, J. W. Marsh, has sent a letter to the Senate Committee on the Pacific cable, ridiculing the statement that there is no firm in America capable of taking the contract for making and laying this cable. Mr. Marsh asserts there are at least two companies with ample resources for doing the work, and that his company stands ready to assume the entire contract, including the purchasing of ships to stretch the wire across the Pacific.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, reports that the demand for its "Monarch" incandescent lamps for use on street railway circuits has been almost more than it could handle. The company claims that the "Monarch" is the best incandescent lamp that a combination of up-to-date machinery and mechanical skill can produce, and states that it has placed them on all kinds of circuits and under the most trying conditions, and has yet to find where they have not come up to the guarantee in every way and given the most complete satisfaction.

THE SHELBY STEEL TUBE CO., of Cleveland, O., has acquired all the assets, including patents, of 14 prominent tube manufacturing plants, among which are the Newcastle Tube Co., Tubing Department of the United States Projectile Co., Tubing Department of the Mansfield Machine Works, the United States Standard Drawn Steel Co., and the Shelby Tube Co., of Ohio. The reorganized company has an authorized capital stock of \$15,000,000. The officers are: President, W. E. Miller; treasurer, W. S. Miller; secretary, H. H. Cockley; general counsel, N. A. Gilbert.

THE MAYER & ENGLUND CO., Philadelphia, has been organized as a Pennsylvania corporation to acquire the business, contracts, good will, etc., of the well known firm of Mayer & Englund,

of Philadelphia. The officers of the new company are Charles J. Mayer, president, and A. H. England, secretary and treasurer. The business heretofore carried on by Mayer & England as a firm will be largely increased by the corporation. An extensive complete catalog, illustrating the full line of railway material handled, will shortly be published, and will be mailed to any railway manager upon request.

THE WESTERN ELECTRIC CO., of Chicago, has furnished the Metropolitan Street Railway Co., of New York City, a 300 kw., 2,500-ampere booster, said to be the largest of its kind ever built. This machine is driven by a 550-volt direct connected motor, the current passing through the series windings. The Western Electric Co. has also received a flattering order from abroad, as the United States Commissioners of the Paris Exposition have chosen Western enclosed arc lamps for lighting the entire American section of the Exposition. These lamps will be placed two in series on 220-volt circuits.

ADAM COOK'S SONS, of New York City, have received the following letter from Wendell Kirth, of Gordon, Neb.: "I wish to report unqualified success with the sample box of Albany compound on our crank pin here. We have been running with it every day since; at first it heated up as it usually has done for the past five or six years, owing to box being badly scored, but now it is running cool every day and we have had no trouble at all with it. There has been more oil used every day in quantity, than would be used with the grease in 80 days' continuous run. We will send to your Chicago people for more."

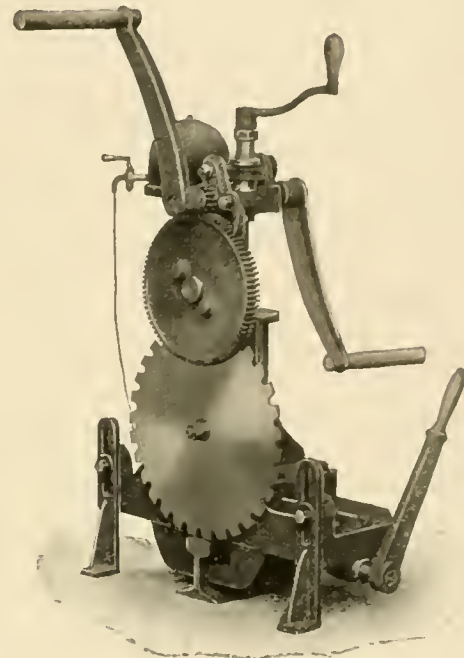
THE STANDARD PAINT CO., of New York, which makes all of the P. & B. products, is supplying the European market from its factory at Hamburg, and P. & B. goods have taken high rank with electric railway companies abroad. This company makes a lining for battery boxes that has withstood the severest tests. During a heavy snow storm in Berlin recently, the accumulator cars having P. & B. lining in the storage battery boxes were able to run with but little trouble from linings being eaten by acid or the excessive heat, with the result that this material is to be placed on many of the Berlin lines, including the Grosse Berliner Strassenbahn Gesellschaft. The P. & B. lining consists of an application of P. & B. paint, P. & B. "Ruberine," P. & B. junction box compound and P. & B. "Ruberoid."

THE DETROIT STEEL & SPRING CO., advises us that the fire of February 25th was much less disastrous than reported in the papers and was confined to one department—the rolling mill. The spring shops, crucible furnaces and steel castings foundries were unharmed. The American Car & Foundry Co., of Detroit, promptly placed at the disposal of the Spring company its rolling department, which will enable it to promptly fill all orders. Before the fire was extinguished the Spring company had ordered a new steel building 180 x 300 ft. which will be erected immediately. Fortunately the extensive machine shops were not injured which will permit the company to repair and put in order at its own works the rolling machinery. One thousand men are employed by the Detroit Steel & Spring Co., which is running night and day, and prepared to take the same prompt care of customers as heretofore.

THE WALWORTH MANUFACTURING CO., now located at 128-136 Federal St., Boston, where it occupies the entire building, five stories and basement, is one of the old establishments, having been founded in 1842. The company is engaged in the manufacture of steam heating apparatus and supplies of all kinds, and is one of the best known houses in that branch of business in New England. In addition to being steam contractor on a large scale, it makes and deals in heating and ventilating apparatus, automatic sprinkling apparatus, boilers and engines, and makes a long list of specialties, which include a full line of gas and steam fitters' tools, and these special tools are shipped to every part of the known globe. The export trade of this company is very large, and its special valves and fittings are used in large quantities in England, on the continent of Europe, in the East Indies, South Africa, South America and Australia, and its trade in these localities is constantly growing.

PORTABLE RAIL SAW.

Now is a Good Time to Get Ready for
Spring Work.



MADE IN FOUR SIZES AND
TWO STYLES TO CUT 9 INCH
GIRDER RAIL OR 100 POUND
STEAM RAIL=====

CUTS AT AN ANGLE UP
TO 45°=====

ATTACHED TO RAIL IN
PLACE=====

AUTOMATIC FEED AND
EASY OPERATION=====

A VALUABLE TOOL TO ALL
TRACKMEN=====



The Q & C CO.

CHICAGO
NEW YORK

NEWS NOTES.

ADRIAN, MICH.—Surveys for the route of the Toledo & Western Co. have been completed between Toledo and Adrian. It is further projected to build a branch line between Toledo and Lyons, O. Seagraves Bros. are promoting the line.

ALBANY, N. Y.—The Senate railroads committee has favorably reported a bill authorizing the United Traction Co. to construct a bridge across the Hudson at Troy.

ATLANTA, GA.—The Atlanta & Western Railway & Power Co. has secured rights of way from Atlanta to the Chattahoochee river, and the project of building a line to connect Atlanta, Douglasville and Marietta, as announced in the "Street Railway Review" bulletin December 22d, will be pushed to completion. The capital stock of \$200,000 has been entirely subscribed. Frank S. Monnett and Judge Earnhart, of Columbus, O., are the principal promoters.

ATLANTIC CITY, N. J.—A new electric line to cost \$400,000 will be built in and about Atlantic City, including Somers Point, Pleasantville and Absecon on its route. J. Howard Gendell may be addressed.

AUGUSTA, ME.—The Railroad Commissioners have rendered a favorable decision on the petition of the Atlantic Shore Line Co. which is projected to run between Biddeford and York via Wells and Kennebunkport. H. M. Heath, Augusta, and Fred J. Allen, Sanford, are promoters.

BALTIMORE, MD.—I. L. Straus and Arthur P. Gorman, jr., are counsel for the Maryland Electric Railway Co. A franchise is asked for a line in Baltimore and suburbs.

BROCKTON, MASS.—Authority for the consolidation of the Brockton, Bridgewater & Taunton, the Taunton & Brockton, the Boston, Milton & Brockton, and the Brockton & East Bridgewater street railway companies with the Brockton Street Railway Co. has been granted by the Railroad Commissioners. The five lines will be operated under the title of the Brockton Street Railway Co. A. A. Glasier, president.

BUENOS AYRES, A. R.—F. C. Marty of Buenos Ayres is investigating American street railway systems with a view to installing electric railways in Buenos Ayres and other South American cities. While in the United States Mr. Marty is the guest of H. S. Judson, Minneapolis.

CHATTANOOGA, TENN.—Bids will be received by the Chattanooga Rapid Transit Co. for the construction of its five-mile suburban line to St. Elmo. S. W. Divine, president.

CHICAGO, ILL.—The Metropolitan West Side Elevated R. R. Co. will purchase 56 new passenger coaches at once. D. MacAllister, president.

COLUMBUS, O.—The Columbus Freight & Traction Co. has been incorporated by W. D. Brickell, W. D. Park, W. D. Hamilton, Charles E. Morris and John W. Mooney. The line is intended to afford the new wholesale district of Columbus prompt and adequate facilities for the receipt and shipment of freight. Any power other than that of steam may be employed. Should electric traction be elected the underground system would be installed.

COVINGTON, KY.—It is reported that the South Covington & Cincinnati Street Railway Co. will build a line to Erlanger. J. C. Ernst, president Cincinnati, Newport & Covington Railway Co., Covington.

DETROIT, MICH.—C. H. White & Co., New York bankers, have purchased the entire \$1,250,000 bond issue of the Detroit, Rochester, Romeo & Lake Orion electric line, taking at once the bonds now issued and owned by John Winter, F. C. Andrews and Oliver H. Lau. The purchase will include the bonds to be issued for the construction of the system from Oxford to Flint. The American Trust & Savings bank of Chicago will act as trustee of the bonds in connection with the Guarantee Trust Co. of New York.

EASTON, PA.—The Easton Consolidated Electric Co. is in the market for three or four 8 or 9-bench open motor cars equipped with Brill 21 trucks and Westinghouse No. 3 motors suitable for 5 ft. 2½ in. gage. Would also like prices on double truck open cars with 12 or 14 benches suitable for standard gage, 4 ft. 8½ in. Address C. E. Flynn, general manager.

EL PASO, TEX.—The Santa Fe street railway of El Paso, a mule car line, has been sold to John T. Terry, of New York, for \$30,000. The new owner will equip the line with electricity.

FAYETTEVILLE, N. C.—Dr. J. W. McNeill has secured a franchise for a street railway in this city, and construction will begin within a year. The line may be extended to Hope Mills, seven miles distant.

FORT WAYNE, IND.—P. A. Randall of Fort Wayne, V. R. Brown of Columbia City, and Oscar Gandy of Churubusco are promoting an electric line from Fort Wayne to Ligonier, to connect by branch lines with Mishawaka, Goshen, South Bend and Elkhart.

It is reported that the Fort Wayne Traction Co. will erect a new car house. A. L. Scott, manager.

GALVESTON, TEX.—The Galveston City R. R. has been sold under order of the United States Circuit Court, it is reported, to Charles E. Hotchkiss, New York, who represents the Guaranty Trust Co. of that city, trustee of the mortgage bondholders, plaintiff in the foreclosure proceedings in which the order of sale was made. Mr. Hotchkiss also represents the reorganization committee of bondholders. The line aggregates 41 miles. The purchase price was \$905,000.

GEORGETOWN, MASS.—The car house and seven cars of the Haverhill, Georgetown & Danvers Street Railway Co. were destroyed by a recent fire, entailing a loss of \$25,000, covered by insurance. C. E. Barnes, president.

HAMILTON, O.—The Hamilton & Lindenwald Electric Transit Co. has been reorganized with Christian Benninghofen, president; J. J. McMaken, vice-president; Peter Benninghofen, secretary and treasurer, and C. E. Warwick, assistant secretary. Under the new regime Ira S. Milliken retires as secretary and manager. Extensive improvements of the line are under consideration.

HARPERS FERRY, W. VA.—Paul Evans, of Philadelphia, formerly owner of the Hagerstown electric light plant, is reported to be promoting an interurban line in West Virginia. A site for a terminal has been purchased at Harpers Ferry. Power will be secured from Weverton.

HASTINGS, MICH.—A company of Detroit and Ann Arbor capitalists has been organized to build an electric line between Hastings and Battle Creek. Franchises have been applied for, and the proposition is favorably considered by both cities. The company is represented by George W. Bullis, of Ann Arbor.

HONOLULU, H. I.—L. P. Matthews, Cleveland, O., represents an American syndicate in promoting an electric railway system in Honolulu. It is reported that \$5,000,000 may be expended in building the proposed lines.

JOLIET, ILL.—The Joliet Street Railway Co. has received and accepted franchises for the proposed extensions to Plainfield and Manhattan. The construction of a down town loop in Joliet is also considered by the company. F. E. Fisher, superintendent.

KALAMAZOO, MICH.—The Michigan Traction Co. will issue \$600,000 bonds, assuming an obligation to the American Trust Co. of Philadelphia. The Michigan company controls the street railways in Kalamazoo and Battle Creek and will extend the system to connect these cities. An extension to Jackson is also projected. Major L. N. Downs, Kalamazoo, president.

KANSAS CITY, MO.—A recent fire in Kansas City destroyed 13 passenger cars, two construction cars and three sweepers of the Metropolitan Street Railway Co. The loss is estimated at \$27,000. W. H. Holmes, president.

LOVELAND, COLO.—The citizens of Loveland in a mass meeting recently appointed Attorneys E. S. Allen and Lyman Porter to arrange with contractors for an electric lighting and trolley system for their city. It is believed that inducements may be offered the Denver, Boulder & Northern to extend its electric line to Loveland.

MEROM, IND.—F. S. Aldrich, president of Union Christian College, Merom, J. W. Beauchamp and J. V. Barbre are promoting a line to be built by popular subscription from Merom to Terre Haute. The line is estimated to cost \$300,000. At meetings in Middletown, Merom and Prairie Creek a large majority voted in favor of the enterprise.

MILBRIDGE, ME.—W. A. Roberts and E. A. Hubbard of Biddeford, Me., are promoting an interurban electric line, to include four towns on its route. The citizens of Milbridge and Cherryfield favor the enterprise. The road may be capitalized by subscription and bonds will be issued for \$120,000.

MOLINE, ILL.—The petition of the Tri-City Railway Co. for a franchise to build an electric line in Moline is favorably received by the council and equipment will be purchased at once. James F. Lardner, manager and secretary.

MORRIS, ILL.—Application has been made for the incorporation of the Geneva Lake, Sycamore & Morris Electric R. R. A line from Morris to Geneva Lake, Wis., with branches to DeKalb and Helvidere is projected. This is practically a revival of the old Geneva Lake, Sycamore & Southern R. R. project. It is said that a new company has been organized with a capital stock of \$150,000.

NEW YORK, N. Y.—The car house and 43 cars of the Sixth Ave. branch of the Metropolitan Street Railway were damaged by fire February 19th. The loss is estimated at \$75,000, covered by insurance. H. H. Vreeland, president.

OSHKOSH, WIS.—Late reports announce the sale of the properties of the Oshkosh Traction Co. to McMillan, Emerson & Co., of New York. The Oshkosh company is capitalized at \$500,000. The terms of the sale have not been given for publication. G. J. Kobusch, president, Oshkosh.

PETERSBURG, VA.—It is reported that the Southside Railway & Development Co. will build nine miles of extensions in Petersburg, and that a theatre will be erected at the terminus of one of the lines for summer entertainments.

PHILADELPHIA, PA.—Reports have been received that the Railways Company General will build an electric line from Philadelphia to New York and that a capital of \$10,000,000 will be required for the purpose. Stock to the value of \$1,500,000 will at once be issued. The directors of project are George J. Kobusch, W. W. Gibbs, Dr. J. H. W. Chestnut, Edwin S. Cramp, J. B. MacAfee and L. N. Downs. The promoters have acquired control of the Philadelphia & Bristol Railway Co. and hold an option on the New Hope bridge, the only available bridge across the Delaware. When the line shall be completed passengers will be carried from Philadelphia to New York for \$1.00.

PHOENIXVILLE, PA.—The Phoenixville & Bridgeport Electric Railway Co. has been incorporated with a capital of \$100,000 by H. H. Gilkyson and H. S. Williams, Phoenixville, J. MacCarroll, J. W. Perry and L. P. Bane, Philadelphia, and G. F. P. Wagner, Pottstown.

PORTSMOUTH, N. H.—The capital stock of the Portsmouth, Kittery & York Street Railway will be increased by \$30,000. Extensions of the system will be made, a storage battery installed, and a ferry boat to run between Portsmouth and Badger's Island will be purchased. A. F. Gerald, president.

REYNOLDSVILLE, PA.—The Reynoldsville Traction Co. has changed its name and is now known as the Northern Pennsylvania Traction Co. A line will be built to Rathmel, Sykesville, Clarion and Oil City. Offices will be taken by the president of the company, in the Drexel Building, Philadelphia.

RICHMOND, IND.—Further franchises have been obtained by the Eaton & Richmond R. R. Co. and the construction of the proposed electric line between Eaton and Richmond will be commenced in the summer. Henry B. Pruden, of Dayton, O., is the principal promoter.

ROCHESTER, N. Y.—The Rochester & Suburban Railway Co., a reorganization of the Rochester & Irondequoit R. R. Co., has been incorporated with a capital stock of \$420,000, of which \$350,000 is preferred stock. Frederick Cook, George W. Archer, William C. Barry, John N. Beckley, Jacob Gerling, Bernard Dunn, Joseph C. Tone, Albrecht Vogt, William Purcell, W. D. Ellwanger, F. S. Upton, Max Brickner and Louis Griesheimer, all of Rochester, are directors.

ROCKVILLE CENTER, N. Y.—The Nassau Belt Line Traction Co. which was organized March 17th, 1899, has completed its organization, obtained its consent from the Railroad Commissioners, has all its local consents from abutting property owners required by statute and has secured the franchises from all the villages through which it passes, including Rockville Centre and Freeport, and from the Town Boardway Commissioners except in the village of Hempstead a distance of two miles, thus completing 28 of its 30 miles of desired franchises. Paul K. Ames, Rockville Centre, president.



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C. B. FAIRCHILD, EASTERN REPRESENTATIVE.

CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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APRIL 15, 1900.

NO. 4

One of the strongest arguments against the municipal ownership or operation of business enterprises is that political consideration instead of efficiency will be the standard for measuring the value of employes. A very good illustration of how this works in practice is shown in the report of the chief of the wiring department of the electrical construction division of public buildings, Boston. Men obtain appointments at the instance of political bosses who see to it that they are not discharged when work becomes scarce. The work done by the wiring department has cost the city of Boston about 60 per cent more than the bids made by reliable companies.

The management of the Hamilton & Lindenwald Electric Transit Co., of Hamilton, O., has announced a radical, and many of our readers will doubtless think, ill-advised reduction in the rates of fare. The tickets are all limited as to the time within which they must be used and consist of three classes. First, books of tickets that are good only during certain hours at the rate of 3½ cents per ticket for 12-ride weekly books and a trifle under 3 cents per ticket for 104-ride monthly books. Second, commutation family books at the rate 3.7 cents per ticket in books of 50, good for 30 days, and 3.5 cents per ticket in books of 100 good for 60 days. Third, individual tickets good for any number of rides in 3 months for \$10.

This company operates 9 miles of track and serves a comparatively small population, say 30,000 people. (The census of 1890 gave Hamilton less than 18,000.) The hauls are short and we venture the guess that the average cost to the passenger even at the 3 cent rate will be in excess of 1 cent per mile. Under these conditions the company may find that traffic will be increased so that cars now carrying but few passengers will be filled, thus producing a revenue with but slightly increased cost of operation.

We sincerely hope that the company may find the reduction of fares a financial gain, but wish to point out that success in this case

would be no indication that the same methods would produce similar results in a city where the hauls are long and the problem is not to fill empty cars, and with the wages and other operating expenses higher than is usual in the country.

For several years there has been a growing tendency on the part of municipalities to try and force a reduction in the fares to be charged by street railway companies, by an ordinance purporting to be based on a clause in the franchise reserving to the city the "power to regulate the operation, etc.," or else defended as a proper exercise of the "police power." It is unfortunately true that no matter how ill-founded may be such pretensions as to the power of the city to confiscate street railway property under the guise of "regulation," there is always danger of the state courts sustaining the validity of the ordinances in question. The company, however, can usually raise a "federal question" and even after the case has been passed on by the state courts, have it reviewed by the federal courts. In view of the frequency of such litigation, those intrusted with the management of large street railway properties, either incorporate in a foreign state or choose non-residents for the trustees of their mortgages, so that the case can be fought in the federal courts from the first.

The three most bitter controversies over a reduction of rates of fare are those in Indianapolis, in Milwaukee and in Detroit. In the Indianapolis 3-cent fare case the Indiana courts held the law to be proper exercise of the "police power" while the federal circuit court decided it was a violation of the contract rights secured to the railway company by its charter; the point was also made that even were it merely a police law, the question of whether the prescribed rate were reasonable would remain to be determined.

The Milwaukee 4-cent fare case decided in the United States Circuit Court, May 31, 1898, was contested on the ground that the prescribed rate was unreasonable and a "taking of private property without due process of law" and also that the company by its franchises had the right to charge a 5-cent fare which right the city could not impair. The case was decided on the first ground only.

Last month the Detroit 3-cent fare ordinance passed in August last was held invalid. The decision of Judge Swan of the United States Circuit Court is given at length elsewhere in this issue. The court held that the power reserved to the city "to make such further rules, orders or regulations * * * deemed necessary to protect the interests, welfare or accommodation of the public * * *," could not be construed to give the right to reduce the fare to 3 cents. Said the court: "If the city may sequester two-fifths of the grantee's earnings, why may it not take all?" It was further held that by prescribing a maximum fare of 5 cents the city was debarred from attempting to regulate this point. This is independent of whether the reduction was reasonable or unreasonable.

There is now pending at Detroit another suit to prevent the enforcement of an ordinance, which provides that transfers should be issued on transfers. The corporation counsel is reported to have refused to appear for the city on the ground that the ordinance is invalid. This is an indication that the ordinance was not passed with any idea of being able to enforce it, but as a play to the galleries and to keep the controversy going.

The necessity of guarding against stray currents from street railway circuits by providing better track returns is again brought to the front in a paper read before the Institution of Engineers and Shipbuilders of Scotland, by Prof. Andrew Jamieson. Although we have always maintained that the danger from such leakage currents has been grossly exaggerated by the daily press and by misguided alarmists, we believe the best way to silence the carping of these critics, and remove any possible ground they may have to stand on, is to provide the best possible return circuit that the latest developments of the science can suggest, even though this is done at an increase in cost of installation. The increased efficiency of the system, the decreased risk of interruption to the service, and in addition the lessening of the chances of having to defend suits for alleged damages by electrolysis will more than counterbalance the extra expenditure. The mere fact that a company can give evidence of having done everything reasonable in its power to prevent electrolysis, will bear considerable weight with an impartial jury, should a suit be brought for alleged destruction of pipes.

But according to Professor Jamieson, it appears that damage to water and sewer pipes and interference with telephone exchanges, are not the only charges to be brought against wandering currents

from tramway circuits. In his communication to the Scottish Institution mentioned above, he draws attention to the action of electric tramway currents on submarine telegraph cables and other electric circuits. In concluding his article he proposes a remedy for perfecting the track return, and thus preventing injury to neighboring pipes, or interference with near-by submarine telegraph lines.

The paper deals particularly with the trouble experienced by the Eastern Telegraph Co. at Cape Town, South Africa, from induced or secondary currents in its telegraph cables, where they approach the shore, along which are laid the tracks of the Cape Town Electric Tramway Co. It is said that this disturbance was one of the many causes of delay in the transmission of cablegrams during the early part of the British-Boer war, and the author states that the same trouble has been experienced to a less degree at Madras, India, and at Coney Island, New York. There is a chance of its occurring wherever submarine cables approach, or run parallel a short distance from electric railway lines, unless proper precautions are taken.

Professor Jamieson was requested last July to proceed to Cape Town for the purpose of acting as one of the advisors to the Cape Town Electric Tramway Co. in an action brought against it by the Eastern Telegraph Co. for this interruption to its business. There was no allegation made that the cables had been injured by electrolytic action, but simply that false, inductive impulses were generated in them by return stray currents from the tramway, these of course rendering regular messages very difficult or impossible to decipher. After a thorough investigation, Professor Jamieson advised a specially prepared cable with twin twisted core with double armoring, for the shore ends of the telegraph lines, and recommended the tramway company to obtain and place in circuit, with separate return feeders from different points along the rails, a sufficient number of negative boosters (or sucking dynamos as he calls them), in order to reduce the return currents in the rails at these points to zero potential; and thus prevent the fall of pressure along any portion thereof ever exceeding the limits of the Board of Trade rules, i. e., not over 7 volts. He says: "This would naturally stop electrolytic action on neighboring pipes, and greatly reduce the potential, the strength and the range of stray currents, and hence the chance of their reaching the sheathing of the submarine cable and of acting inductively upon its conductor. Finally, I believe that land telegraph, telephone, and other electric circuits can be protected from all interfering influences of electric tramways by employing twisted outgoing and return insulated conductors, and that electrolysis may be prevented by using heavy well-bonded rails with return feeders and sucking dynamos whenever the fall of pressure along any section tends to exceed five volts."

As a rule the street railway companies subscribe to the technical journals devoted to the industry, for the general officers, and many of them go farther and take from five to one hundred copies per month, according to the size of the road, for the purpose of supplying its minor officials and employes with this instructive literature. That the best managed and largest roads in the country pursue this policy to the largest extent is evidence that they consider it a desirable and profitable investment. They certainly are not actuated so to do from motives of charity.

Recently, however, the executive committee of a well-known road reached the conclusion that "its heads of departments should have ambition enough to secure for themselves such matter as will qualify them for their several positions." The committee could not see why the company should furnish its president, secretary, superintendent or any other officer with reading matter of any kind. It maintained that these offices are filled by men who have received a liberal education and who are paid all they are worth. If they feel the need of information and experience other than that now possessed, or to be obtained within the limits of their own daily routine work, let them individually bear the expense. The inference plainly is that the committee has done its work of selecting officers so well that those officers have or should have,—if the committee has made no mistake,—a fund of knowledge and experience which needs no addition from outside sources.

We freely subscribe to the claim that the road in question is well conducted, and its officers rank well in the official fraternity, but the impression conveyed in the ruling of the committee, while highly complimentary to the ability of its officers today, carries no urgent expectation of a greatly higher standard. None of us but should feel, however well performed an accomplishment of today,

we ought to do a little better next time. In these days the man who hesitates—hesitates to crowd his efforts constantly to the utmost—will soon fall behind in the race. There is a meritorious pride in a thing well done, but it could and should be better done another time. We believe in frankly commending the deserving, faithful worker, from the president down to the employe filling the most humble position; but we also believe in holding before him in the right spirit the policy of always striving after still better results.

The secret of success of many managers who most satisfactorily handle large bodies of employes is found in an intelligent exercise of this means of encouragement and improvement. Apparently the executive committee in question does not take this into consideration. It is not the little matter of the few dollars involved in the half dozen or so subscriptions, for the total amount is too small to spend any time in discussion; it is the principle involved. It is seldom the large things but rather the small ones which show the direction of the wind.

Is there any reason why a company should furnish its operating heads with literature? Is a technical journal, or is it not, one of the necessary tools with which a man should be provided? Does the paper represent merely the individual ideas of its editor or does it collect and present the experiences and opinions of the best workers in its field, every where? Would the up-to-date manager of ten years ago be considered up-to-date today had he remained at home all through these years of evolution and read nothing of what other men were doing? The ideas and methods contained in a single issue of any first-class technical journal would cost the individual reader weeks of travel and study to obtain. No man in these days can hope to do the best work of which he is capable unless he regularly studies the current literature of his business, calling or profession. When very sick do you seek out the doctor who was good a few years ago but has read nothing of medical discoveries, appliances and methods for five years past? Street railway properties are subject to constant and acute attacks of socialistic germs and other vicious microbes, and the manager who is to keep his corporate patient well and strong and in the fullest possession of its faculties cannot be too well fortified against the day of need. It is no time to read up on bone setting when an arm is fractured.

It is also true that the officer reads his street railway paper because he is a street railway man. When for any reason he goes out of the work to engage in some other, he no longer has the time, necessity or inclination to continue studying street railway problems but takes up another publication devoted to the industry or profession to which he has gone. The journals for which he has paid several dollars per year are worthless to him for reference in his new occupation; they are, however, extremely valuable to his successor. They should therefore be paid for by the company and after reading become the property of the office, to be handed down to the new incumbent together with the desk and other office equipment. That these monthly records of events are valuable is evidenced in the fact that scarcely a day passes but we are called on to furnish one or more back numbers. Frequently these requests come by telegraph, showing the emergency of the need.

When the American Street Railway Association was organized and for several years, very many of the men who attended these meetings did so at their own personal expense.

The directors with a great show of liberality allowed the manager a week's vacation (!) in order to attend the annual convention. Happily this has changed; boards have realized how important it is to have its operating heads attend these meetings and where a few years ago one representative came, the same official is now accompanied not only by other officers, but the electrician and trackmaster and master mechanic also are with him.

We have not wandered from our subject. The latter instance simply illustrates the original proposition, which is, all the experience is not bound up in boards of directors and executive committees, and it is poor economy to withhold from your workers, official, or in the ranks, anything within reason which will strengthen their position. The daily press of the country are not fighting the battles of the street railway to any noticeable extent. It is left almost wholly to the street railway press to secure, collate and present in usable form, such data and ideas as help to fortify the street railway official in his tireless efforts to protect street railway interests.

The System of the Boston Elevated Railway Co.

Department of Motive Power and Machinery—Rolling Stock and Repairs—Shop Methods—Department of Electrical Engineering—Department of Stores.

BY C. B. FAIRCHILD.

PART II.

DEPARTMENT OF MOTIVE POWER AND MACHINERY.

The regulations state that the superintendent of this department (Mr. Charles F. Baker) shall have charge for surface lines of all power stations, repair shops, machinery, mechanical motive power, car, motor and truck repairs, and is to be assisted by the following officers: Superintendent of Power Distribution, Superintendent of Machine Shops, Superintendent of Car Equipment Shops, Superintendent of Car Shops, Chief Mechanical Draftsman, Inspector of Motor Car Repair.

All appointments to positions of importance in these departments have to be submitted to the vice-president for his approval before taking effect, as also the discharges of these officials, and the wages and salaries paid with any change in same are also to be submitted to the same officer for approval before becoming effective.

POWER STATIONS.

As stated, the electric current for the entire system is supplied from seven stations, and these are named from the location. The accompanying table shows the name and electrical capacity of each of the stations. From this, it will be noted the nominal capacity is 26,144 kw. and 47,533 amperes, but the equipment is safe for an over load of 25 per cent, which means 32,680 kw. or 59,417 amperes.

STATION CAPACITIES.

STATION.	Number of Machines.	Size.	Nominal Capacity.	
			Kw.	Amperes
Central Power Station	1	2,700	2,700	4,909
" " "	2	1,500	3,000	5,454
" " "	6	1,200	7,200	13,091
Total	9		12,900	23,454
Auxiliary Station	38	50	1,900	3,455
Total Main Station	47		14,800	26,909
Harvard	3	1,200	3,600	6,545
East Cambridge	7	400	2,800	5,090
Dorchester	2	1,000	2,000	3,636
Charlestown	2	800	1,600	2,909
Allston	12	62	744	1,353
Total Main System	73		25,544	46,412
East Boston	3	200	600	1,091
Grand Total	76		26,144	47,533

Space will not permit of an elaborate description of the steam and electrical equipment of the various stations, but the reader is referred to the Boston Convention number of the "Street Railway Review," August, 1898, for the description of the seven stations then in existence. The central power station, however, which is located on Albany St. and near the center of power distribution is of interest in this connection from the fact that the station and equipment have been remodeled since the plant was first established and because the equipment has recently been increased by the addition of a new unit larger, and of a different type, from those in any of the other stations and raising the capacity of the station to 18,000 h. p. This unit consists of a vertical cross-compound condensing engine of 4,000 nominal h. p. but capable of working up to 7,000 h. p. The cylinders are 42 and 90 x 60 in. and it is designed to run at 75 revolutions. The fly-wheel is 28 ft. in diameter and of the spoke type. The top of the frame stands about 34 ft. above the floor. In workmanship and design this machine sustains the reputation of both the old and new companies. The engine is direct coupled to a 2,700-kw. generator. This generator was contracted for and partly built by the Walker Co., of Cleveland, but was finished by the Westinghouse company after the latter came into possession of the plant of the Walker Co., and at that time it was the largest machine that had been designed. The total weight of the generator is about 300,000 lb., and the armature, which is 16 ft. 6 in. in diameter, weighs 115,000 lb., and is mounted on a 37-in. hollow-forged nickel steel shaft made by the Bethlehem Steel Co. The outside diameter of the commutator is 8 ft. 9 in. The field magnet frame is of cast steel and provided with hand holes. The poles are of laminated wrought iron and bolted into the frame, the handholes giving easy access to the bolts which hold

the poles in place. At a normal load this generator is designed to give an output of 4,500 amperes at 600 volts, or sufficient to operate 300 loaded street cars.

The condensing "plant" of this engine is of special interest, as it dispenses with the usual air pump required with condensing engines, and forms and maintains its vacuum entirely by the use of the exhaust steam and the condensing water. The apparatus consists of two of the well-known "Bulkley" injector-condensers, attached by angle elbows to the main exhaust pipe, each condenser being 24 in. in its exhaust opening. The exhaust steam enters a hollow cone of moving water, at the upper part of the condenser, and in condensing imparts to it a velocity that it enables it to carry

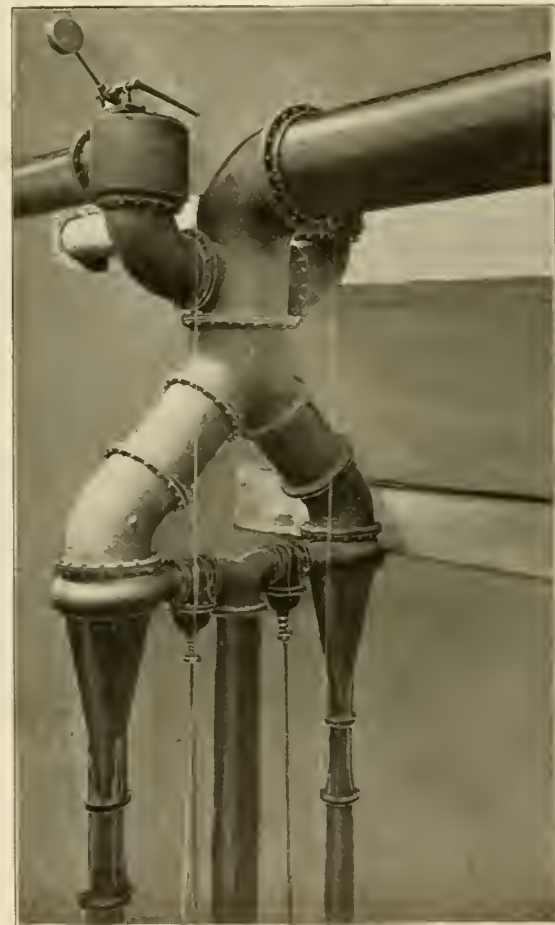


FIG. 28 BULKLEY CONDENSER.

out the air and vapor into the enlarged portion of the condenser below. The condensers are each connected with the hot-well below by air-tight water discharge pipes, of sufficient length to allow the water to be delivered by gravity against the pressure of the atmosphere. They are both supplied with water by a centrifugal pump operated by an electric motor, which takes its supply of salt water from the Bay, and after the vacuum is formed the water is elevated about 25 ft. by atmospheric pressure, thus giving the pump very little work to do. Either or both condensers may be used, according to the load on the engine and temperature of the water, and a very high vacuum is thus maintained as long as the water supply is kept up. The automatic relief valves at the top, will allow the engine to work non-condensing the instant the vacuum is lost from

any cause. In many instances a natural head of water of 10 ft. or more can be obtained, in which case no pump is required, the condenser syphoning the water, after starting, and operating until the water is shut off. The safety, simplicity, and economy of this device will commend themselves to any one using a steam engine, where condensing water can be obtained. Several independent condensers may be supplied by a single pump, which may be a steam driven, a centrifugal, a rotary or other power pump.

The central power station has a very interesting history. It was designed and built in 1889-91 under the direction of Mr. F. S. Pearson, then chief engineer of the West End Co. As originally designed the equipment consisted of six triple-expansion engines belted through countershafting to multipolar 500 kw. generators. In 1896, however, under the direction of the present superintendent of power stations, the six triple-expansion engines were enlarged to 1,600 h. p. and direct coupled to G. E. generators. Two of these are of 1,350 kw. capacity and four of 1,200 kw. There are also two 2,000-h. p. engines direct coupled to generators of 1,500 kw. capacity. The fly-wheels of all the engines are of the solid plate type. This type of wheel, however, is not in favor with the engineer of the

are tandem-compound of 200 h. p. each and are run at 210 revolutions and are each belted to four G. E. generators of the D. 62 type. It is interesting to note in this connection that no deterioration of efficiency is observed in the engines or generators notwithstanding their long service. It is not claimed, however, that the arrangement is as economical as that obtained by more modern methods.

Among the station practices, it is worthy of remark that it is the custom of the engineer to have the different machines started up and run for an hour before the load is thrown on, thus giving the cylinders and ports a chance to warm up and prevent the danger of condensation in the cylinders, resulting in breakdowns which were so common in the early history of this equipment. In the engineer's room is found a testing equipment by which the steam and vacuum gages can be tested, the same apparatus answering for both types of gages, by the proper adjustment of the pump connections. It is the practice of the engineer to test all the gages of each machine once every month and also to indicate each engine monthly. When the station was changed, as stated above, the piping system of the whole station was also reorganized and sim-

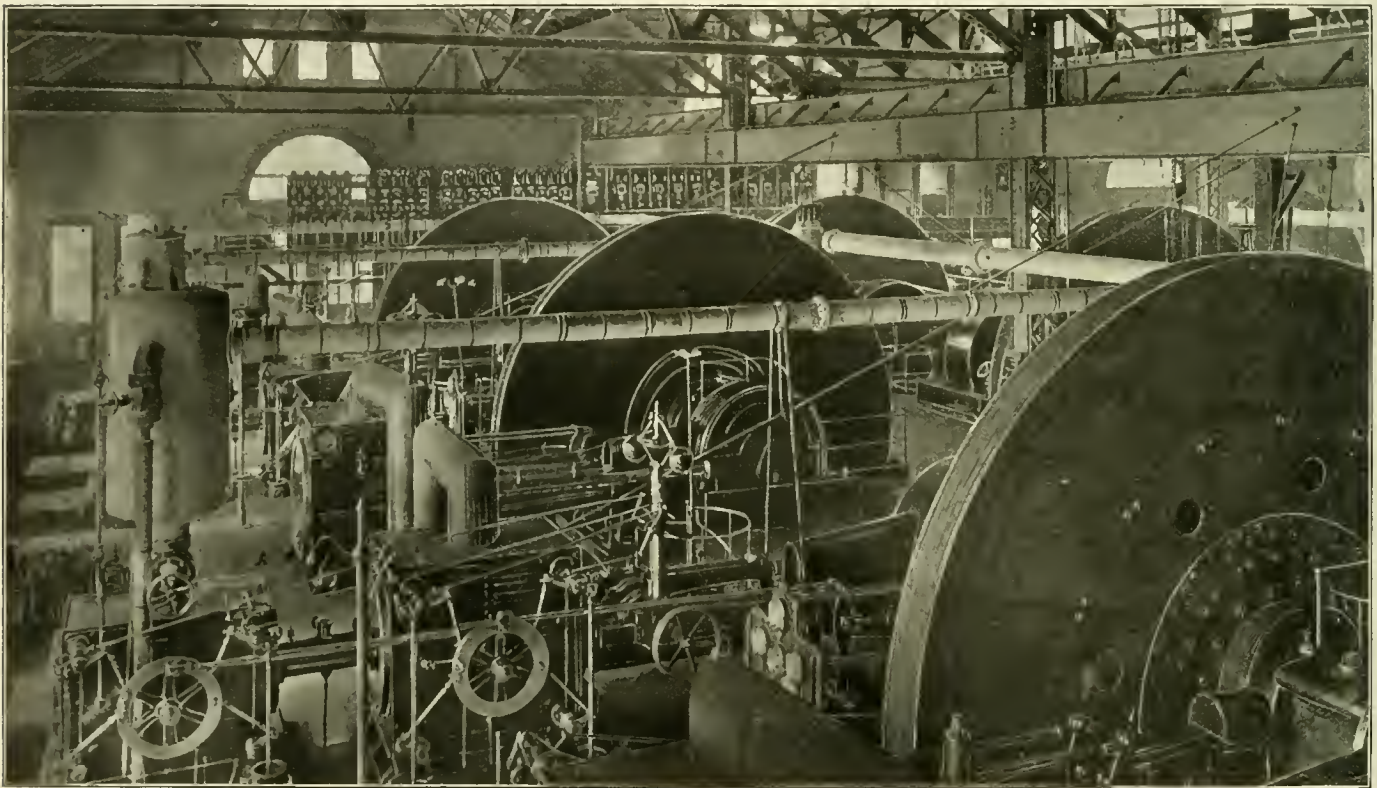


FIG. 29—GENERAL VIEW OF CENTRAL POWER STATION, BOSTON.

station for the reason that the attendants cannot see through so as to know the condition of the machinery on the opposite side, and they do not provide as good ventilation for the generators as spoke wheels, for the spokes set up a circulation of air that helps to cool the generators. The engines are of the Reynolds-Corliss type and were made by the E. P. Allis Co., of Milwaukee. Included in the auxiliary equipment are Stratton separators built by the Goubert Manufacturing Co., of New York, and Green economizers. The feed water is handled by a series of gang pumps of the four-plunger pattern, piped to heaters, economizers and boilers. These pumps are driven by means of a shaft actuated by a D-62 type of generator run as a motor. Fig. 29 is a general view of this station showing engines Nos. 1, 2 and 3.

In connection with the central power station should be noted the original power equipment located in neighboring building which was a part of the old Hinkley locomotive works that formerly occupied this property. This station was one of the first installed by the railway company for electrical purposes and was built in 1889, but is still running, and is used to help out the load during the heavy morning and evening traffic and in stormy weather. This station has a total capacity of 10 engines and 40 generators. The engines

plified. The duplicate system of pipes was removed and by a method of coupling the same results were secured with much less complication and all this overhauling was done without interfering with the operation of the station.

The boiler equipment of the central station includes 32 boilers, all of the Babcock & Wilcox type; eight of these are double-deck batteries and 24 in single decks; two extra boilers were recently installed to provide steam for the new vertical engine. Thus far mechanical stokers have not been employed in this boiler plant.

COAL HANDLING.

Coal for the central station is landed from barges and schooners upon a wharf just across the street from the station. Here is also landed the coal for such of the stations as are not located on the rivers or water front. An elaborate coal-handling equipment is provided. This consists of a bridge crane which transports all the coal between the vessel and cars; this span is shown in Fig. 30. At the water end is a cab with an 80-h. p. motor for operating the ropes controlling the shovel which is of the clam-shell type, so that the coal is elevated and run out over the storage area and dumped where necessary. The storage platform is provided with two tun-

nels, one larger than the other, constructed as shown in Fig. 30. These are of wood and are of sufficient height to allow the coal cars and mining trains to back in and out. The coal is piled in heaps above these tunnels and at suitable intervals chutes and gates through the roof are provided, by the opening of which the coal falls directly into the cars.

For delivering coal to the boiler house of the central station from the dump, a distance of about 950 ft., a mining train is employed, consisting of a narrow-gage electric locomotive and two Hunt automatic side-dumping cars. The train being backed into one of the tunnels is loaded as above described and after crossing the street is run onto scales, as shown in Fig. 31, where each car is weighed,

HARVARD POWER STATION.

This being the last new station erected, having been completed in 1898, the nature of the power equipment is of interest. This consists of six 500 h. p. Babcock & Wilcox boilers with economizers and smokestack for twice this number. At this station the boilers are fitted with "Acme" stokers, these being the only mechanical stokers used by the Boston Elevated. The main engine equipment comprises three compound corliss engines, 28 and 56 by 60 in., made by the Allis company, direct connected to 1,200-kw. General Electric generators. An extended description of this plant and the results of a 45-hour test of the station were published in the "Review" for December, 1898, page 875, et seq.

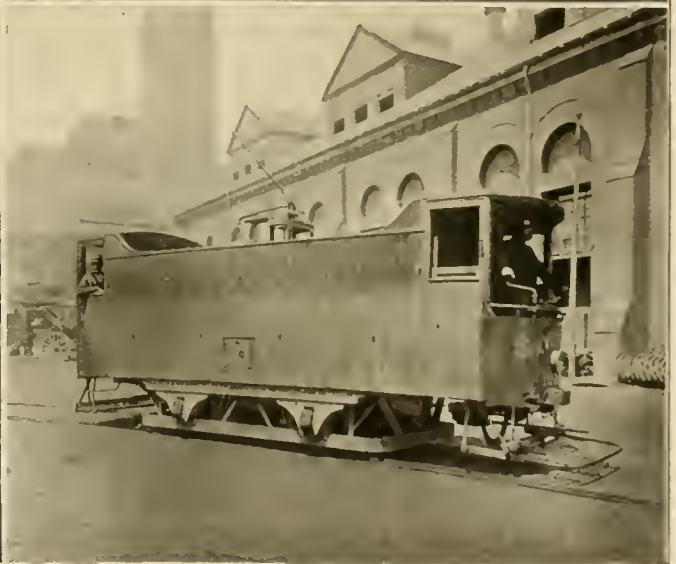


FIG. 30—COAL WHARF.
FIG. 32—ALLSTON COAL CAR.

FIG. 31—SCALES.
FIG. 33—HARVARD COAL CAR.

when the train proceeds to the boiler room over a slightly elevated track where the cars are unloaded in front of the boiler, the cars being so constructed that they dump without shoveling.

For transporting the coal to some of the stations and car houses two types of coal cars are employed, both of which are loaded in the tunnels as already described. A car that delivers coal to the Allston power station and car houses is shown in Fig. 32. It carries a number of steel buckets, provided with heavy cross arms or bails, which are so designed that they can be unloaded by hoists, and being lifted are run by overhead trolleys and dumped at any desired location, and the bucket returned to the car. Fig. 33 is an electric coal car with a capacity of 30,000 lb. serving the Harvard station. This consists of a single bin into which the coal is loaded in the tunnels and which is provided with side-dumping mechanism.

ROLLING STOCK AND REPAIR SHOPS.

The number of closed passenger cars employed by the company is 1,381 and of open cars 1,392. Of the former 18 are 16-ft. cars, 330 are 20-ft. cars with single trucks (including parlor cars) and 1,033 are 25-ft. cars, double trucks. The open passenger cars include 88 seven-bench single truck cars, 480 eight-bench single truck, and 747 nine-bench single truck, 46 ten-bench and 31 twelve-bench double truck cars. There are also eleven 16-ft. mail cars, two electric locomotives, four 16-ft. service cars and one 16-ft. directors' car. There are now under contract, for delivery the coming summer, 150 standard 25-ft. closed passenger cars, and the company is building in its shops at Bartlett St. 50 standard 12-bench double truck passenger cars to be ready for use in June next.

Fig. 34 illustrates the standard closed car. The standard length

for closed cars is 25 feet. These are provided with side seats upholstered with plush and plush backs. All the closed cars have Woods safety gates, made by the R. Bliss Manufacturing Co., of Pawtucket, R. I.; this gate is the type as used by the Brooklyn Heights R. R. The car shown in Fig. 34 is equipped with the illuminated sign shown in Fig. 40 and also has the Wilson trolley pole catcher, which was furnished by the Frank Ridlon Co.

The standard open car is illustrated in Fig. 35. Trucks are provided for both closed and open cars, but the motor equipment for



FIG. 34—STANDARD CLOSED CAR.

the open cars is taken in part from the trucks of the closed cars. The single truck open cars are usually equipped with only one motor and on these the current is controlled by means of rheostats of the half circle type and operated with lever and chain.

nearly all mounted on single trucks; out of the total number 1,315 are single. The motor equipment consists of 1,620 of the W. P. type, 550 G. E. 58, 519 G. E. 800, 773 No. 12 A Westinghouse, 396 No. 12 Westinghouse, 30 Westinghouse 68, and four of the Walker type, making a total of 3,808. The latest additions are the large size

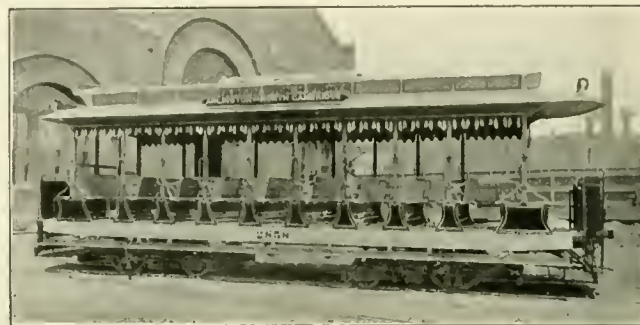


FIG. 35—STANDARD 12-BENCH OPEN CAR.

motors. The miscellaneous equipment includes 188 snow plows of which 43 are of the Taunton type. The others were made by the company. Fig. 36 shows the Taunton 1800-1900 model and Fig. 37 the Taunton plow with the Boston Elevated Railway Co's improvements; these are standard on the Boston Elevated. Fig. 38 is from a view of a plow with the fluke raised. The lever attachment was devised to relieve the men of the work of holding down the fluke, which was usually done by riding on the wing. This lever is like a wagon tongue and is pivoted to the top of the wing with the upper end passing through a ring attached to the edge of the roof. From the upper end a chain descends to a foot lever, which may be operated from the rear platform or from within the cab, by means of which the wing may be held down with pressure sufficient to hold

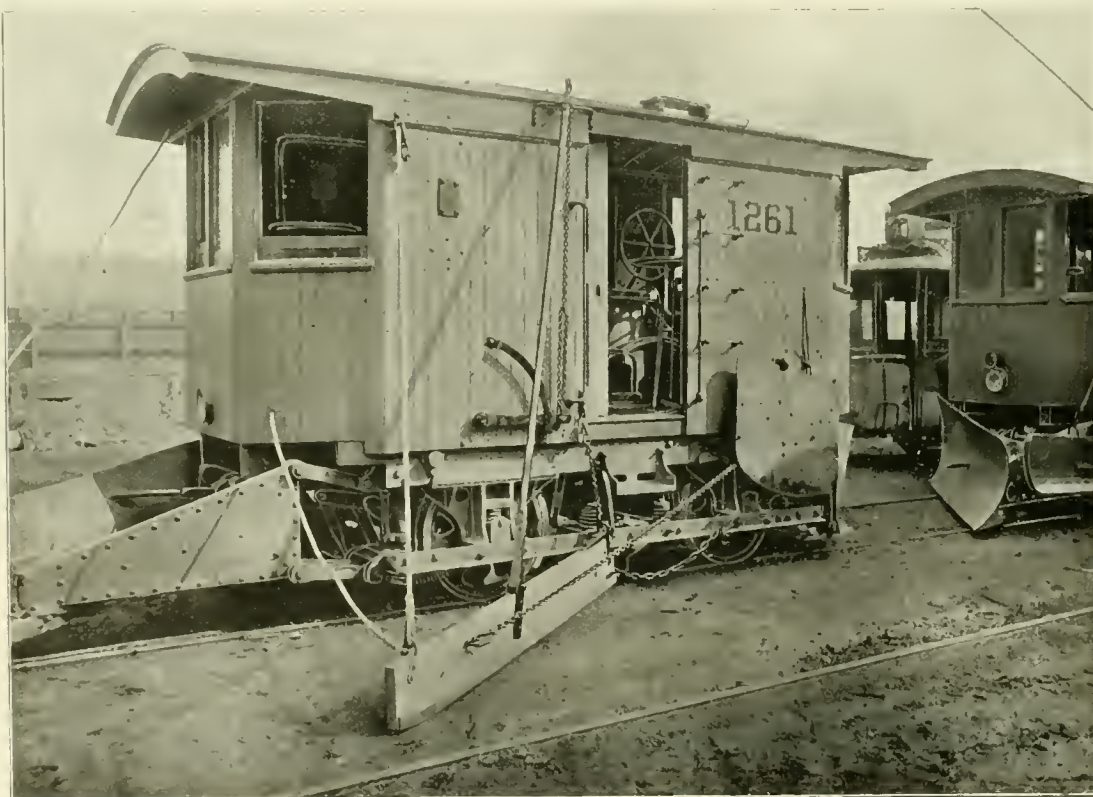


FIG. 37—TAUNTON PLOW WITH IMPROVEMENTS.

Various types of trucks are employed. These consist of 1,715 four-wheel trucks, 22 Robinson radial, 678 West End swivel, 292 Bemis, 131 maximum traction, including those of the Brill and Peckham make, and 7 miscellaneous trucks. The open cars are

it to its work without exposing the men. A helical spring inserted in the chain near the top provides an elastic motion for the wing.

The latest addition to the snow plow equipment is what is termed by the company a parlor snow plow; this was built in the com-

pany's shop after a design suggested by the president, and is fitted up for the accommodation of the president and his friends whenever he shall choose to get a practical demonstration of the best methods of fighting snow. The cab is finished with interior apartments with cushion seats and observation rooms and provision is made for keeping it warm and comfortable. This machine is illustrated in Fig. 30. The methods of handling the snow problem will be described later in connection with the transportation department. Besides the coal cars already illustrated there are four miscellaneous cars for handling freight and distributing supplies.

An interesting feature of the 50 open cars the company is building in its own shops is the steel plate which reinforces the car sills. This plate is $\frac{3}{4}$ in. thick, 10 in. wide and 30 ft. in length, with square and round holes for the bolts, the holes being punched in the repair shop.

Notwithstanding the different makes of trucks employed, the company specifies the type of brake mechanism, the journal boxes and the method of motor suspension. These are standards with the company. Included in the latest snow plow equipments are several sets of wheels having serrated flanges furnished by the Burnham & Duggan Railway Appliance Co., of 60 State St., Boston. The serrations are on the outside of the flange and are designed to dig the snow and ice out of the groove of the rail to insure good traction and electrical contact; it is stated that these wheels work in a very satisfactory manner.

An interesting point of the car equipment is an illuminated sign, shown in Fig. 40, which is located under the hood of the car. The illumination is secured by means of a long semi-circular metal reflector attached under the edge of the hood and open on the under side, with an 8 c. p. incandescent lamp in a horizontal position near each end. The sign is slid into a holder consisting of a metal plate with double flanges which provides for carrying two signs. The letters of the sign are large and of a bluish white dead color. Each plate has lettering on each side, so that four changes may be made. The success of the sign is due to absence of reflecting surfaces in the letter or sign.

The reflector and sign were devised at the suggestion of Mr. Sergeant, and were made in the company's shops. The ordinary tin shop tools were used, with the addition of a hydraulic press, so that the plates are trimmed and stamped out in a very economical manner.

on Bartlett St., near Washington, and several miles from the former. The Albany St. buildings also provide for the storing of supplies. A new shop is contemplated by the management, so that all the repairing can be done under one roof. The first floor of the Albany St. shop is known as the car equipment shop, where motors are mounted, trucks repaired and car bodies adjusted to the truck. On this floor are a number of heavy iron working machines together with the wheel borers and the wheel presses. The tools are operated by a stationary motor, and special motors are provided for some of the larger tools. This shop is provided with pits, also with trucks and hand hoists and pneumatic hoists for the handling of heavy parts. One section of the blacksmith's shop also occupies this floor. The different floors of the



FIG. 30. STANDARD TAUNTON SNOW PLOW.

building are served by an elevator, and material is hited to the different floors on small trucks, which run on tracks through the different departments. The first floor also contains the motor testing department, which will have attention later on.

The machine shop proper, which is under the supervision of Mr. John L. Mitchell, occupies the third floor and the equipment of tools is very complete. The company has discontinued the manufacture of gears and pinions, finding it better to purchase these from the makers of this class of supplies. For this reason it has several gear cutters for sale, which are first-class machines. Trolley wheels, car trimmings and brass fittings of every description are made in the shops, a brass foundry being provided for the

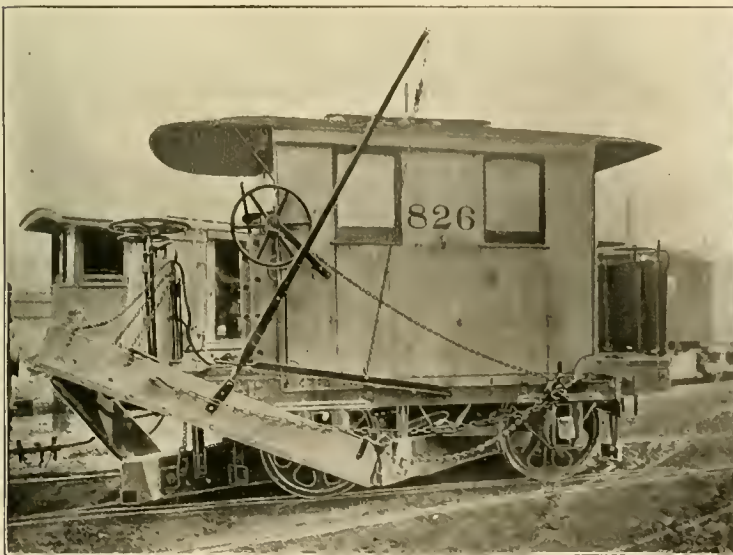


FIG. 38—PLOW WITH FLUKE RAISED.



FIG. 39—OBSERVATION SNOW PLOW.

The wheels are chiefly of the Griffin make. These are turned bored and mounted in the company's repair shop two 30-in., 100-ton wheel presses made by the J. T. Schaffer Manufacturing Co., of Rochester, N. Y., being employed. The axles are of cold rolled steel and are turned and fitted in the shop.

The repair shops of the entire system occupy two sets of buildings, one on Albany St., near the central power station, which was formerly occupied by the Hinkley Locomotive Works, the other

castings. Among the special methods and practices of the shop may be noted a device for turning trolley wheels. This is so designed that the wheel is mounted on a mandrel and a cutting tool of the desired shape for the groove is brought into action and turns each wheel to an exact pattern at one operation. The cutting tool is made of steel like a small sheave, but with a segment cut out making the cross section of the rim of the desired form of the groove. To sharpen this tool one side of the segment is

ground flat, a very simple operation, and each grinding leaves the cutting edges of the same shape. A single cutter of this design is said to last for the turning of as many as 50,000 wheels. In fact, it is almost indestructible. The work of turning the wheels can be done by a boy, as very little skill is required, and one is able to turn up as many as 300 wheels a day. For forming the outside edges of the flange of the wheel a cutting tool is mounted on the same head, and is brought into action as required.

Among other interesting machines are two Hartness flat turret lathes made by the Jones & Lamson Machine Co., Springfield, Vt., which are used for making the steel bond thimbles, by means of which the rail bonds used on this system are attached to the rail. The largest of these are taper plugs about 2 in. long, bored out to receive the bond wire; these being swedged to the bond and driven into the rail holes, make good electrical contact. This



FIG. 40—SIGN.

machine receives a steel rod of proper size and turns out complete thimbles.

In one section is a machine for testing the ability of trolley wire to stand the bending strains. A section of trolley wire about a foot long is fastened to an ear or clamp in the ordinary manner, and this is held stationary, while a rod attached to the crank of a wheel is fastened to the other end, so that the wire is bent up and down through about the range that is found in actual service. This machine has a register which counts the number of times the wire is bent, and the machine is run at about 60 revolutions per minute. A record is made of how many bends the wires of different sizes will stand before breaking.

The tool room is fenced off in one section of the floor in which tools are kept and repaired and dealt out to the workmen.

The superintendent of the machine shop keeps a pattern book, in which he makes a sketch (see Fig. 41) of every pattern that is made for parts of either iron or brass. These sketches are numbered, and though not drawn to scale have the dimensions and weights noted. Those for iron parts are made in black ink, and those for brass in red. This serves as a handy reference, and when a part is wanted the foreman has but to turn to the record, when the pattern can be located by its number and the weight and character of the material to be ordered is readily ascertained.

Several of the best machinists are assigned to night work in the shop. These are always on duty at night, so that they may be on hand for any special repairs that may be required. A list of 15 or 20 of the regular machinists is also kept, with their house address and nearest telephone station, so that in case of breakdowns, or when their services are required at night, the master mechanic can call on one or all of them and order them out for any special work.

The armature repair department occupies a floor of this same building, and here all repairs to armatures, commutators, rheostats and controllers are made. Commutators are made in the shop from drop forged bars, which are purchased from the dealers. Female help is employed in the coil winding and taping department. For taping the coils, stands are provided with a swinging button, so that the coil is held firmly in position to facilitate the winding. The tape is wound on circular bobbins having a tension apparatus, so that the roll is passed readily through the coil, and the winding quickly effected. Only plain tape is employed for winding the coils, but after winding the coils are dipped in an insulating compound known as "Armalac." In the opinion of the shop superintendent, this method is superior to that formerly employed, as it gives the best insulating quality, remains flexible, and is cheaper than paper or rubber insulation.

The brass foundry occupies a portion of the ground floor and

here seven molders are usually employed, for, as noted above, all the trimmings, as well as trolley wheels and other brass supplies, are cast in this department. Scrap copper is used, while the tin and spelter are purchased in the pig. The equipment of this foundry includes six brass furnaces, with all the auxiliary equipment usually found in foundries of this character. Car trimmings for repairs are not only made, but all the trimmings for the 50 new open cars that are being built are here cast and finished up in the machine shops. The car trimmings include the out rigged double handles, which are illustrated as mounted on the posts in Fig. 35.

A written order, with number, is given by the superintendent for every item of repair that is done in the shops, and the time and character of the work is reported by the machinist, so that a careful record is kept of all work done.

A full description of the car repair shop will not be attempted, as the general details are much the same as prevail in the shops of other large systems, and only a few tools and methods will be mentioned. The machine tool equipment for the wood shop is very complete, and among the recent additions is a surface sanding machine that is considered by the shop superintendent as a very valuable tool.

It is the practice of the company to make the cushions and backs for upholstering the car seats, the seats being all of the longitud-

CLASS - D			
PATTERN No.	NAME	SKETCH	MATERIAL & WEIGHT
200	G. E. 800 Motor Commutator Cap		Steel 9 1/2 lbs
201	G. E. 62 Motor Axle top Bearing (end)		Brass 3 3/4 lbs
202	" " " " bottom		3 1/2 lbs
203	Westinghouse Commutator Cap		2 3/4 lbs
204	" " " " NUT		2 1/2 Sog
205	G. E. 800 Armature Bearing Ring (175)		5 1/2 C. I.
206	G. E. 62 Armature Bearing Shell top		5 1/2 C. I.
207	" " " " " bottom		4 1/2 lb Brass
208	" " " " " bottom		1 1/2 Sog
209	" " " " " top		"
210	G. E. 800 Armature Bearing Cap - Gen. End		C. I. 17 1/2 lbs
211	" " " " " Comm. End		3 1/2 lbs
212	" " " " " Cover		11 oz. C. I.
213	Westinghouse 12A Axle Bearing Shell top		5 1/2 lbs C. I.
214	" " " " " bottom		5 1/2 lb C. I.
215	" " " " " Top		Brass 6 1/2 lbs
216	" " " " " bottom		"
217	" " " " " Shell top		C. I. 9 1/2
218	" " " " " bottom		C. I. 9 1/4
219	Journal Box for Coal Wharf Motor C.P.S.		C. I. 4 1/2 lbs
220	Oil Ring		Brass
221	W. P. Motor Commutator Guard		M. I. 2 1/2 lbs
222	" " " " " Cover		M. I.
223	Walker Motor Bushing for Anna Bearing (both ends)		Brass 8 oz.

FIG. 41—PAGE FROM RECORD BOOK.

inal type. This department is partitioned off from the main shop, and is equipped with sewing machines and other appliances for cutting and uniting the materials and also for preparing the curled hair. All the car seats are upholstered in plush, and for this purpose the material, in a combination of red and black colors, is bought in quantities, and this, as well as the curled hair, is of the best quality.

Among the labor saving devices, found in an adjoining department, is an arrangement for cutting glass, on which the faces for the stationary headlights are cut out in circular form. The headlight disks are about 9 in. in diameter, and are cut out from square panes of glass at the rate of three a minute. This is accomplished by placing from 25 to 30 plates of glass in a pile on a pivoted table, so that the pile can be readily turned by a handle attached to the table. Above this is a vertical rod having on its lower end a wooden disk of the diameter to which the glass is to be cut. The rod, by means of a short lever and rope, is made to bring the disk down upon the top layer of glass with sufficient pressure to keep

the pile in position. A diamond glass cutter is then placed against one side of the disk, and the table being revolved a circular cut is made in the upper layer of glass. The disk is then lifted, the top glass taken out, placed to one side, and the process is repeated till each layer of glass has been cut. After this the different panes of glass are gently tapped against a plug located over a hole in the table, and the outside rim breaks away in pieces, the pieces falling into a barrel placed underneath the table, and the completed disks, all of the same diameter, are ready for the lamps.

The saving of scrap paint is quite a feature in these shops. The inner surfaces of barrels, kegs and cans, in which paint is received, are carefully scraped after being emptied. These paint skins, together with the paint soaked out of the brushes, are cooked in a jacketed steam boiler; then all the paint and oil is skimmed off and this material is then properly mixed and used for painting tracks and floors of buildings.

One of the types of car motors used has to be housed in with wood or canvas to protect it from dirt and moisture, and another labor-saving device is noted in the means used for painting the strips of canvas from which these motor screens or coverings are cut. The water proof paint for this purpose, on being mixed, is put into a wooden box with slanting sides, and to one side is fastened a set of large tinner's rolls, borrowed from the tin shop, and used as is a clothes wringer. The rolls of canvas, which are purchased in 100 yd. lengths and 28 in. wide, are mounted to one side of this box when the end is dipped into the paint and led out through the rolls. An attendant then takes hold of the end of the strip and pulls it through the rolls as fast as he can walk. After all is run through, it is left lying on the shop floor till the paint is partially dry, when it is hung in a suitable place for further drying.

Open cars are run through the shops for cleaning and painting in the winter season at the rate of about 60 a week. The old paint and varnish is burnt off; this process is considered by the shop superintendent better than the use of any of the liquid compounds which are recommended for removing paint, for the reason that by the burning process, no acid is left to affect the wood. The open cars are numbered on the bumpers.

A room with fire-proof walls is set apart for the storing of paint, oil and varnish, and this is provided with steam pipes and boilers and other accessories usually found in a paint department of this character. Paints are dealt out only on orders from the foremen of the different departments.

The buffing department is run in connection with the shop for the purpose of finishing and cleaning the brass car trimmings, all of which are cast in the company's foundry as before mentioned.

The shop stock room adjoins the superintendent's office, and occupies a part of two floors. All supplies are issued to the men on an order from the shop foreman, and are charged to the particular car or job. The shops employ ordinarily in winter 225 hands, but more in summer. Each man is provided with a daily time slip, which he fills out in his own handwriting, giving his name, residence and the department in which he works. He records the time he spends on any job, and the men are checked in and out of the shop both morning and afternoon. The time slips are copied in the office and are kept on record. In conducting the office work a library card system is provided, both for the records of the men and for each car or job. Suitable cabinets are provided for the cards, and the work is so systematized that with comparatively little labor the cost of all work is accurately recorded. All the work at the Bartlett St. works is done under the direction of Mr. Henry L. Libby, who has the title of Superintendent of Car Shops.

DEPARTMENT OF STORES.

The second floor, 125 x 60 ft., of the Albany St. building, known as the car equipment shop, is devoted to the storing of supplies for the entire system. This department is fitted with suitable bins, shelving, racks, etc., for holding the goods, and on the floor is a system of narrow gage tracks on which low trucks are run for shifting material. All of the stores are classified, and each item has a number and the different bins and racks are numbered to correspond. Besides in case of small pieces, samples of each are fastened to the bin front in full view of the keepers. All orders are filled by numbers, and requisitions are received from the superintendents of the different car houses only on certain days. This is to avoid confusion, as there are 30 car houses, 7 power houses and 3 shops which draw their supplies from the department

of stores. During the last year, ending September 30th, the orders filled embraced over 82,000 items. All supplies are received and shipped through one door on the first floor of the building, and are transported to the different buildings by special motor freight cars, of which there are four employed. For unloading goods from cars or wagon, hydraulic lift are provided, by means of which heavy boxes or supplies are placed upon the small trucks before noted, which run on narrow gage tracks to the elevator, and when lifted are run off onto the track, which run through all the aisles and cross galleries of the stock room. These tracks have turn tables at all the inter sections, thus providing for the shifting of cars to any part of the room for delivering or receiving loads for distribution. The floor between the rails is planked flush with the top of the rail, so that hand truck and cart employed can be readily run across the tracks or through any aisle. All goods that are received or shipped are checked up or weighed and inspected by a keeper having an office located near the main door. Among the things of interest in a locked fire proof department in the same room, was noted a large quantity of subway tickets. These tickets are received in rolls about 12 in. in diameter, and each roll contains about 5,000 tickets, all printed and suitably numbered, the numbers being made to correspond with the subway station at which the tickets are to be sold. The depot of stores is conducted under the management of Mr. Frank T. Lewis, with the title of General Store Keeper, and he has under him 18 men for conducting the work of the department. His duties, as prescribed in the printed regulations, to which reference has already been made, state that he "shall, under the vice-president, have charge of the receipt, issue and distribution of the general stores of material and supplies, shall make requisition for replenishment of stock and for such material and supplies as are not in stock, for which requisition is made upon him by the several departments, shall specify upon requisitions the purposes for which the articles are required, shall certify all bills for goods received by him as to their quality and quantity, and shall be responsible for the custody and accounting for all material in his charge. He shall keep such accounts and make such reports to the auditor and vice-president as may be required."

DEPARTMENT OF ELECTRICAL ENGINEERING.

The duties of the head of this department, now presided over by Mr. Roger W. Conant, with the title of Electrical Engineer, are prescribed as follows:

"He shall have charge of all electrical engineering for surface lines, shall prepare plans for the distribution of feeders and returns, shall investigate all special troubles with electric wires or genera-

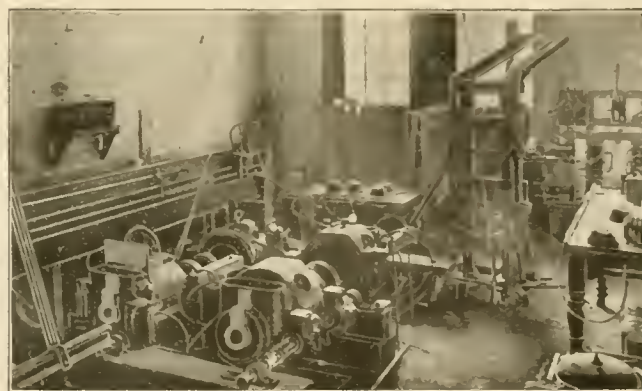


FIG. 42—MOTOR TESTING ROOM.

tors and report thereon; shall consult and advise with the superintendent of motive power and the superintendent of wires upon electrical matters, and shall perform such other duties and make such report as may be required."

The office of the electrical engineer is also in the Albany St. building, and in one portion of the equipment shop are the motor testing stands, shown in Fig. 42. All motor testing is done in a very thorough manner. The method used is to couple two motors in the manner shown, and one is run as a generator. The two motors are placed in line, and to the ends of their respective shafts

disks are attached to which round, wooden or rubber blocks are bolted. The disks are brought close enough together for these blocks to overlap each other, so that power is transmitted from one shaft to the other without any time being lost in getting a perfect alignment of the shafts, as the couplings work even if the shafts are slightly out of line. The testing is made to determine temperature and efficiency. In the test six different instruments are used, and for the resistance test a storage battery current is employed. The instruments are located on the table as shown; the water rheostats are placed just outside the door, and consist of large barrels, some of which are on an insulated foundation, and in which is a solution of salsoda. The resistance plates are suspended in a group by means of a rope and pulley, the different plates being about 1 in. apart. These plates are raised out of or lowered into the water by means of the rope attachment connecting with the windlass mounted on a frame near the operator. The temperature is electrically determined by the rise in the resistance, no thermometer being employed. The rise in temperature is reckoned as 2.5° C to each one per cent increase in resistance. The commutator tests are made after the motors are mounted on the car, and for this the truck is chained to the rail, and the line current is turned into the motors without any resistance, the wheels being made to slip upon the rails.

In order to accurately test the consumption of power, while the car is in active service, 60 cars have been equipped with wattmeters; 30 of these are open cars and 30 closed. The cost of equipping these cars with these instruments is said to be about \$25 each. Careful records are kept, and the weekly reports are used to check the different motormen in the use of the current, as the results on the different cars can be compared and a proper average made.

METER INSPECTION CHECK.

Herewith is shown the form of ticket used by the conductor of these specially equipped cars in recording the wattmeter readings. The numbers are punched out to read from left to right. The accompanying table shows the amount of power consumed on one division for one week, and from it interesting comparisons can be worked out.

STATEMENT OF ELECTRICAL POWER CONSUMED IN DIVISION 4 CAR SERVICE. FOR WEEK ENDING JAN. 28, 1900.

Motorman.	KW.H	Miles.	Passengers.	Watt-Hours per Car-Mile.	Pass. per Car-Mile.
Route No. 402.					
4002	78.4	36.40	290	2150	8.0
4003	694.2	358.80	3499	1935	9.5
4004	713.5	364.00	3859	1960	10.6
4009	90.4	49.40	481	1830	9.7
4023	485.0	299.00	2732	1625	9.1
4024	127.1	67.60	518	1880	7.8
4028	781.4	410.80	4008	1910	9.8
4028	685.3	353.60	3052	1940	8.6
4030	724.8	408.20	3132	1770	7.8
4035	17.4	7.80	100	2260	12.8
4036	33.0	15.60	253	2120	16.1
4041	649.1	358.80	3598	1810	10.1
4043	15.8	7.80	139	2020	17.8
4047	93.1	49.40	684	1890	13.8
4049	85.8	49.40	705	1740	14.3
Summary	5274.3	2836.60	26060	1860	9.5
Route No. 404.					
4001	608.4	389.12	3053	1565	7.9
4002	23.9	10.24	76	2330	7.4
4003	105.6	56.32	782	1870	13.9
4008	575.3	391.68	2913	1470	7.4
4010	582.3	399.36	2753	1460	6.9
4014	520.2	332.80	2401	1565	7.2
4016	133.0	92.16	797	1445	8.6
4017	590.7	368.64	2548	1655	7.1
4019	101.7	56.32	638	1810	11.3
4020	107.1	66.56	493	1620	7.4
4021	633.8	389.12	3227	1630	8.3

4023	83.8	56.32	447	1490	7.9
4024	67.3	46.08	373	1460	8.1
4027	242.9	140.80	1059	1730	7.5
4028	85.5	56.32	445	1520	9.8
4031	98.9	66.56	593	1480	8.5
4033	677.2	455.68	4129	1490	9.1
4035	189.9	112.64	918	1680	8.1
4037	762.9	455.68	3611	1675	7.9
4038	446.0	256.00	2556	1730	9.9
4041	94.0	56.32	767	1695	13.7
4042	531.1	384.00	3205	1485	8.3
4043	150.1	79.36	742	1890	9.3
4047	587.7	401.92	3122	1465	7.8
4049	579.6	399.36	3123	1450	7.8
4050	15.5	10.24	35	1510	3.4
Summary	850.44	5529.60	44776	1560	8.1

Route No. 403.					
4002	15.2	6.60	62	2300	9.4
4009	458.8	241.72	1597	1900	6.6
4019	682.3	303.61	2541	2250	8.4
4020	242.5	120.44	816	2010	6.8
4024	202.3	94.05	1059	2110	11.3
4027	15.3	6.60	96	2320	14.5
4031	63.4	33.00	522	1920	15.8
4036	180.1	81.68	911	2200	14.8
4043	12.8	6.60	63	1940	9.5
4044	759.9	353.07	2994	2150	8.5
Summary	2632.6	1247.37	10661	2110	8.5

Route No. 405.					
4000	134.0	87.40	703	1530	8.0
4002	301.8	176.43	1620	1710	9.2
4005	674.0	419.52	3511	1610	8.4
4006	659.4	419.53	3545	1580	8.3
4007	427.1	270.96	2012	1580	7.4
4011	652.8	417.38	3487	1490	8.4
4012	671.6	388.93	3635	1730	9.4
4018	518.5	358.34	3111	1445	8.7
4020	317.2	183.54	1494	1730	8.1
4022	78.4	52.44	660	1495	11.6
4024	69.1	39.34	314	1760	8.0
4027	110.2	61.18	464	1800	7.6
4031	108.5	65.55	577	1685	8.3
4034	675.4	419.52	3259	1610	7.8
4035	238.8	130.84	1372	1710	9.8
4036	97.3	61.18	576	1495	9.4
4038	76.6	43.70	318	1760	7.3
4039	660.5	419.53	3795	1590	9.0
4040	593.5	380.19	3214	1540	8.4
4043	284.5	179.17	1467	1580	8.2
4050	347.2	209.76	2038	1660	9.7
Summary	7795.4	4793.43	41172	1610	8.6

Route No. 407.					
4008	18.5	10.82	62	1710	5.7
4016	200.6	129.84	518	1550	4.0
4024	43.0	32.46	155	1325	4.8
4031	42.7	32.46	168	1310	5.2
4035	56.6	32.46	137	1740	4.2
Summary	361.4	238.04	1040	1515	4.3

General Summary.					
402	5274.3	2836.60	26960	1860	9.5
403	2632.6	1247.37	10661	2110	8.5
404	8594.4	5529.60	44776	1560	8.1
405	7795.4	4793.43	41172	1610	8.6
407	361.4	238.04	1040	1515	4.3
Summary	24568.1	14645.04	124609	1675	8.5

Besides testing motors and other appliances, the electrical engineer has recently made an elaborate test of the incandescent lamps in use on the entire system. Lamps from 13 different makers were subject to the test, the object being to ascertain the efficiency, resistance and life. The lamps were all of 16 candle power of 4 watt capacity. The tests show a wide range in the value of the lamps from the different makers. Three types of electric heaters are used on the cars of the surface lines; these include those made by the Simplex Electric Co., the Consolidated Car Heating Co. and the Gold Street Car Heating Co. Tests show that there is not a very wide difference in the consumption of current by the different heaters. In extreme cold weather it requires about 10.5 amperes to properly warm a 25-ft. car. The range is from 3.5 to 10.5 amperes, the average being about 7.5 amperes. It is the practice of the company to make thorough tests of all new electric equipments, and when any electric appliances are ordered the electrical engineer makes the specification to embody the best and highest efficiency that his tests indicate it is possible to attain.

the joint. It will be remarked that of the 54 joints indicated, resistance of 3 ft. of rail, including the joint, was in 37 cases equal to the resistance of an equal length of rail; in 5 cases was less; in 7 cases was one-sixth more, and in 5 cases was more than one-sixth more than an equal length of rail.

The standard bond for fish plate construction consists of a No. 0000 flexible wire, tinned at the ends and sweated into a tapering steel sleeve or thimble. The hole in the rail being reamed to fit, the steel plug or thimble is driven in tightly by means of a half round tool which embraces the wire, so that a blow from a hammer drives it home to a close fit.

The standard size for the trolley wire is a No. 0; in the subway the trolley wire is of the figure 8 section. Beneath the elevated structure the trolley wire is supported from braided span wires, which extend across beneath the arch of the cross girders, being clamped to the flanges of the girder or to the tops of the supporting columns.

The system of current distribution employed by the electrical engineer is one of the most interesting features of the Boston

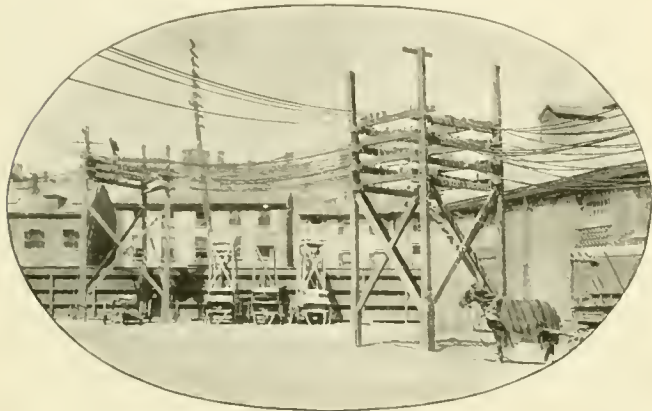


FIG. 44.

Elevated system. Early in the history of electrical railway development in Boston, it was decided, owing to the physical condition that prevailed in and about the city, that a direct current system with a number of power houses, properly distributed, was preferable in this case to a high pressure system with a single power house and transformer stations, especially as it was found possible with one exception to locate the various power stations on tide water. In order to solve the feeder problem, however, the engineer did not follow the ordinary methods of copper distribution by taking the average current consumption per car, and assuming a certain fixed drop per mile, but planned to provide for the varying loads. The load is affected by the speed of cars in congested localities when the cars are off schedule time, and varies

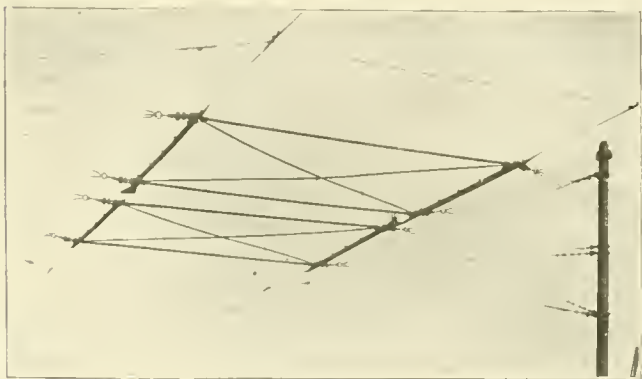


FIG. 46.

greatly because of the snow plow operation in winter; the maximum demand during the summer months had also to be considered. The average consumption of power was found by dividing the total output of the stations by the number of cars on the line at any one time. The result, however, was modified in many cases

by the actual feeder readings which were taken on days of excessive load at all the power stations between 4 and 6 o'clock p. m., the hours of maximum travel, from which the capacity load of each section was obtained. As a basis for the work, a map is prepared each year, showing all the lines operated, together with the loca-



FIG. 45—LINE ON COMMONWEALTH AVE.

tion of each power station, car house, and the boundaries of the various sections into which the territory is divided. The position of every car at the time of maximum load is based on the regular time table schedule. The cars are indicated by cross lines, each cross line representing two cars. One of the maps is shown in the accompanying diagram, Fig. 43. The territory is divided into 56 sections, shown by dotted lines. These sections are so coupled that any one can be cut off in case of trouble and sections can be coupled together to help out during hours of heavy traffic. In arranging the size of the section, care was exercised to make them small enough to be safe and large enough for economical operation, so each was made to meet the local condition. In computing the copper required to give the most economical results, the engineer followed a method devised by himself, and which was published in the "Review" for July, 1897.

In the central power station the feeder panels and tables are grouped at one end of the switchboard gallery and the ground feeders are connected in on the opposite side of the same bus bars as the negative leads from the generator, an arrangement which saves copper. The feeders lead beneath the floor of the gallery and into the basement, where they separate into four divisions or groups. Group 1, going west, consists of 20 overhead feeders; group 2, of



FIG. 47.

20 underground cables and 90 buried ground or return wires; group 3, going east, 15 overhead feeders and 4 overhead returns, and group 4 of 25 underground cables and 8 buried grounds. Fig. 44 shows one of the towers carrying overhead feeders, which stands near the central power station.

The lines are all operated by the overhead system, except on the elevated structure. The feeders in the business district are carried underground, as also a few in the outlying district. In other cases they are carried overhead, as shown in Fig. 45, which illustrates the method of supporting the feeder and trolley wires on a section where the tracks are located on a reservation, as is the case on some of the finest avenues.

The overhead feeders consist principally of 500,000 c. m. cables; some, however, are 300,000-c. m. and a few 1,000,000 c. m. For the small feeders No. 0000 and No. 0 wire are used. The insulation

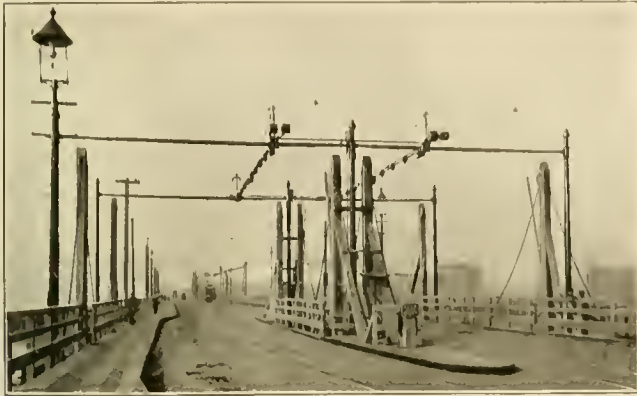


FIG. 48.

of the overhead feeders is of tarred jute principally, and they are supported on glass insulators of the petticoat pattern. The underground feeders are insulated with paper or rubber, according to the conditions likely to be encountered in the soil. The resistance of the insulation on the underground cables ranges from 200 to 1,500 megohms per mile. It is the practice to test the different cables at the station every two or three days, in order to detect incipient defects, so that they may be remedied before developing into serious trouble. The drop in potential varies on the lines from 10 to 15 per cent, except on one or two of the longer lines, where the drop reaches 20 per cent. In ordering cables or wires the specifications as to purity are that the resistance shall not exceed .1157 ohms per mile of 500,000-c. m. section.

The total length of the overhead feeders is 456.5 miles, of which 13 miles are returns. The aggregate of the underground feeders is 63 miles, and of the returns 68 miles. There are also nearly 3 miles of armored submarine cables for use under the draw or swingbridges, of which there are 25 on the system.

The underground conduits have been constructed both of terra cotta ducts laid in cement and of cement lined iron tubes. The manholes are from 50 to 400 ft. apart, and are in general located at street corners. In moist ground the manholes are built with double



FIG. 49—TRUCK USED IN REMOVING WAGONS.

walls with water proof paper between. About 11 miles of underground conduits have been constructed, containing 133 miles of individual ducts. In some cases the return consists of scrap cable, from which the covering has been removed, the bare wires being drawn into the duct. In some cases as many as five wires have been placed in a single duct. Scrap trolley and feed wire is also used for bridging around special work; also for laying across bridges where flat rails are used, and also for cross connections from track to track.

Figs. 46, 47 and 48 show three different methods used at draw-bridges for supporting the overhead trolley wires so as to provide for automatic contact when the bridges are closed and to support the terminals.

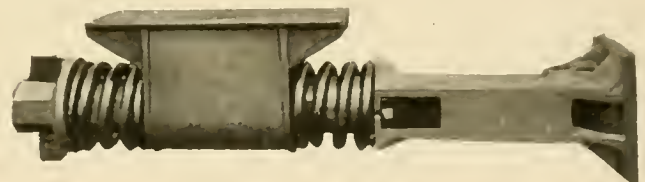
Besides the general map showing the entire feeder system, as illustrated in Fig. 43, the electrical engineer prepares, from time to time, blue prints of the individual sections showing the location of all the feeders, overhead, underground or submarine, also the location of switch boxes and cutouts, with the sizes and numbers. These diagrams are supplied as changes occur, to the crews of each of the eight emergency stations, and also to each division superintendent and to each of the general officers. These are designed to assist the crews of the emergency stations in making repairs to overhead lines and feeders and to enable them to make temporary changes in the feeder switches, as may be directed by the operating department.

The emergency stations are all equipped with all the usual appliances, including tower wagon, tools and teams, and the crews are on duty at all hours. Among the appliances not usually used with wagons of this nature was noted a low two wheeled truck or dinky, Fig. 49, which is carried on some of the emergency wagons, and is designed for removing from the tracks heavy trucks or wagons that may become disabled by the breaking of a wheel or axle. The tower wagons are mostly of the Trenton type. The stations are all connected with the public telephone service, and also by private telephone line and exchanges, to all the power stations, car houses, and with the offices of the company. The crews respond to all fire alarms in their respective districts, and when necessary remove overhead wires and feeders and afterward restore them to their proper positions.

To be continued.

VAN DORN COUPLERS FOR BOSTON.

The accompanying engraving shows the No. 8 Van Dorn draw bar which was specially designed for the Boston Elevated Ry. As mentioned in "Review" for March, page 128, the three experimental trains now in operation were fitted with these couplers and all of the elevated rolling stock is to be similarly equipped. The W. T.



NO. 8 VAN DORN DRAW BAR.

Van Dorn Co. has also received orders from the Brooklyn Heights R. R. for 250 sets of No. 3 trail draw bars, and from the Metropolitan Elevated, of Chicago, for 50 sets for new cars. The Brooklyn order will make six car loads. Among recent foreign shipments is one of 20 sets for Japan.

SERRATED WHEELS.

In the article on the Boston Elevated Ry., page 189, reference is made to the serrated wheels with which a number of the company's snow plows, including the observation snow plow, are equipped. These wheels derive their name from the serrations in the flanges and are designed for use with either cars or snow plows operating over tracks obstructed by dirt, ice or snow. The advantages arising from the increased traction secured are longer life for wheels and motors, and a saving of time and power; it is also claimed that there is less wear on the track.

"Serrated" wheels are made for the Burnham & Duggan Railway Appliance Co., of 60 State St., Boston, by the New York Car Wheel Works, the Boston Car Wheel Co., and the Rochester Car Wheel Works. The Burnham & Duggan company, in addition to those in use on the Boston Elevated, has supplied serrated wheels for cars of the Quincy & Boston, the Massachusetts Electric Cos., the Portland Railway Co., the Metropolitan Street Ry., of New York, and others. Snow plows and sweepers recently built by the Taunton, Peckham, Wesson and Woburn companies have been equipped with these wheels.

A verdict for the defendant has been returned in a suit against the Chicago City Railway Co. for alleged damage, caused by vibration, to property adjacent to the power house at 52d St. and Wabash Ave.

MORE TROUBLE FROM SNOW AND RAIN.

The accompanying reproductions from photographs are good proof that the general manager's couch is not always the softest one in the world; he occasionally has to lay down the coupon cutter and get out and hustle to keep cars moving.

The view at Springfield, Vt., was taken during the high water of February last. The line of the highway along which are laid the tracks of the Springfield Electric Ry. can be traced between the two rows of poles, the trolley poles on the left and telephone and



FLOODED TRACKS AT SPRINGFIELD, VT.

telegraph poles on the right. Mr. M. A. Coolidge, of Northampton, Mass., who sent us the photograph, writes that at the point on the street railway tracks, where stands the freight car, which is on a turn-out, there is a standard railroad flat car entirely covered by water. The rails at this place are about 18 in. above the level of the highway. The flood was occasioned by the great amount of water coming down the Black River, and was also increased by the ice jam in the Connecticut River. The water was about 15 ft. above normal height.

For the view on the Palmer & Monson Street Ry. we are indebted to Gen. Mgr. D. F. Burrill. The amount of water can be judged by the fact that the fence at the left is nearly covered.

The Toledo (O.) Traction Co. last month had the hardest fight with snow that it has had in six years, but through the excellent management of Gen. Mgr. Thomas H. McLean and Superintendent Collins, cars were kept running in comparatively regular order on the principal lines. Over 200 extra men and a score of teams, in



ON THE PALMER & MONSON LINE.

addition to the snow plows and the company's regular force, were at work for nearly 24 hours at a stretch before the battle was won.

A number of interesting statistics are at hand from Montreal, Can., relative to the heavy snow of February 28th and March 1st and 2d, and the cost of removing it from the tracks of the Montreal Street Railway Co. The official records give the snow fall

on February 28th as 1.3 in.; on March 1st, 18.2 in.; on March 2d, 3.6, making a total of 23.1 in. To keep the tracks open during these three days the street railway company employed 2,100 men and boys at an expense of about \$5,300 per day. Its loss in traffic was about 85 per cent, as will be seen from the statement that on Mar. 1, 1899, the total receipts were \$4,249.39, while on the corresponding date in 1900 they were but \$1,410.15. On Mar. 2, 1900, they were \$1,211.00. It is estimated the rolling stock was damaged as a direct result of the snow to the amount of about \$1,700. As a single example of the obstacles encountered it is stated that a natural drift over 15 ft. high and containing 1,900 cu. yd. of snow completely filled one broad thoroughfare. Sleighs passed through this by means of a tunnelled passage.

The Rochester (N. Y.) Railway Co., on March 1st was forced to call its cars into the barn for part of the day, owing to one of the heaviest falls of snow that western New York has known for years. The eleven plows and three sweepers belonging to the company were kept constantly at work and cars were in operation at the first sign of abatement in the storm. The plows in some cases were pushed by two and three motor cars.

The same storm visited Buffalo and it took every facility for fighting snow that the company could command to restore regular schedules.

Peoria, Ill., was the center of a hard snow storm on the last day of February, but in spite of this, cars were operated on nearly



SCENE AT TOLEDO, O.

all the lines. A local paper, in speaking of the good work accomplished by the company in keeping its lines open, said:

"It is the fashion to berate the street car company. Perhaps no other company in the city has met with more abuse than this same corporation. The company expects this. It would perhaps be lonesome if it did not get it. But there comes a time now and then when the company does get a little credit—deserved credit—and one of these occasions was furnished by the great snow storm of this week. Honor to whom honor is due."

A sleet storm in Cleveland, O., on March 8th, caused immense damage to overhead wires. All of the street railways in the city, both cable and electric, were obliged to suspend service, some of the lines not getting into operation for two days after the storm.

ANOTHER INTERURBAN FOR INDIANA.

We are in receipt of a letter from Stillwell & Browne, Lovett Block, Anderson, Ind., stating that a company has been organized for the purpose of constructing an interurban electric railway from Indianapolis to Kokomo, Ind., passing through Noblesville, Cicero, Arcadia, Atlanta and Tipton, with a branch line from Tipton to Elwood. The total length of the road will be 65 miles. The officers are: President, William L. Kann, of Pittsburg; vice-president, Charles A. Ford, of Kokomo, Ind.; secretary, George Lilly, of Anderson, Ind.; treasurer, Horace C. Stillwell, of Anderson, Ind.

CORRESPONDENCE

Electricity vs. Steam in Connecticut.

Editor "Review": Lately there appeared in the railroad news column of the New York Evening Post a special dispatch reporting another purchase by the New York, New Haven and Hartford R. R. of a link in one of the many trolley parallels to this system in the state of Connecticut. In the dispatch appears the following:

"By the purchase the New Haven company breaks the threatened parallel. * * * It is also significant as showing that the New Haven is not relying altogether on the third rail to meet trolley competition—(passengers! and freight?)."

The following may be of interest to those who are in hearty sympathy with the development of our trolley systems; affording, as they do, facilities and conveniences which have never heretofore existed between and in communities; but who are also desirous of furthering electrical development on our steam railroad systems along those lines which will bring success to both. I quote from a paper before the American Society of Civil Engineers ("Proceedings," November, 1899).

(1) Steam railroads will, in the near future, handle their suburban and short-distance interurban passenger traffic and mail, express, baggage and light local freight carried in said suburban and interurban passenger trains, by electric motive power; and this, irrespective of whether operating expenses are affected favorably or unfavorably. * * * *

In the future development of steam railroad systems they will eventually be operated jointly with surface electric railways, either through actual mutual ownership, or by traffic contracts, leases, etc.

The above conclusions are obviously dependent upon what Mr. Prout properly defines as "traffic conditions," and not primarily engineering details or operating expenses. * * * *

Effect of Competition.—One often hears of the competition which electric parallels have brought to our steam-railroad systems. This has been exaggerated greatly, for most of the traffic of electric railways did not exist until created by low "total cost" and frequent and quick service, although, in certain isolated cases, the building of electric parallels has temporarily drawn away traffic from steam railroads, only to be recovered as the total volume naturally increased. * * * *

nected by a steam railroad. More unwise legislation against a natural progress, which would also benefit those whose influence created it, can scarcely be imagined. It is fair to assume that in this controversy—for the street railways naturally opposed such legislation—both sides produced the strongest arguments in support of their respective contentions; the Consolidated presenting losses of traffic, while the street railways insisted that their passenger travel was mostly an induced one, which did not and could not exist under steam-railroad conditions and operative methods.

An examination of Table No. 30 shows conclusively how the steam railroads convicted themselves. The Consolidated System only claimed a total loss of \$4,000 per month, or \$48,000 per annum on the entire system, being about one-third of one per cent of their gross passenger revenue. If the average fare were 10 cents, this would mean a total loss of 480,000 passengers per annum out of a total of 44,448,324, or 1.1 per cent; but 1894 was the year of financial depression, when the steam railroads of Massachusetts lost 8.3 per cent of their former passenger traffic, so that only part of this loss on the Consolidated was due to trolley parallels. While the total loss to the Consolidated was given by its officers, all the towns between which it occurred were not stated, so that in Table No. 30 the 12,365,571 passenger trips, between and in a few of these towns, is only part of the total passenger traffic of the street railways serving all localities where such loss took place. Whether this figure should be increased by 50 to 100 per cent, or more, we cannot say, but, in any case, the data are sufficient to show the large induced traffic of street railways; or, in other words, systems which give low fares, frequent service, short total time consumed in round trip and a "leave-at-your-door" service.

As an example of interurban traffic, we can take Ansonia and New Haven, Conn. When the steam railroad owns the systems of street railways in both towns, their cars will pick up passengers at either center, will pass onto the present steam tracks on the right-of-way of the New Haven and Derby Railroad (New York, New Haven and Hartford Railroad Co.), run at high speed without stops to the other center, pass onto the local street railway tracks there and distribute its passengers where they desire, all for one fare. Such a system operated by electric motors would be a financial success, where a line like the third-rail between Hartford and New Britain is a failure in the true sense. Many other similar examples might be given, but this indicates the future of our steam railroads.

Yours truly,

99 Cedar St., New York. CHARLES H. DAVIS.

TABLE No. 30.—EFFECT OF COMPETING ELECTRIC INTERURBAN PARALLELS TO STEAM RAILROADS.

Localities Connected.	Loss due to trolley parallels, as claimed by V. F. Hall of N. Y., N. H. & H. R. R. Committee, Railroad State Legislature of Connecticut (a).	Approximate distance between R. R. Road Committee Map.	Trips per day as given by time table of N. Y., N. H. & H. R. R.	Trips per day of trolley roads.	Number of passengers carried by Electric Railway System in and between these towns, part of which them, 1894.
Norwalk—Rowayton	50%	4.75	57	84	956 241
Bridgeport—Stratford	\$35 per day.	3.00	36	84	4 659 822 (Est.)
Bridgeport—Southport	80%	5.50	33	69	2 024 421
Waterbury—Naugatuck	90%	6.00	13	30	2 001 347
Wallingford—Meriden	90%	5.50	17	112	1 083 977
Birmingham—Ansonia	90%	3.00	16	.....	1 090 263
Winoepauk—S. Norwalk	(b) 50%	3.00	.....	.....	.....
					12 865 571

(a) Total loss to N. Y., N. H. & H. R. R. from all parallel trolley roads in the State of Connecticut = \$1,000 per month = \$38,000 per annum, or 1/17 loss on total passenger income of \$12,971,000 in 1894, as shown by Railroad Committee Reports.

(b) 64 passengers were carried on N. Y., N. H. & H. R. R. in the month of December, 1898, and 9 in the same month of 1894, or a total loss of 780 passengers per annum, at a possible maximum of 15 cents = \$117.

Table No. 30 has been prepared from a speech by Mr. Edwin B. Gager before the railroad committee of the State Legislature at Hartford, Conn., March 22, 1895. (Those who are interested can obtain a reprint of Mr. Gager's speech by addressing him at Derby, Conn.) For many years bitter warfare has been waged against interurban electric railways by the Consolidated System (New York, New Haven and Hartford Railway Co.) resulting in the electric parallel law, where "public convenience and necessity" must be demonstrated to the satisfaction of the Superior Court before an electric railway can be built between two points already con-

Electrolysis and the Testing of Rail Bonds.

Editor "Review": I have read with interest Mr. Lincoln Nissley's article regarding electrolysis published in the "Review" for March, page 149, but must take issue with him on several points.

First, that his test involves placing artificial conditions on the system under test which do not exist in practice.

Secondly, that his method of remedying the troubles makes the railroad company legally liable for damages from electrolysis by making the connections proposed which would convert the water pipe system into an auxiliary ground return system.

Taking up the testing methods employed it will be noticed from the connections in Fig. 1 that they introduce into the water pipe system current directly; and also that the other leg of the differential ammeter passes current to the rails. This will give him the ratio of resistance of the rail return and pipe return circuit, but there is neglected in this test the important determination of the resistance between the rails and the water pipe, which is included in the circuit when any car passes that point; and the current that actually traverses the water pipe system in the practical operation of the road will only give the results from which information for determining the proper remedies for electrolytic damages to the water pipe by those currents can be determined. The character of the soil and pavement adjacent to and underlying the rails greatly affects this leakage from the rail to the water pipe. For instance, rails laid on a 10 in. cement bed with sand 4 in. and a brick pavement will measure as high as forty ohms per mile single track with 90-lb. 7-in. girder rail. In one test the track was parallel to a 24-in. main; the leakage of current to the main was .02 of an ampere per mile; from a resistance measurement the pipe line showed lower resistance to station than rail, yet the current it actu-

ally carried was 1-40 of one per cent. of the current flow in the rails. Again referring to Fig. 1, with the switches closed on this differential ammeter, he reads the drop on the ammeter and switches with the current flowing; a reading of volts with the switches open gives the difference of potential between the rail and pipe system which is using the pipe as a pressure wire for the average ground resistance and rail drop. The higher the electrical resistance of the rail environment, the nearer this voltage will be to the true rail drop back to the station if the pipes are connected to ground bus at station. If the test car is placed on the track at any point and a current delivered to the rails, and an ammeter inserted in the pipe returns and also in the ground returns at the station, the ratio of these two ammeter readings will be as the conductivity of these two returns as exists in the operation of the road. This

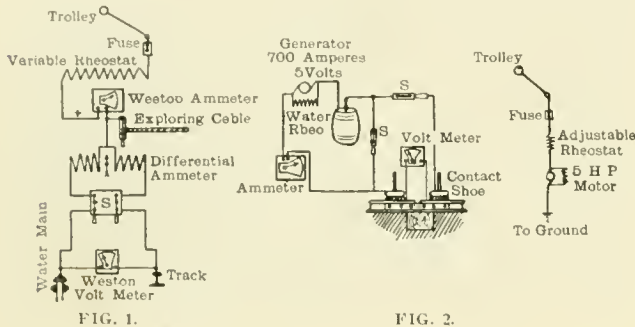


FIG. 1.
From the "Review" for March, 1900.

also gives a means of discovering any metallic connections which the water company may have established by locating gate boxes against the rails, and in this way introducing current into their system.

The flow of current in the water pipe system can be readily determined by the shunting method between hydrants.

Regarding so-called danger zones determined by the voltmeter method the difference of potential observed is that due to the fall of potential along the track circuit and the resistance between the rails and the pipe system. This voltage is at a maximum when the rails are insulated, with the water pipe connected to the ground bus of the system but with no current flow in the pipe system. Yet the flow of current in actual conditions in a water pipe is greatest where the difference of potential between the track and pipe is the least; that is, where the pipe is passing through the so-called neutral potential area located between the positive and negative potential areas. With lead service pipes passing under the tracks the negative potential of the pipe system with regard to the rails is sometimes least where the passage of current and corrosion is the greatest. I know that, in the past, potential areas have been plotted in order to indicate electrolytic troubles, but I can find no tangible relation between potential areas in street railway practice, using the earth as a ground return, and locations of electrolytic action on water pipes.

In regard to the second suggestion, to connect the rails to the water pipe at any points where current would flow from the rails to the water pipe, it would place the railway company so doing in a dangerous legal position in respect to the water company, for the reason that it would establish clearly the use of the water pipes for assisting the rail return back to the station; and any electrolytic damages resulting from the use of this water pipe system for a purpose distinctly to the advantage of the railway company would be a burden that would have to be borne by the railway company.

The excessive flow of current caused by such connections will at least damage the lead service pipes and pipe joints in the water pipe system which increases with the resistance with the flow of current through them; this is one of the reasons why the natural currents through water pipes gradually fall off from year to year. By making connections to introduce current into the water pipe system he is at variance with the accepted practice to reduce this current to the lowest possible amount by harmlessly conducting away through metallic conductors only such current which will seep into the water pipe system, and those currents which enter it due to the paralleling of two conductor systems, and in this way remedying electrolytic troubles. Yours truly,

ALBERT B. HERRICK.

New York, Apr. 2, 1900.

THIRD-RAIL ROAD AT ALBANY, N. Y.

Newspaper dispatches state that contracts for the building of a 35-mile railway from Hudson to Albany, N. Y., have been let to C. W. Blakeslee & Sons, contractors, of New Haven, Conn. A company of which A. M. Young, of Waterbury, Conn., is president, has been organized with a capital of \$2,000,000 to construct and equip the road, which will be built upon the third-rail system, using a T-rail located about 30 in. outside of the tracks. Contact will be by a sliding shoe similar to that employed on the New York, New Haven & Hartford branch between Hartford and Bristol. Electricity will be generated from water power at Stuyvesant Falls, N. Y.

The road will run via Niversville, N. Y., where it will intersect the Boston & Albany R. R., and will be a strong competitor for the passenger and freight traffic between Hudson and Albany, now carried exclusively by the New York Central. Private rights-of-way will be purchased for the entire distance, permitting high speeds and frequent service. It is estimated the district immediately tributary to the line has a population of about 200,000 people.

THE PITTSBURG CONSOLIDATION.

The stockholders of the Consolidated Traction Co., of Pittsburg, on March 31st voted to lease the property for 900 years to the Union Traction Co., which was recently organized to effect a consolidation of the principal systems of Pittsburg. The action was not unanimous, the small stockholders, led by the firm of Whitney & Stephenson, strongly opposing the combining of interests. It is probable litigation will be instituted at once to have the consolidation set aside, and the merger will not take place until this litigation has been decided.

The lease as it now stands provides for the payment of 6 per cent per annum on the preferred stock of the Consolidated Traction Co. from April 1, 1900, to April 1, 1906, at which time the rate will be increased to 7 per cent per annum, and that rate maintained during the life of the lease. Upon the common stock, 2 per cent per annum will be paid for two years; 3 per cent for the following three years; 3½ per cent for the next two years, and 4 per cent thereafter. The lessee will also pay in May, 1900, certain accumulated dividends amounting to about 6 per cent.

It is the intention to include in the consolidation the Consolidated Traction Co., the United Traction Co., and the Monongahela Street Railway Co.

CHANGES IN BROOKLYN RAPID TRANSIT.

Last month a number of changes in the form of management were made by the Brooklyn Rapid Transit Co. Mr. J. C. Brackenridge, who has been chief engineer of the company, is now acting general manager, that office having been created to relieve President Rossiter of much of the detail work that has hitherto fallen upon him. Mr. Brackenridge will perform in part the duties formerly discharged by Mr. Ira A. McCormack.

In addition to the position of acting general manager the offices of second and third vice-president were made to still further relieve the president. Mr. T. S. Williams, secretary and treasurer for the company, will assume the duties of second vice-president. The other position has not yet been filled. Mr. C. D. Meneely, who has been assistant secretary and treasurer, has been elected secretary and treasurer to succeed Mr. Williams.

ANOTHER MASSACHUSETTS CONSOLIDATION

New York and Philadelphia capitalists represented by Clark Bros., bankers, of Philadelphia, have arranged for a consolidation of the following roads in and near Worcester, Mass.: Worcester Consolidated; Worcester & Suburban; Worcester & Marlboro; Worcester & Clinton; Warren, Brookfield & Spencer; Clinton & Hudson; Leominster & Clinton; Worcester & Blackstone Valley.

These roads aggregate 157 miles of track and for the last fiscal year earned \$902,906.

It is intended to incorporate these properties as the Massachusetts Electrical Co.

Hauling Freight and Express Matter on Electric Railways.

Some Theory and Practice.

Starting with the point that the fundamental and essential duty of a street railway is to furnish better transportation facilities to a considerable majority of the community tributary to the road, and that franchises are granted, or at least should be granted, only after it has been proven that the best good of the community requires the extra means of travel that the new road is going to provide, it has been argued in times past, and the statement is still occasionally heard, that electric railway companies operating on rights of way through the public streets or highways, should confine themselves strictly to the transportation of passengers, and should not

erally supposed. The carrying of goods is in fact a natural development of passenger transportation. In the early days of electric railroading passengers were permitted to take into the car only such bundles, satchels or packages as could be held in the lap or placed under the seat without causing inconvenience to fellow passengers. It was not long before this accommodation was extended to carrying larger bundles which were deposited on the front platform. In this case the owner of the bundle was usually requested to pay an extra fare. There certainly could be no objection to this arrangement, and there should be none when a special compartment in the car is provided for the better accommodation of such bundles or packages; nor should the fact that the owner does not accompany the package alter the principle. From the special compartment to the special car is but a step.

If it is an advantage to the public to have the roads carry packages and bundles, it is not difficult to prove the benefits of a general freight service. It will be admitted that freight must be transported in some way, and how better can this be done, than in special cars, operated so as to cause no delay to the passenger traffic, running on rails where the tractive force per ton is only one-half to one-fiftieth what it is on a street or road, saving the wear and tear on the highways caused by the wheels of heavy trucks, and traveling at a speed from three to ten times faster than horses could draw the same goods. Taking into consideration these advantages with others of increased facilities, saving in time and reduction in cost of haulage, it is hard to explain why the question of transporting goods on electric railways was not brought forward sooner than it has been, and why the practice is not now more nearly universal. One cause for the delay, and perhaps this is the chief cause, is found in the opposition of the steam railroads wherever the subject was suggested. But the opposition encountered is gradually being overcome, and the question is one of the live ones of the day. In the language of Judge Marean of the Supreme Court of New York, "The public having discovered that the transportation of freight can be made more economically on electric railways than by former methods, there is no meritorious reason



FIG. 1.—STANDARD EXPRESS CAR, CLEVELAND.

be permitted to use their tracks for the carrying of baggage, freight or express packages.

This premise may or may not be true, but admitting for the moment that it is, the conclusion should by no means be accepted as necessarily following, for it can easily be demonstrated that the best interests of the public will as surely be furthered by a combination passenger and goods service, as by a passenger service exclusively. It will of course be granted that the freight or express traffic must be kept under proper restrictions, and must never be



FIG. 2.—AT HEADQUARTERS OF ELECTRIC PACKAGE CO., CLEVELAND.

permitted to interfere with the passenger accommodations which should receive paramount consideration in every case.

Contrary to the first impression one might have on thinking of this question, the transition from a traffic exclusively passenger, to one including express and freight is not so abrupt as is gen-

erally supposed. The public is demanding a goods carrying service and the public usually gets what it wants sooner or later. As examples of this demand, and these are but two of many, various attempts have been made to interfere by injunction with the package and freight business carried on by the

will enable a package delivery service to be instituted on almost any road, to the convenience of the public and the material increase of the company's receipts.

The question of handling farm products and heavy goods also presents to the manager opportunities for thinking out ways of taking advantage of conditions as they exist in his community. No single item illustrates better the possibilities in this direction than

In exactly the same way other products of the farm can be gathered and distributed.

There is one more point that is not always considered when this goods service is under discussion. The cry of the day is down with expenses and to this end every by-product of the power house is carefully scrutinized to see if it can be utilized in some way. Freight and express cars can be run whenever passenger traffic is light, and

Youngstown, Ohio. 189

Received from THE MAHONING VALLEY RAILWAY CO the properly described below in apparent good order, except as noted.

Shipped by _____ from _____

on the _____ day of _____ 189

Consigned to _____ at _____

Storage will accrue on property not removed from Depot within two days after its arrival

Remarks _____

Signature _____

FIG. 6.—RECEIPT.

the carrying of milk. Under the usual arrangement the farmers awake in the wee small hours, do their milking, load their cans into wagons and start on a long, often times four or five mile drive to the railroad station. This must be done no matter what the condition of roads or weather. The milk train then takes up the cans and delivers them at some central distributing depot in the city, where they are again loaded into wagons for delivery to the small milk merchants through the town. This is a tedious, expensive and unsatisfactory routine. With the interurban roads doing the work, the farmers carry their cans out to the tracks at their front doors, or perhaps wheel them in small hand carts, for a short distance to reach the line. Here they are left on a rude platform erected for the purpose. The milk car comes along, gathers up the cans along the way, and without another handling sets them down at the milk dealers' door. The saving can be counted in hours and in dollars.



FIG. 8.—FREIGHT AT NEWBURGH, N. Y.

why then does this not present to the manager a method of using the surplus power of his station, which in a certain sense then becomes a by-product, for the running of goods cars, and in this manner bringing up the drops in his load curves to the more nearly straight line of maximum efficiency. There are many railway plants where an engine and generator have to be kept in operation all night to run a few owl cars, in which cases the ideal conditions are found for introducing an "economy" by means of the class of service under discussion.

It is not the province of this article to give advice. The managers and superintendents of this country are in a position to work out their own problems better than any one else, and they are fully capable of doing so. It is the intention to give here suggestions only and for the purpose of presenting the latest and best practice in this new field of usefulness now rapidly opening up, the "Review" has obtained from a number of leading roads a description

MAKE YOUR SHIPMENTS
BY THE
ELECTRIC PACKAGE AND FREIGHT LINE
BETWEEN
Struthers, Haselton, Youngstown, Brier Hill, Girard, Niles and Warren

FREQUENT SERVICE



QUICK DELIVERY



RAPID TRANSIT



REASONABLE RATES

LOCATION OF DEPOTS.

STRUTHERS	Opp. P. & W. R. R. Station
YOUNGSTOWN	Power House
GIRARD	State and Liberty Sts.
NILES	Power House
WARREN	No. 38 North Main St.

Shipments consigned to points located on our Line delivered direct to Consignee without additional charge.

SCHEDULE—STANDARD TIME—IN EFFECT DEC. 18, 1899.
(NOT OPERATED ON SUNDAY.)

WEST BOUND							EAST BOUND						
St. Struthers	St. Haselton	St. Youngstown	St. Brier Hill	St. Girard	St. Niles	St. Warren	St. Warren	St. Niles	St. Girard	St. Brier Hill	St. Youngstown	St. Haselton	St. Struthers
7:40	7:50	8:45	9:00	9:15	10:00	11:00	6:00	8:30	6:45	7:10	7:30	7:40	
1:30	3:00	3:00	3:15	3:30	4:15	5:15	11:00	11:45	12:15	12:30	1:00	1:30	1:30
							3:15	6:00					

LIGHT FACE FIGURES A. M. DARK FACE FIGURES P. M.

Special Rates on Large Shipments given on application to Depot Agents or Freight Conductor. All Packages must be Marked Plainly with Name and Address of Consignee. All charges must be Paid in Advance

SPECIAL NOTICE TO SHIPPERS.

Goods for Shipment must Arrive at depots at least 15 Minutes before time for departure of Car, otherwise will be stored in depots until the next trip. (This regulation will be rigidly enforced.)

A. A. ANDERSON, Gen'l Mgr., Youngstown, O.

FIG. 7.—POSTER NOTICE.

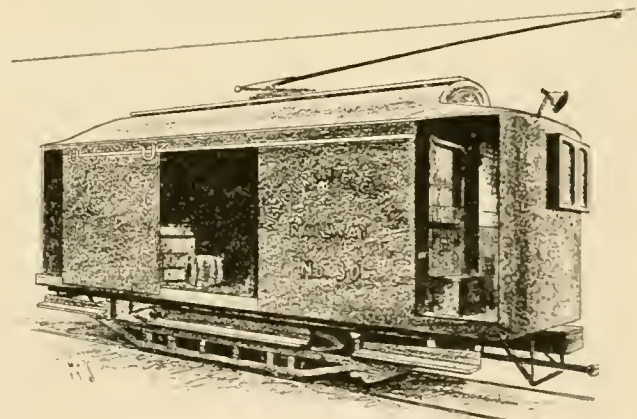


FIG. 9.—BOX FREIGHT CAR, NEWBURGH.

of their methods. Several of the printed forms used and photographs of cars are reproduced for the convenience of companies about to start an express or freight traffic.

Cleveland, O., is the center of what is probably the most extensive parcel and light freight service in the United States, its location and the network of interurban roads entering the city, furnishing the very best conditions for the development of traffic of this nature. The business has grown to such an extent that the prominent electric lines centering there do not attempt to take care of the express matter themselves, but have placed the traffic in the hands of a separate company known as the Electric Package Co. and doing business on exactly the same methods as the older ex-

press companies operate on steam roads. The Electric Package Co. controls the carriage of baggage and parcels on the Lorain & Cleveland Ry., the Cleveland, Berea, Elyria & Oberlin Ry., the Northern Ohio Traction Co., and the Cleveland, Painesville & Eastern R. R., reaching Cleveland, Akron, Painesville, Oberlin, Elyria, Lorain and other points.

Mr. W. H. Kenworthy, superintendent of the package company sends us the following account of the work it is doing:



FIG. 10 BAGGAGE CARRIER, WATERLOO, IA.

"The keen competition of electric street railways in the line of all business covered by steam roads has led the large trunk roads in different sections of the country to take advantage of all means to affect this class of competition. About a year ago a number of the trunk lines compelled the express companies operating over their systems to vacate electric railways that in any way competed with or paralleled their roads. This, as a matter of course, compelled the old line express companies to vacate all suburban electric lines centering in Cleveland, and this led to the development of our express service for light freight.

"The Electric Package Co., which is a direct representative of the suburban electric lines centering in Cleveland and which cover a radius of 50 or 60 miles from Cleveland, has inaugurated a system of baggage and express service which is equal to that on any steam line in the country.

"First, take into consideration the handling of milk. We are at present handling altogether on our five lines, from 800 to 1,000 ten-gallon cans per day. This, you will note, was formerly carried by the baggage department of the railroads, and from it they derived considerable revenue. We obtain this business through the advantages offered by electric suburban lines, which traverse the country highways and make each farm house or road crossing a loading station at which cars can stop and load; and this stopping and starting can be accomplished with little or no expense or inconvenience in comparison with the steam lines. Again, the cars traverse the city streets, and we find that cans can be delivered to milk-men along streets, causing no more delay to cars than to pick up and discharge passengers. We also get a large quantity of mill feed to handle for the dairy farms, which furnishes us with a profitable revenue.

"Our system offers to the traveling public the proper care and security for the handling of baggage in transit, and places our lines on the same basis as the steam roads. This, together with the fact that we can carry passengers at a rate lower than steam lines, and give them good speed service, naturally forces business our way.

"Our system of express freight is handled just as by the old line companies, and at rates equivalent to those charged by them; we maintain city terminal delivery and collection service, and as we are in position to forward and receive matter in transit on cars on the hour schedule, these advantages are readily seized by our city dealers and the suburban merchants, as they can order goods and have the satisfaction of knowing about when to expect them.

"As we speed along by the farm, the farmer realizes the advantages of our lines, and instead of loading his produce on his wagon and teaming it to the city markets, he uses our cars, and in a short space of time he is bartering his produce on the market and

is enabled to return home without the aid of a slow team; and while en route, can with amazement figure the advantages of the electric age.

"Having demonstrated that there is no end to the advantages in handling freight on electric lines, after securing proper legislation which will give us the privileges of handling our cars on the city lines during the night, we will be able to handle freight in car-load lots at rates lower or equivalent to those offered by steam lines, and as time is a great advantage, will in time, control the suburban freight short haul traffic.

"We have not confined our service to lines directly under our control, but accept freight destined to lake ports, which we transfer to the fast passenger boats when lake navigation is in operation. We could handle rail freight connection, but are handicapped by the steam roads refusing to have business intercourse with the electric lines.

"The Electric Package Co. is under the management of B. Mahler, manager, and W. H. Kenworthy, superintendent, who has had over 20 years experience in all branches of the express service with the old line companies."

Fig. 1 is a view of one of the standard express cars at Cleveland, Fig. 2 shows two of the cars in front of the office of the Electric Package Co., just as they came in to be loaded and unloaded, and Fig. 3 shows the receipt blank used. This in its original size is 5½ x 8½ in.

The Mahoning Valley Railway Co., of Youngstown, O., operates a package and freight car between Struthers, Youngstown, Girard, Niles, Warren and Mineral Ridge. Two trips a day are made to each point except Mineral Ridge, which has but one trip a day. A map of this company's system was published on page 3 of the "Review" for January, 1900.

The freight car is 32 ft. in length with two sliding doors on each side. The interior is one large compartment extending from vestibule to vestibule with only a small partition at the motorman's end, about 3 ft. high to prevent packages and freight matter from interfering with the controller or brake. The company also has a short, single truck box car about 14 ft. in length, which is used as a trailer when occasion requires.

Through the courtesy of Mr. A. A. Anderson, general manager and treasurer of the Mahoning Valley Railway Co., we are able to reproduce herewith, Figs. 4 to 7 inclusive, several printed forms used in connection with the operation of its freight department, including bill of lading, card for showing distribution of amounts collected over the various divisions, receipt given for goods, and an advertising poster, which announces schedules, shipping instructions, etc.



FIG. 12—DAYTON & WESTERN BAGGAGE CAR.

The bill of lading is shown reduced in Fig. 4. This form is on a sheet 45½ x 7½ in.; it is coated on the back with a special duplicating substance and is printed on the same sheet as the receipt to be signed by the consignee, and folds over it, being detached when filled out, the two forming one leaf in a book. Thus when the conductor receives a package and fills out the bill of lading he at the same time secures a duplicate of the entry on the page of his receipt book. The amount paid by the consignor is indicated by punch marks in the margin. This scheme of coating the back of the bill of lading obviates the necessity of using loose sheets of carbon paper.

The receipt remaining in the conductor's book serves as a duplicate of the bill of lading and is signed by the consignee when the goods are delivered.

The distribution card is shown in Fig. 5. The lower half is a duplication of the upper half, with the exception that the letters at the top of the columns are reversed. These letters stand for the names of the towns on the route, Y for Youngstown, G for Girard, N for Niles, W for Warren, etc. The card is 6 3/4 x 9 1/8 in. The receipt used at depots, Fig. 6, is 8 x 5 3/8 in. and the poster notice, Fig. 7, is 9 x 11 1/8 in.

Waterloo and Cedar Falls Rapid Transit Ry. Co.
CONDUCTOR'S STUB.

Date 189 No. 9585
From To
NO. DESCRIPTION NO. CONSIGNEE TOTAL COLLECTY TOTAL DREBART

Conductor make bill for all packages carried detach stub, show bill to consignee on bags, depot. Receipt rate, day, month, date and sum. Stub in office with Daily Report.
The last Conductor heading this Way Bill will not receive Receipt from Dress and Mack Linn.

Waterloo and Cedar Falls Rapid Transit Railway Co.
FREIGHT WAY BILL. NO 9585

Table with columns: NO, DESCRIPTION, WEIGHT, CONSIGNEE, RATE, TOTAL, etc. Includes a section for 'WRITE NAME OF MONTH' and '189'.

FIG. 11—FREIGHT WAY BILL, WATERLOO & CEDAR FALLS.

Figs. 8 and 9 show two of the freight cars on the Newburgh (N. Y.) Electric Ry. The company has four of these flat trail cars, each capable of carrying from 8 to 9 tons. The box cars are so arranged that snow plows can be attached to them, and the tracks outside of the city are cleaned of snow in this way.

One of the best schemes that has come to our attention, for carrying merchandise, baggage, etc., where this class of traffic has not developed to proportions sufficiently large to justify the running of special cars, has been worked out by Mr. L. S. Cass, president and general manager of the Waterloo (Ia.) & Cedar Falls Rapid Transit Co. On this line between Waterloo and Cedar Falls, this company operates long, double truck, vestibuled "interurban" cars, a type now well developed in this country. Attached to the rear end of each car is a removable shelf or carrier, a good idea of which can be obtained from Fig. 10. This is supported at one edge by pockets under the car on the sills, and is strengthened at the other by two stay chains as shown. The carrier can be quickly removed if necessary although this should be seldom required. If it is desired to run a trailer with a motor car equipped with the device, an extension coupling can be easily utilized.

On the Waterloo and Cedar Falls line a canvas cover is carried with each car at all times for the purpose of covering any articles that may be on the suspended platform, in case of storm. The weight to be placed on each carrier is limited to 4,000 lb. Mr. Cass states he first got the idea of these extension shelves for baggage, etc. from seeing a similar device on the old stage coach in Buffalo Bill's Wild West Show. He courteously offers to furnish further details to any manager who desires to adopt the arrangement.

The freight way bill in use on this road with conductor's stub attached is reproduced in Fig. 11. Its original size is 4 1/4 x 14 3/4 in.

From a small folder issued by the Waterloo & Cedar Falls Rapid Transit Co. to its conductors, we reprint the following rates and rules governing the handling of packages, etc. on both its interurban and city cars.

- All packages of merchandise up to 100 lb., inclusive, from Waterloo or Cedar Falls to Cedar River Park, San Souci, Fossilman, Cass Junction, Cedar Falls, Waterloo, and intermediate points... 20 cents
- Packages carried to and from points within the city limits of Waterloo up to 100 lb., inclusive... 10 cents
- Over 100 lb. 6 cents per 100 lb. or fraction thereof. (Example: a package weighing 110 lb., 26 cents or 16 cents, according to destination).

Bicycles and baby cabs will be carried at the same rate as 100 lb. of merchandise, except when accompanied by their owner, in which case the same rate will be collected for the bicycle or baby cab as is collected for the passenger.

(Example: a 5 cent fare is collected for the passenger, collect 5 cents for the bicycle or baby cab.)

Hand baggage that does not occupy the space of a passenger will be carried free. All other baggage will be charged for at 20 cents per piece, regardless of weight or destination.

Dogs will not be allowed in any car, but will be carried on platform and a

charge of 25 cents shall be made for every dog on any car between all points on this line.

When goods are shipped C. O. D., you will make a charge of 25 cents for collecting the money and returning it to the consignee.

All empty cases, crates, kegs, etc., when being returned to original consignee for re-filling, will be carried at 5 cents each, regardless of weight, and at owner's risk.

No goods must be accepted that are perishable, after 5 p. m. of any day, unless the conductor knows personally that delivery can be made promptly upon arrival at destination.

All articles will be accepted for transportation, either prepaid or collect. When collect, the conductor or agent will mark the word "collect" in pencil on wrapper or tag, and in figures mark the amount to be collected.

Packages that are marked collect will not be delivered to consignee until charges have been paid. In case charges are not paid you will retain package in your possession and notify the general office.

All packages of merchandise, bicycles, baby cabs, dogs, etc., except baggage and empty crates, kegs, etc., will be called for and delivered within the city limits of Waterloo and Cedar Falls at the rates above named.

Baggage will not be called for or delivered, but will be transported from any given point on the line to any destination on the line at rates named above.

Empty crates, kegs, cases, etc., will be delivered free of charge within the

Form titled 'COPY Received from By the DAYTON & WESTERN TRACTION CO.' with fields for 'Consignee', 'Destination', 'MARKS', 'ARTICLES', 'WEIGHT Subject to Correction', and 'Received the above described property in good condition, except as noted.' Includes a table for freight rates.

FIG. 13—COPY OF BILL OF LADING.

cities of Waterloo or Cedar Falls, but must be delivered to car by consignor at point of shipment.

Bicycles and baby cabs, when accompanied by owner, must be delivered to car by consignor, and taken from car and receipted for by parties accompanying it.

All shipments, when consigned to any point on our line outside of the city limits of Waterloo or Cedar Falls, must be received at owner's risk and will only be delivered by parties calling at car and receipting for same.

Receipts for articles delivered must be taken on way bills by interurban conductors and on reports furnished for that purpose by local conductors.

Charges collected by local conductors will be shown on report furnished them for that purpose, deposited with passenger collections and rung up on register.

Interurban conductors will way bill all articles carried by them; will deposit all collections with passenger earnings but not ring collections for packages on their register.

No agent or conductor has the authority to vary from these rules without written authority from an officer of this company.

Fig. 12 is a view of the type of freight and baggage car, adopted by the Dayton (O.) & Western Traction Co., which has a well organized freight department. We are indebted to Mr. Valentine Winters, president, for the photograph from which this was taken, and also for several samples of printed matter used in connection with the handling of freight. The form reproduced in Fig. 13 is the duplicate bill of lading, retained by the company. The original which is given to the consignor is substantially the same, except that it bears the word "Original" in place of the word "Copy," the word "Agent" instead of "Consignee," and it does not contain the last line referring to the condition of the property. A shipping order, also of about the same form is provided, in which the shipper declares the contents of his consignment.

All of these blanks are 5 x 9 in. and on the backs, the following conditions are printed in small type:

CONDITIONS.

1. No carrier or party in possession of all or any of the property herein described, shall be liable for any loss thereof or damage thereto; by causes beyond its control or by floods or by fire from any cause or wheresoever occurring; or by riots, strikes or stoppage of labor; or by leakage, breakage, chafing, loss in weight, changes in weather, heat, frost, wet or decay; or from any cause if it be necessary or is usual to carry such property upon open cars.

2. No carrier is bound to carry said property by any particular train or vessel, or in time for any particular market, or otherwise than with as reasonable dispatch as its general business will permit. Every carrier shall have the right, in case of necessity, to forward said property by any railroad or route between the point of shipment and the point to which the rate is given.

3. No carrier shall be liable for loss or damage not occurring on its own road or its portion of the through route, nor after said property is ready for delivery to the next carrier or to consignee. The amount of any loss or damage for which any carrier becomes liable shall be computed at the value of the property at the place and time of shipment under this bill of lading, unless a lower value has been agreed upon or is determined by the classification upon which the rate is based, in either of which events such lower value shall be maximum price to govern such computation. Claims for loss or damage must be made in writing to the agent at point of delivery after arrival of the property, and if delayed for more than 30 days after delivery of the property or after due time for the delivery thereof, no carrier hereunder shall be liable in any event.

4. All property shall be subject to necessary cooperage and baling at owners cost. Each carrier over whose route cotton is to be carried hereunder shall have the privilege at its own cost, of compressing the same for greater convenience in handling and forwarding, and shall not be held responsible for unavoidable delays in procuring such compression. Grain in bulk consigned to a point where there is an elevator may (unless otherwise expressly noted herein, and then if it is not promptly unloaded) be there delivered and placed with other grain of same kind, without respect to ownership, and if so delivered shall be subject to a lien for elevator charges in addition to all other charges hereunder. No carrier shall be liable for difference in weights or for shrinkage of any grain or seed carried in bulk.

5. Property not removed by the person or party entitled to receive it, within 24 hours after its arrival at destination, may be kept in the car, depot or place of delivery of the carrier, at the sole risk of the owner of said property, or may be, at the option of the carrier, removed and otherwise stored at the owner's risk and cost and there held subject to lien for all freight and other charges. The delivering carrier may make a reasonable charge per day for the detention of any car and for use of track after the car has been held 48 hours for unloading, and may add such charge to all other charges hereunder, and hold said property subject to a lien therefor. Property destined to or from a station at which there is no regularly appointed agent, shall be entirely at risk of owner when unloaded from cars, or until loaded into cars and when received from or delivered on private or other sidings, shall be at owner's risk until the cars are attached to and after they are detached from trains.

6. No carrier hereunder will carry, or be liable in any way for any documents, specie or for any article of extraordinary value not specifically rated in the published classifications unless a special agreement to do so and a stipulated value of the articles are endorsed hereon.

7. Every party, whether principal or agent, shipping inflammable, explosive or dangerous goods without previous full written disclosure to the carrier of their nature shall be liable for all loss or damage caused thereby, and such goods may be warehoused at owner's risk and expense or destroyed without compensation.

8. Any alteration, addition, or erasure in this bill of lading which shall be made without special notation hereon of the agent of the carrier issuing this bill of lading shall be void.

9. If the word "order" is written hereon immediately before or after the name of the party to whose order the property is consigned without any condition or limitation other than the name of a party to be notified of the arrival of the property, the surrender of this bill of lading properly endorsed shall be required before the delivery of property at destination. If any other than the aforesaid form of consignment is used herein the said property may, at the option of the carrier, be delivered without requiring the production or surrender of this bill of lading.

10. Owner or consignee shall pay freight at the rate below stated, and all

other charges occurring on said property, before delivery, and according to weights ascertained by any carrier hereunder; and if upon inspection it is ascertained that the articles shipped are not those described in this bill of lading, the freight charges must be paid upon the articles actually shipped, and at the rates and under the rules provided for by published classification.

11. If all or any part of said property is carried by water over any part of said route, such water carriage shall be performed subject to the condition whether written or printed contained in this bill of lading, including the condition that no carrier or party shall be liable for any loss or damage resulting from the perils of the lakes, seas, or other waters; or from exposure, bursting

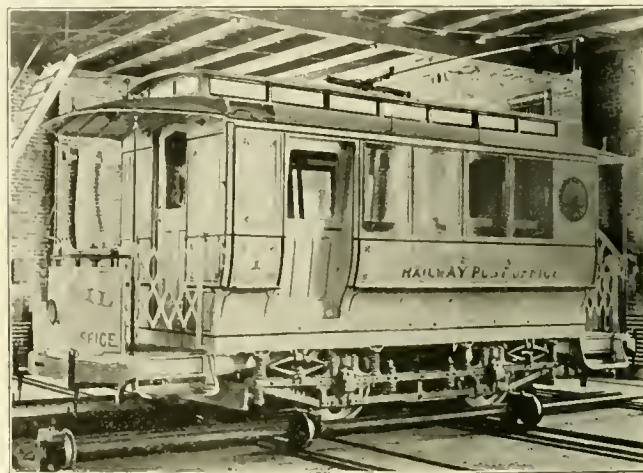


FIG. 14—MAIL CAR, BROOKLYN.

of boilers, breaking of shafts, or any latent defect in hull, machinery or appurtenances; or from collision, stranding, or other accidents of navigation or prolongation of the voyage. And any vessel carrying any or all of the property herein described shall have liberty to call at intermediate ports; to tow and be towed and to assist vessels in distress, and to deviate for the purpose of saving life or property. And any carrier by water liable on account of loss or damage to any of said property shall have the full benefit of any insurance that may have been effected upon or on account of said property.

We are enabled to show herewith, Figs. 14 to 19 inclusive, through the courtesy of Mr. C. L. Rossiter, president of the Brooklyn Rapid Transit Co., six of the special cars operating on that system, including two flat cars used by the company for handling rails, motors, heavy tools, etc. for its own purpose. The Brooklyn Rapid Transit Co. does not do a public freight and express business itself, but furnishes cars and power to run them, to the National

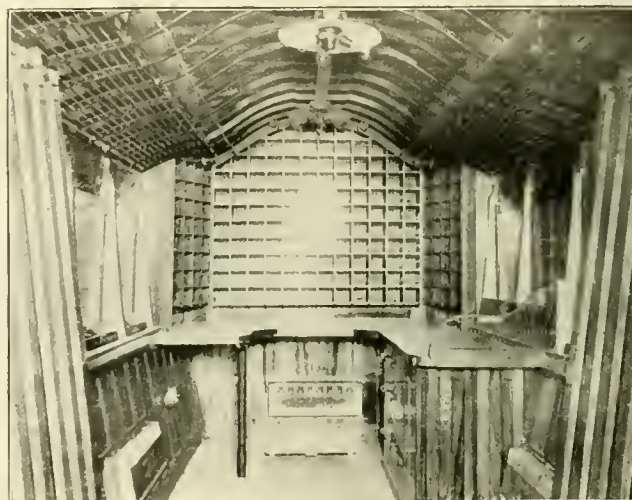


FIG. 15—INTERIOR OF MAIL CAR.

Express Co., which operates over the line in about the same way as over steam railroads.

The following letter has been received from Mr. R. E. Danforth, superintendent of the International Traction Co., of Buffalo, on the subject of freight:

"We have two electric locomotives on the Buffalo & Lockport division in constant use. We haul no freight at present on any of the other lines. For a number of years freight cars were hauled by a small motor car weighing 6 tons and equipped with two W. P. 50

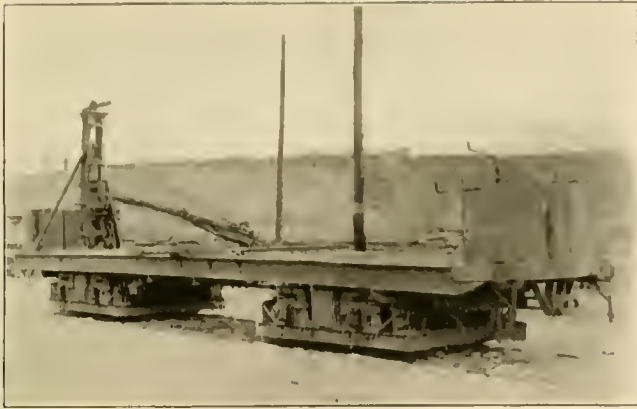


FIG. 16—SPECIAL CAR WITH CRANE.



FIG. 17 SPECIAL CAR FOR RAILS.

motors, on the Buffalo, Bellevue & Lancaster line. The work was done very satisfactorily and to the profit of the company. The shutting down of the stone quarry put an end to the freight business on that line, as the freight consisted entirely of building and crushed stone.

"The Buffalo & Niagara Falls Electric Ry. and Buffalo & Lockport Ry. run on regular schedule, combination passenger and baggage cars, handling the personal baggage of passengers between Buffalo and Niagara Falls and Lockport.

"A single truck baggage car is used on the Niagara Falls Park & River Ry. during summer months. This car is the usual closed box pattern with large side doors and small end platforms."

The Chicago, Harvard & Geneva Lake Ry., which has been in operation now eight months, finds its freight income steadily increasing and the company has been obliged to purchase a second

On cross examination, however, the information was elicited that the three witnesses had prior to the trial, received from Irwin, a carefully prepared typewritten statement "to look over and refresh their recollection so that they would know what to say on the trial of the action." This statement was wholly false and untrue.

In Chicago last month the city attorneys discovered an organized bureau which advertised for all kinds of personal injury cases, undertaking to make the evidence fit the complaint. The promoter and nearly all of his clients are Poles or Bohemians and they operate against all corporations, but make a specialty of defective sidewalk cases against the city.



FIG. 18—EXPRESS CAR.

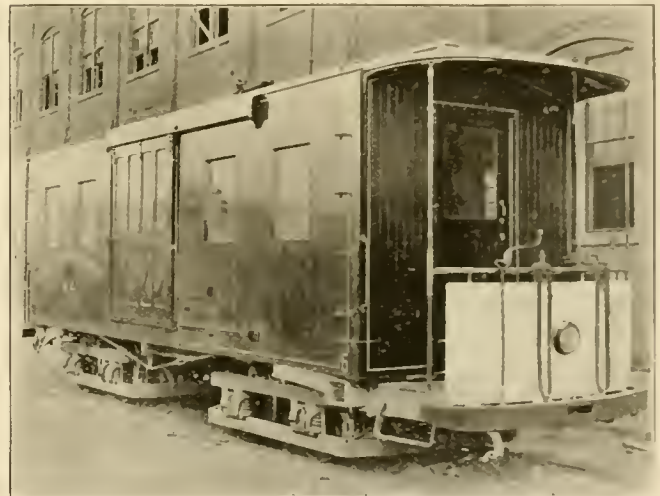


FIG. 19—FREIGHT CAR.

freight locomotive. In addition to piece freight and express the car-load business is good. On March 12th to the 15th inclusive—four days—30 full car loads were hauled, including coal, lumber, brick and live stock. This all went in and out of a farm district where the largest village is less than 500 population.

AN EXPERT "ACCIDENT ADJUSTER."

Counsel for the Metropolitan Street Railway Co., of New York, has been successful in bringing to trial for subornation of perjury, a man named Robert J. Irwin, who is described as an "accident adjuster", with offices at 7 Beekman St., New York. The particular offense on which the charge is made was discovered on February 8th last, at the trial of an action to recover \$25,000 damages from the Metropolitan Street Railway Co. for a woman's death, said to have been caused by injuries received while alighting from a car. At the hearing three witnesses testified that the conductor was clearly at fault, having given the signal to go ahead before the woman had stepped to the ground.

NEW FRANCHISE AT DENVER.

On March 20th the Denver board of aldermen passed an ordinance giving the Denver City Tramway Co. a 20 year franchise on all the streets now occupied by cable lines, with permission to change the motive power; the mayor gave his approval the following day. As soon as Mr. C. K. Durbin, general superintendent of the company was advised of the mayor's action a force of 200 men was put at work setting poles, and it was promised that within two weeks cables would be a thing of the past in Denver. The company expects to spend \$1,000,000 on improvements which will include a new power house.

It is stated that suit has been filed by stockholders of the Dayton (O.) Traction Co., to set aside the consolidation of the Dayton Traction Co., the Cincinnati & Miami Valley Traction Co., the Cincinnati & Hamilton Electric Street Railway Co. as the Southern Ohio Traction Co., and praying for a receiver for the Dayton Traction Co.

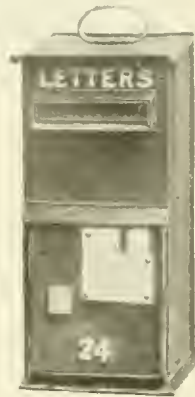
TRAMWAY LETTER BOXES AT HUDDERSFIELD, ENG.

Through the courtesy of Mr. J. Pogson, general manager of the Huddersfield (Eng.) Corporation Tramways, we are enabled to give an account of the letter-box collecting system which has been in use on the tramway cars at Huddersfield for seven years with results equally satisfactory to the postal authorities, the tramway company and the public. The method is totally different from the street railway postal service common in this country in that in place of letter boxes rigidly fastened to the cars, a detachable box is employed, and mail collections are made by collecting the boxes themselves.

One of the receptacles is shown herewith. These are furnished by the Town Corporation, but are fitted with locks provided by the postal authorities and keys to which are carried only by special postmen. Two boxes, each numbered alike, are provided for each car, although but one is carried at a time.

At the end of every trip or about every hour, the conductor removes the filled box from his car and deposits it at the general office of the tramway company, in a small room specially fitted up for the purpose. Here are two rows of shelves divided into pigeon holes, each large enough to receive one of the boxes, and numbered to correspond with the box numbers. The conductor places the full box on the top shelf in the proper space and takes an empty one, bearing the same number, from immediately under it on the bottom shelf. A postman at frequent intervals visits the office, opens the boxes and collects the mail, placing the empty ones on the bottom shelf under their respective numbers and ready for the next clearance.

The boxes are attached to the cars by means of a sliding bracket somewhat similar to the usual device for attaching a lamp to the front fork of a bicycle. The movement of placing the box on the



LETTER BOX.



HUDDERSFIELD TRAM CAR.

bracket automatically locks it in position and operates a shutter which opens the aperture for receiving letters. It is necessary to use the conductor's carriage key for disengaging the box, and the act of disengaging, operates the shutter again and closes the aperture for letters and it remains closed and cannot be opened until the letter box is opened by the postman, when the shutter is released automatically and put into position for receiving mail.

The number of letters posted annually in the boxes attached to the 20 street cars in operation is about 500,000. An arrangement is made with the postal authorities for the postal and telegraph staff to have the use of the cars when on duty; the amount of the contract, inclusive of the letter boxes, is £300 per annum.

The instructions, a copy of which is reproduced herewith, allow for letters to be posted at the various termini, rd. stages and authorized stopping places free, but rd. is charged for a stoppage for the sole purpose of posting a letter. This rule was considered necessary to prevent abuse, but no difficulty has been experienced, the public appearing very willing to walk to a stopping place.

Huddersfield  Corporation
TRAMWAYS.

POSTAL LETTER BOX
ON THE TRAM CARS.

For the convenience of the Outer Districts, arrangements have been made with the Postal Authorities to have a Letter Box attached to each Tram Car.

The Boxes will be cleared by the Postal Staff, at the times stated on the tablet attached to the Box.

Letters Posted in these Boxes are subject to the usual Postal Rules and Regulations.

INSTRUCTIONS.

Letters may be Posted at the various Termini, rd. Stages, and the authorised stopping places, Free

The Tram may be stopped at any other point for the purpose of Posting Letters, on payment of rd., which must be put into the Conductor's Fare Box.

BY ORDER

J. POGSON,

MANAGER.

*Tramways Department,
March 20th, 1893.*

The tramway arrangements of the town are very favorable for a satisfactory letter box system, all the cars converging on one center (St. George's Square), immediately in front of the railway station. The tramway offices and postoffice practically adjoin each other in the square.

TICKET BOOKS AT HAMILTON, O.

The Hamilton (O.) & Lindenwald Electric Transit Co. has decided to issue books of tickets at reduced rates and from the announcement published by the company we take the following:

Twelve tickets book, good for eight days (Sunday to Sunday inclusive), 40c each.

Fifty-two tickets book, good for one calendar month, \$1.65 each.

One hundred and four tickets book, good for one calendar month, \$3 each.

These tickets are to be detached by the conductor when used, and when presented by the person named on the cover, and are good only between the following hours: 5:30 a. m. to 7 a. m.; 12 m. to 1 p. m.; 5 p. m. to 7 p. m. (Saturdays 4 p. m. to 6 p. m.).

A liberal construction will be given to the above condition by conductors, who will be instructed to allow 20 minutes' latitude on same. Upon request a change in the conditions will be made so that holders of books, who are employed until say 9 p. m. can use the tickets when returning from work at night. In case purchaser is prevented through sickness, or other good cause, from using all of his tickets within the time specified, his unused tickets will be accepted at full price charged, in part payment on a new coupon book.

Fifty tickets book, good for 30 days from date of sale, \$1.85 each.

One hundred tickets book, good for 60 days from date of sale, \$3.50 each.

These tickets are good for all hours of the day, to be used by the person whose name is mentioned on the cover, or by any member of his family. The holder of this kind of coupon book may leave it at his home and detach tickets from it as needed.

One ticket, good for three months from date of sale, permitting person whose name is mentioned to ride as often as desired, \$10.

All of the special rate coupon books are for sale at the office of the H. & L. Electric Transit Co. An authorized agent in each shop will take orders for and deliver coupon books.

The announcement is signed by C. Benninghofen, president; J. J. McMaken, vice-president; P. Benninghofen, secretary and treasurer; C. E. Warwick, assistant secretary.

In answer to an inquiry as to the reasons which prompted these reductions President Benninghofen writes us: "We made the reductions because we wish to encourage street car riding. We undertook the active management of this road only quite recently and found it was necessary to adopt means whereby traffic would be increased. The change in rates is of such recent date that we cannot at present state how well the plan will work. However, we can say this much, that we are meeting with encouragement, and believe that ultimately the plan will prove successful."

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ANNUAL REPORT TWIN CITY RAPID TRANSIT CO.

Pres. Thomas Lowry, in transmitting the annual report for last year of the Twin City Rapid Transit Co., of Minneapolis, said:

"The gross earnings of the company for the fiscal year ending Dec. 31, 1899, have been \$2,522,793.85, as against \$2,170,716.01 for the year 1898. The cost of operation including taxes, has been 48.71 per cent. For the year 1898 this cost was 49.92 per cent, and for the year 1897, 53.18 per cent. The efficiency of the property in every respect has not only been maintained but increased. The surplus earnings for the year were \$737,578.60, which was an increase over the previous year of 49 per cent. After paying the regular quarterly dividends on the preferred stock, the surplus for the common stock was \$550,025.26. On August 15th the first dividend of one per cent, or \$150,100, was paid on the common stock, and on February 15th of this year a second dividend of 1½ per cent, or \$225,150, was paid. This left a balance in the surplus account of 1899 of \$174,775.26, carried to surplus account.

"During the year the company has cancelled \$20,000 of the remaining \$310,000 Minneapolis Street Railway Co.'s first mortgage 7 per cent bonds by the issue of \$20,000 consolidated mortgage 5 per cent bonds of the same company. By the sale of \$237,800 of the preferred stock of the company it has purchased \$291,000 St. Paul City Railway Co.'s 6 per cent debenture bonds.

"The company has likewise acquired further amounts of stock of the Minneapolis & St. Paul Suburban Railway Co. The St. Paul City Railway Co. has guaranteed for the latter company the principal and interest of \$450,000 25-year 5 per cent gold bonds, thus enabling the company to sell the bonds and make an important addition to its line which now joins with the lines of the St. Paul City Railway Co. and runs through the villages of North St. Paul, White Bear and Mahtomedi to the city of Stillwater, where it occupies the main street in that city.

"The whole line is operated by electric power from stations located in St. Paul, White Bear and the city of Stillwater. The road has been thoroughly equipped with large standard cars of the most improved type. It was opened for traffic July 1, 1899, and the earnings have proved satisfactory."

The operating expenses for the year are given as follows:

Maintenance of way and structures.....	\$ 33,820.00
Maintenance of equipment.....	165,364.44
Operation of power plant.....	147,467.12
Car services.....	602,601.79
General expenses.....	105,855.79
Legal expenses.....	21,099.92
Injuries and damages.....	72,910.64
Insurance.....	6,862.67

Total operating expenses.....\$1,156,972.37
 The number of car-miles run during the year was 13,211,865.

SLID-FLAT WHEELS.

At the January meeting of the Northwest Railway Club the subject of "Slid Flat Car Wheels" was discussed by Mr. F. B. Farmer, of the Westinghouse Air Brake Co. The author said that the general experience appeared to be that more wheels are skidded in winter when there is no snow, dust and frost being a combination most conducive to skidding. Proceeding to the other causes, he said in part:

Some time ago, while investigating the question of slid wheels, my attention was called to a machine that was being used at that time in the Soo shops. They grind cast wheels and mate and remount them. Noticing that a pair of wheels in the grinder had flat spots, and that the wheels were out of true, I asked the man to see if other cases were similar to this, showing that the large part of the wheel was just passing under the brake shoe, when the part having the flat spot would have been in contact with the rail. He followed it up for some time, and found that this is almost invariably true. On a road that had considerable trouble from cast wheels flattening, the matter was given some attention, and a device was got up for quickly testing this feature. They found a few cases where the wheels were bored out of center, traced them, and found a boring mill responsible for the poor condition; so that I think the two instances cited are sample illustrations of causes of wheels sliding.

It has been frequently remarked that when a wheel or a pair of wheels flattens, the next time they catch it will be in the same spot. I think this is more often due to such a cause as just mentioned rather than to the flat spot made in the first instance.

It may be of interest to hear of a test that was made on a western road some three years ago. Owing to the large number of flat wheels in a train of loaded cars, a test was made to determine about what pressure was necessary to slide wheels, and the distance necessary to produce a given length of flat spot. A loaded box car weighing 69,000 lb. at the rails, was charged to 100 lb. pressure, the brake was applied with full force standing, and the car was pulled for one-half mile. One pair of wheels turned almost the whole distance, two pairs slid intermittently, causing what is termed a "chain" flat, a succession of small flat spots, not serious enough to justify removal. One pair slid the entire distance, and had a 2¼-in. flat spot. Another test was made by applying the brake heavily, and pulling the car 100 ft. on what might be termed an ordinary rail, without sand. Then they examined the spot in contact with the rail and found scarcely any abrasion. The test was repeated on an undamaged spot, using sand the whole distance, and they found, upon examination, a 1-in. flat spot. So this shows how seriously sand may effect the flattening, and it indicates as well the small probability of wheels starting to revolve when sand is used after once locking. Of course, the great weight on the rail, with the car loaded, aided materially in causing this long flat spot, resulting from 100 ft. of sliding.

On the ore-carrying roads much trouble has been experienced from wheels sliding, due to several causes, the most important being that the empties are hauled one way, and the direction is generally an ascending grade. The grade and the empty cars enable the stop to be made with a very light application of the brake. In order to insure a release of applied brakes, the train-pipe pressure throughout the whole length of the train should be raised quickly and considerably. Where the reduction is small, the difference between the main reservoir pressure and the train line at the time of the release is correspondingly less than where the application is heavier. For that reason, holding the brake valve in the full-release position for a short length of time would give a sluggish flow toward the rear end and a lesser raise in pressure. If, to correct that, as far as possible, the brake valve is left in full release for a longer period, the brakes up at the head end are liable to be overcharged, and later on, through the temporary absence of any supply, the brakes may stick.

To overcome this the men have been instructed to insure, before attempting to release, a reduction of at least 10 to 15 lb. On one road they even went so far as to say that before attempting to release, a full service application of 20 lb. reduction should be made, and at the end of the season, whether from that or more attention being paid to other details, they had a better showing on the flat wheel question than previously. That same difficulty of

brakes sticking from a light application has been met with often on passenger trains, particularly when the engineman has applied the brake a little to steady the train around curves. It does not mean that the application made for the purpose of stopping the train at a given point must be any different than otherwise, but before the release is attempted enough should be added to that to insure the desired result.

NEW HAMPSHIRE ELECTRIC RAILWAYS.

The following is extracted from the "New Hampshire Railroad Commissioners' Report" for the year 1899 and gives that portion dealing with the electric railways in the state:

The Legislature of 1899 granted special charters for eight electric street roads: The Alton & Gilmanton, from Alton Bay to any point in the town of Gilmanton; the Claremont, between any points in the town of Claremont; the Derry & Pelham, from Derry Depot through the towns of Derry, Londonderry, Windham, and Pelham to the Massachusetts line; the Gilmanton & Barnstead, from any point in Gilmanton to any point in Barnstead; the Hudson, Pelham & Salem, from the Merrimack river in Hudson through the towns of Hudson, Pelham, Windham, and Salem to the Massachusetts line; the Meredith & Ossipee, from the steam railroad station in Meredith through the towns of Meredith, Center Harbor, Moultonborough, Sandwich, Tamworth, and Ossipee to the Boston & Maine Railroad in Ossipee; the Mont Vernon & Milford, from Milford village to any point in Mont Vernon, and the Troy, from the Fitchburg Railroad to the quarries of the Granite Co. It also authorized the Manchester Street Railway Co. to extend its road to Goffstown, extended the charters of the Keene road, and granted a charter to the Exeter, Hampton & Amesbury, with authority to consolidate in this corporation the Exeter & Hampton Street Ry., the Hampton & Amesbury Ry. and the Rockingham Electric companies.

All these street railway companies were authorized to occupy the highways, to issue stock and bonds, to construct and maintain dams and power-houses, and given all the rights, privileges and immunities that were asked for, but neither has built a rod of road or, so far as we are informed, taken any steps towards the use of its charter, for the reason that the grantees have not been able to convince capitalists that the enterprises could be made to pay.

The only new electric road construction of the year has been an extension of the Laconia road from Lakeport to the Weirs, another along Hampton Beach by the Exeter, Hampton & Amesbury Corporation, a short one in Manchester, and the production of a road from Portsmouth to Rye Center by the Boston & Maine. A petition for the approval of the issue of stock and bonds necessary to the construction of a road from Berlin to a point in Gorham, under a charter granted by the court upon the finding of the commission that the public good required it, is now pending before the board.

The Laconia road was extended from Lakeport to the Weirs to accommodate summer travel, and during the tourist season the extension had a paying patronage, but with the close of that season its business entirely disappeared, and the board, upon petition, authorized the managers to discontinue its operation until May 1, 1900.

The Legislature of 1899 passed an act imposing upon this board the duty of determining to what extent cars used upon electric roads in this state should be provided with vestibules and what the character of the vestibules should be.

After several public hearings and much investigation, it was ordered that all cars making regular round trips of more than fifteen minutes during the months of December, January, February and March should be vestibuled. This order was promptly complied with by the managers of the roads and the improvement is now in general use in this state. Experience thus far has abundantly justified the change.

The appearance of the cars is much better, the passengers are much more comfortable, and conductors and motormen are shielded from the winter weather which, when they worked upon open platforms, severely tested their powers of endurance, made them the objects of the pity of the public, and subjected their employers to bitter criticism.

None of the objections urged have been found to be important.

No accidents have resulted from the use of vestibules. No serious inconvenience has attended ingress or egress through them, and the testimony of motormen is that even in a storm when the windows are partially covered with snow or rain they can see as well and handle themselves better than they could when exposed as they were formerly.

The gross receipts and net earnings of all our completed street roads were larger in 1899 than in any previous year. Omitting the Laconia, which was being converted into an electric and extended, and the Exeter, Hampton & Amesbury and the Portsmouth, which were in process of construction, the footings for the year, as shown by the corporation returns, are as follows:

	Capital Stock.	Bonded Debt.	Floating Debt.	Earnings.	All Expenses.
Concord.....	\$100,000	\$118,500	\$12,325.00	\$67,364.02	\$56,230.37
Chester & Derry.....	50,000	50,000	7,301.46	10,340.23	10,314.63
Nashua.....	250,000	150,000	57,136.75	62,384.34	54,383.52
Manchester.....	170,000	250,000	36,559.95	162,074.43	162,455.77
Union.....	100,000	100,000	6,077.65	36,492.78	29,876.70
Totals.....	\$670,000	\$668,500	\$119,400.81	\$328,565.80	\$313,230.99

The expense account of the Manchester includes \$20,437.18 for the old accident claims. Making due allowance for this, the total payments of the five completed roads, including operating expenses, taxes, interest and incidentals, were \$292,793.81, and the receipts were \$328,565.80, a net income of \$35,771.99, or about 5 1-3 per cent on the capital stock, which is \$670,000. No dividends were paid, the divisible income being applied to floating indebtedness.

STORAGE BATTERY DECISION.

The United States Circuit Court of Appeals for the First Circuit (Judges Putnam, Aldrich and Brown) recently rendered a decision in the case of the Electric Storage Battery Co. against the Hatch Storage Battery Co., affirming the decision of the Circuit Court (Judge Colt) wherein the Hatch battery was held to be an infringement of the Brush patent, owned by the Electric Storage Battery Co., and an injunction granted against the further manufacture and sale of the Hatch battery. The opinion says that the Hatch battery "is clearly an infringement" and "it also seems clear to us that the respondent has taken the complainant's device," the court therefore affirmed the decretal order appealed from, with special reference to the first claim of the Brush patent, which is the basic claim.

This is the broadest legal victory yet won by the Electric Storage Battery Co. and secures to it a continuation of its monopoly during the life of the patent, on batteries composed of "a plate or suitable support primarily coated or combined with a chemically applied oxide or lead or equivalent lead compound" without which a commercial storage battery is impossible. This litigation has been pending for the past three years and has been most vigorously contested throughout, the Electric Storage Battery Co. being represented by John R. Bennett of New York and the Hatch company by Causten Brown and Alexander P. Brown, of Boston.

MANUFACTURERS' EXHIBIT AT NEW YORK.

The International Land & Exhibition Co. has been incorporated with a capital stock of \$500,000 for the purpose of extending to inland manufacturing concerns the privileges of an office in New York City. It has secured a space of 10,000 sq. ft. occupying the northwesterly quarter of the ground floor of the Bowling Green Building, and this will be devoted to exhibits of machinery, samples, etc., for clients. In connection with the showroom the company will have an export department, with branches in Europe, Mexico, Central and South America, Asia, Africa and Australia, a patent department and a land department. The charge for exhibition space is \$6 per sq. ft. per year. Mr. Albert Krimmert, Bowling Green Building, New York, is president of the company.

FIXED STOPPING POINTS FOR CARS.

The street railways at Worcester, Mass., and Hartford, Conn., are endeavoring to reduce the number of necessary stops made by their cars in service by stopping only at fixed points indicated by suitable signs. In discussing the change the Hartford Courant says that it is "informed that one motorman on the Asylum Ave. line whose running time is 10 hours a day, recently made a count and found that he stopped 550 times in the 600 minutes. It needs only to give (and accept) the figures to see how the business of running the car must have been interrupted. Of course, cars must stop. If they did not, they would be of no use. But stopping every minute all day long suggests that people stand in a long row and wait to be picked up. This is an apparent convenience to them, but, when you study it and note that whoever takes the car is stopped for but once and then has to be delayed by all the stops for others, the question opens whether the frequency of stops helps anybody as much as it hampers."

Some doubt is expressed as to the accuracy of the count but after a liberal allowance for excess of zeal it is evident that there is room for a marked reduction in the number of stops with corresponding increase in the convenience of the service.

STATISTICS FROM LIVERPOOL.

By the end of 1898 the city of Liverpool had $6\frac{1}{4}$ miles of electric road which had been built as an experiment. During 1899 over 30 miles were reconstructed for electric traction. In 1898 the traffic receipts were £311,610; passengers carried, 41,772,034; car-miles run, 4,789,300. In 1899 the receipts were £356,265; passengers carried, 63,771,450; car-miles run, 7,600,545. Of these passengers the electric cars carried 15,853,160; horse cars, 39,321,946; omnibuses, 8,596,344. In 1898 the rolling stock actually in service comprised 12 electric cars, 187 horse cars, 80 omnibuses; in 1899 there were 70 electric cars, 180 horse cars and 40 omnibuses in use, showing that the electric traffic was new business or obtained at the expense of the omnibus traffic.

Up to the first of the year the total expenditures on the tramway account aggregated £260,000, but the proposed expenditure for this year is over £600,000, of which £140,000 is for cars.

COLUMBUS (O.) CONTROVERSY.

The press dispatches from Columbus, O., of late have been full of accounts of the controversy pending between the Columbus Railway Co. and the city council over the renewal of franchises. In a letter to the mayor, Mr. E. K. Stewart, vice-president of the company, sets forth that the present dispute is not of the company's making and explains why a franchise ordinance was proposed. Last fall the Columbus Ry. acquired the property of the Columbus Central Ry. and in accordance with the general desire of the public wished to secure connections between these lines and its old High St. line. In anticipation of being able to get the necessary grants surveys were made and the special work bought at a cost of over \$25,000. On making application to the council, however, an outcry was raised that the street railway company was trying to get new franchises. The company was not seeking renewals, as the present grants do not expire for from 11 to 17 years, but at the request of the board of trade it prepared an ordinance for a 25-year extension of its High St. franchise and offered to pay the city \$50,000. This offer was rejected by the board of public works.

1,000 MILES BY TROLLEY.

Mrs. Jane Lindsey, in the New York World, describes the details of a trip of 1,008 miles by trolley which was as nearly continuous as schedules would permit; the time spent on the cars was 112 hours, 25 minutes, and the money spent in fares over the electric lines was \$12.05. During the trip which occupied just one week it was necessary to ride 54 miles in conveyances other than electric cars to cover breaks.

The start was made from Paterson, N. J., Friday, Feb. 9, 1900, at 9 p. m. The route was from Paterson to New York, via Passaic, Rutherford and Hoboken; thence to Coney Island and return; thence to Boston, via Mt. Vernon, New Rochelle, Bridgeport, New Haven, Hartford, Worcester, South Framingham, Niantic and New-

ton; thence to Nashua, N. H., via Lowell, and return; from Boston to Rockport, via Stoneham, Wakefield and Gloucester, and return, via Beverly; from Boston to Providence, R. I.; thence to Taunton; thence to Boston via Fall River, New Bedford and Brockton; from Boston to Worcester, via Needham; thence to New York over the same route as from New York to Worcester.

NO STRIKE AT ST. LOUIS.

As we went to press last month there was a strike threatened by the employes of the St. Louis Transit Co., the men asking for recognition of their union, a 10-hour day and uniform rate of wages. On March 11th the company and a committee of the men reached an agreement embodied in the following language:

"We will fairly inquire into every case, and any man discharged solely on the ground that he belonged to the union will be re-employed.

"Ten-hour work day, completed within 12 consecutive hours when possible, and a uniform rate of 20 cents an hour. Uniform rate may be established at once if the men wish.

"Men ordered to report for duty at a specified hour shall be paid from that hour until relieved. If not put on duty to receive half pay until relieved.

"Firemen, greasers, motor inspectors, car-washers and shedmen to be paid for overtime. We will meet any individual employe or any committee of employes in relation to any grievance."

Professional agitators worked up the strike situation, but the prompt, determined and eminently fair proposition laid down by General Manager Coleman left nothing to strike for.

REPORT OF THE CHARLESTON COMPANY.

The Charleston (S. C.) Consolidation Railway, Gas & Electric Co. was organized Feb. 21, 1899 (St. Ry. Rev., Apr., 1899, p. 268) under a special act of the Legislature granting a perpetual charter and gas and electric light powers, and controls the whole transportation and lighting field of Charleston. The only securities of the company are the following: Stock, \$1,500,000. Charleston City Ry., first mortgage 5 per cent gold bonds, \$816,000. Consolidated mortgage 5 per cent gold bonds, \$1,664,000. The authorized issue of the Consolidated bonds is \$2,500,000, of which \$850,000 is held in the treasury to retire the Charleston City bonds when due in 1923.

President Carey advises us that the earnings for the year ending Mar. 28, 1900, were \$439,920.85, and the operating expenses \$280,742.76, leaving \$159,178.09 net earnings.

The company owns 40 miles of electric road, of which 30 miles are in Charleston and 10 miles from Mount Pleasant (connecting by ferry with Charleston) to Sullivan's Island and Isle of Palms, a pleasure resort on the Atlantic coast, including land at Isle of Palms, ferry, etc. The company is consolidating all of its three power stations in one and in March, 1900, its addition to its City Ry. power station for that purpose was rapidly approaching completion. On completion both railway systems and light and power division will be operated from same station; the Seashore division having been connected by submarine cable.

The officers are: President, Francis K. Carey; vice-president, Philip H. Gadsden; general manager, Nicholas S. Hill, jr.; auditor, P. J. Balaguer; cashier, Montague Trieste. The directors are: Francis K. Carey, Robert C. Davidson, J. Bannister Hall, of Baltimore, and Philip H. Gadsden, Samuel H. Wilson, J. S. Buist, George B. Edwards, George W. Williams, jr., George A. Wagener and William M. Bird, of Charleston. Offices, No. 141 Meeting St., Charleston.

LONG ELECTRIC LINE IN AUSTRIA.

Mr. Josef Mechtl-Steinmanger in a recent article in the *Electrotechnischer Anzeiger* describes the electrical equipment of a proposed double-track tramway between Vienna and Pressburg, Austria. A stretch of 55 miles is to be worked from one power station; the whole system comprises over 60 miles. The power station will be at Hainburg on the Danube, where a fall of 19 ft. will be utilized. The generators of 250 kw. each will furnish alternating and continuous currents simultaneously from one winding.

G. W. KNOX.

Mr. George W. Knox, who recently resigned his position as electrical engineer of the Chicago City Railway Co., has associated himself with the firm of Kohler Brothers, engineers and contractors, as engineer and manager of the railway department. This



G. W. KNOX.

firm is prepared to engage in general railway engineering and construction work, commencing with the bare ground, building the road, equipping it completely and turning it over ready for operation. Mr. Knox is particularly well fitted for undertaking the direction of this department, having been engaged in similar work for the past 15 years. In 1885 he was employed in the mechanical department of the Chicago, Burlington & Northern; two years later he went with the Pullman company, being in the street car department of the works; the following year he was

with the Thomson-Houston company and in 1886 entered the service of the Sprague Electric Railway & Motor Co., with headquarters in Chicago, having charge of the electrical equipment of cars built at the Pullman shops.

In 1890 Mr. Knox was in charge of work for the Sprague company in equipping the West Side or Becker line in Milwaukee; the next year the company sent him to Minneapolis and St. Paul where he was assistant to the chief engineer in charge of the car and station equipment for over 200 miles of road. When this installation was completed Mr. Knox continued with the Edison General Electric Co., successor to the Sprague company, and was engaged at Milwaukee, Cincinnati, Columbus, Newark and elsewhere. In 1892 he went to Kansas City to superintend the conversion of the elevated road for electric traction and while there was offered a position with the Chicago City Ry.

Mr. Knox remained with the Chicago City Ry. for 7½ years, and three years ago was placed in charge of the track construction and general construction work of the entire system, with the title of engineer of construction, by the late Mr. M. K. Bowen, who was then general manager of the company. This long experience makes Mr. Knox well qualified for the work he has undertaken and we predict his success.

MUNICIPAL WIRING IN BOSTON.

The advocates of municipal ownership will find little comfort in the report of Mr. William Brophy, chief electrician of the Boston wire department, recently made to the mayor. This department was inaugurated several years ago by Mayor Quincy, together with other city undertakings with the avowed object of protecting the municipal treasury from the raids of private contractors. Details of the cost of work done by the wiring department of the electrical-construction division of public buildings show that the work as a rule cost about 2½ times the estimated cost, and on a number of instances where bids from private contractors had been rejected, the cost of the work to the city was about 60 per cent more than the amount of the rejected bids.

This difference is largely due to the class of labor. Mr. Brophy says: "A glance at the pay-rolls shows that nearly 60 per cent of the men whose names they contain were appointed at the request of certain prominent gentlemen, who, to say the least, are not the best judges of the necessary qualifications of the employes of this department. Electrical contractors employ only a sufficient number of men to meet the requirements of their business. Not so with the head of this department, for when, in his judgment, the force should be reduced, owing to lack of business, he meets with a most decided opposition from the friends of the men whose services sound business principles prompt him to dispense with. In nine cases out of ten the men selected for dismissal, because their services are not required, owe their appointment to some active politician, high in the councils of his party, who sees to it that his friends are

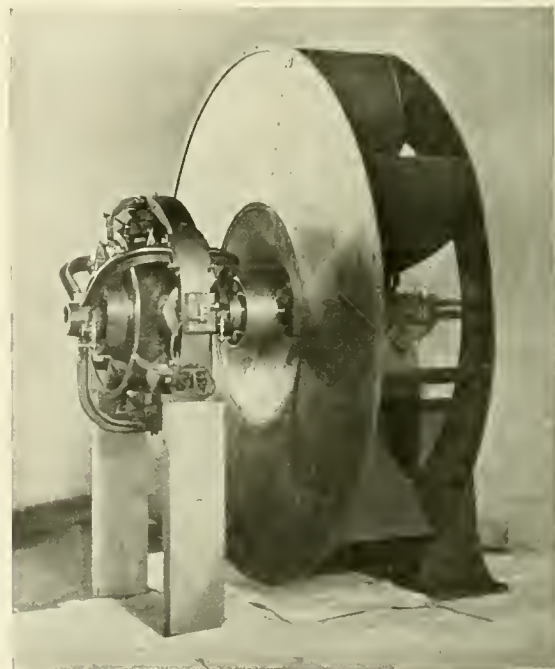
reinstated, regardless of the city's interest or the condition of its treasury. As a result of this unwarrantable interference men are kept on the pay-roll whose services are not needed, and others who never should have been employed. Discipline, which is so necessary for the success of any establishment, cannot be maintained in this department so long as a large percentage of its employes can retain their position, not through any effort of their own, but owing to party exigencies."

He recommends that the electrical construction division be discontinued.

A NEW STYLE OF ELECTRICALLY-DRIVEN VENTILATING WHEEL.

In the accompanying illustration is shown a form of ventilating wheel with special eight-pole attached motor, recently designed and constructed by the B. F. Sturtevant Co., of Boston, Mass. The fan is arranged with a large inlet for admission of air through one side only, has curved blades, and a conoidal plate concentric with the inlet, which serves to gradually deflect the air from an axial to a radial movement. In the inlet is placed a continuous-oiling journal box, which supports the fan shaft upon that side. Immediately outside and at the back of the wheel is a flanged coupling which joins the fan shaft to the motor shaft.

The motor is built within a wrought iron field ring. Attached to each side of the ring are tripod supports which carry the ring oiler bearings and absolutely center the armature within the field. The field cores are of wrought iron, with a special type of cast iron pole shoe, the peculiar size and shape of which makes possible extreme variation in load without sparking or adjustment of the brushes.



STURTEVANT VENTILATING WHEEL.

The armature coils are built up of laminated slotted discs which are solidly clamped between brass rings, having teeth to correspond with the core teeth which support both edges of the core. The commutator is built up of pure drop-forged copper segments and is of large diameter. Self-adjusting and self-feeding brush holders with carbon brushes are used.

This type of electric fan is employed without a casing, and usually arranged to draw the air through an opening in a wall and discharge it at a comparatively low velocity into the space within which is located the fan and the motor.

By the blowing of a fuse a conductor on the Metropolitan Street Ry., of New York, had the sight of both eyes destroyed. One fuse had blown out and the man was under the car making repairs when the second fuse flashed in his face.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

PHOTOGRAPHS AS EVIDENCE.

Stewart v. St. Paul City Railway Co. (Minn.), 80 N. W. Rep. 855. Nov. 17, 1899.

Photographs are frequently admitted in evidence as either secondary or demonstrative evidence, according to the method of their use. As demonstrative evidence they are competent whenever it is important that the locus in quo or place in which interest centers, or any object, person, or thing, be described to the jury. In such cases they serve to illustrate and apply the testimony, and are aids to the court or jury in comprehending the questions in dispute, as affected by the evidence. But their value depends upon their accuracy. They must be shown by extrinsic evidence to be faithful representations of the place or subject as it existed at the time involved in the controversy.

Here was an action for personal injuries caused by the alleged negligence of the defendant in stopping its car for a passenger to alight at an unsafe place. The principal issue being the distance from the car steps to a hole in the street, the defendant, after the hole had been filled, and about eight months after the accident occurred, placed the car where it claimed it stood at the time of the accident, and placed a crowbar in a vertical position where it claimed the hole had been, and then caused a photograph of the surroundings to be taken. Upon the trial the defendant offered the photograph in evidence, accompanied by an offer to prove that the car stood about where it stood when the accident occurred, and that the crowbar correctly indicated the location of the hole.

In this case, the photograph was evidently offered as demonstrative evidence. The mere fact that the hole had been filled up would not of itself, the supreme court of Minnesota holds, be sufficient ground for excluding the photograph, if otherwise competent. But it points out that not only had the hole been filled up, but the car had been removed, and the defendant attempted to reproduce the former condition of things, while the value, if any, of the photograph depended upon the fact that the condition existing when it was taken was an exactly accurate reproduction of the condition existing when the accident occurred, and an error of a single foot in the location of the car or of the hole might render the photograph very misleading to the jury. Moreover, it says that in this case a photograph would have had no real value as demonstrative evidence. Given the exact location of the hole and of the car at the time of the accident, the distance and direction of the one from the other was a mere mathematical problem, to be solved by a measurement on the face of the earth. The photograph could in no way aid in this matter. Its only effect would be to possibly mislead the jury, and give them an erroneous impression of distance, resulting either from the manner in which it was taken, or from error in the evidence tending to show that the car and the crowbar constituted an exact reproduction of the condition existing at the time of the accident—prone, as juries would naturally be, to accept any photograph as absolutely correct, not only as to the physical objects which it represents, but also as to the impressions which it conveys as to size and distance.

Under such circumstances, the supreme court does not consider that there was any error in refusing to admit the photograph in evidence.

LIABILITY FOR INSULTING AND INDECENT LANGUAGE OF EMPLOYEE.

Knoxville Traction Co. v. Lane (Tenn.), 53 S. W. Rep. 557. Oct. 28, 1899.

When Mrs. Lane entered the car of the company here sued, and paid her fare, there was an implied contract on the part of the company, the supreme court of Tennessee holds, that she should receive proper, polite, and courteous treatment from its employes, and that she should be protected against hearing obscenity, witnessing immodest conduct, or submitting to wanton approach; and a violation of this contract on the part of the company was actionable, and entitled her to some damages. The contract to carry passengers is not one of mere toleration and duty to transport the

passenger on its cars, but it also includes the obligation on the part of the carrier to guaranty to its passengers respectful and courteous treatment, and to protect them, not only from violence and insults from strangers, but also against violence and insult from the carrier's own servants.

It is well-settled law, the court goes on to say, that, in all cases where the master owes a contractual duty to third persons or to the public, he cannot shirk or evade it by committing its performance to another, but is bound absolutely to perform the duty, and is liable for a failure to do so in any respect whereby injury results to others, whether such failure results from negligence, or from the willful, wanton, or criminal conduct of the agent to whom the duty is committed. Being bound to do the act or perform the duty, if he does it by another the master is treated as having done it himself; and the fact that his servant or agent acted contrary to his instructions, without his consent, or even fraudulently, will not excuse him.

Either the company or the passenger must take the risk of infirmities of temper, maliciousness, and misconduct of the employes whom the company has placed upon its cars, and to whom it has committed the discharge of its duty to protect and look after the safety of its passengers. A passenger has no control over them, and the company alone has the power to select and remove them. It is therefore but just to make the company, rather than the passengers, take the risk, and to hold it responsible.

This leads the court to the conclusion that the defendant company was liable for an injury and insult willfully inflicted upon Mrs. Lane by its employe (a motorman) while engaged in performing the duty which the company owed to her, although the company was guilty of no negligence in selecting its employes, and did not authorize or ratify the servant's wrongful act. Any other rule, it adds, might place the traveling public at the mercy of a reckless and vicious employe.

The gravamen of the action being for the defendant's breach of its contract of carriage, which included, as above stated, the duty to protect the passenger from insult or injury either by its employes or third persons, and this contract on the part of the defendant having been directly violated by the inexcusable conduct of its servants, the court holds that not only did the contract give her a clear right of action and entitle her to recover some damages, but that she might maintain her action to recover all the damages she might show herself to have sustained by reason of the wrongful act of the defendant's agent, including injuries to her feelings and sensibilities. Nor does it consider \$500 an excessive award in this case.

Moreover, inasmuch as the act of the servant in this case was the act of the master, and was oppressive and insulting in the highest degree, showing an utter disregard of the rights of the passenger under its protection, the court holds that the trial judge very properly charged the jury that, in its discretion, it might find vindictive or punitive damages against the defendant. Exemplary damages, it says, are allowed when a wrongful act is done with a bad motive and in disregard of social obligations, or where there is negligence so gross as to amount to positive misconduct.

TEST OF NEGLIGENCE IN NOT HAVING SECOND MAN ON CAR.

Palmer v. Winona Railway & Light Co. (Minn.), 80 N. W. Rep. 869. Nov. 22, 1899.

A passenger was injured in getting off a street car on which one man performed the services of both motorman and conductor. He put the blame on the motorman suddenly starting the car while he stood upon the step and was about to step off. The motorman testified that, although he told him to wait until he stopped the car, the passenger stepped off before the car stopped, while he turned to set the brake.

The court charged the jury as follows: "I charge you that the evidence in this case is not sufficient to warrant you in finding that the want of a conductor was the proximate cause of the injury to the plaintiff; and you are therefore instructed to leave that alleged fact entirely out of consideration, except so far, if at all, as

you may think the want of a conductor increased the degree of care and watchfulness required from the motorman, and, of course, from the company, through the motorman." The company requested the court to charge as follows, and the court gave the request, with the modification inclosed in brackets, following the same: "The fact that defendant company was operating its cars without a conductor on the occasion in question is in itself no evidence of negligence. It had a right to so operate its cars. And you will therefore disregard that fact in your deliberation (except so far, if at all, as the absence of the conductor rendered necessary an increase of care and attention on the part of the motorman)." Now, the supreme court of Minnesota holds that the defendant was entitled to have the request given without the modification, and that the part of the charge included in the modification was erroneous, as was also the corresponding part of the charge first quoted; and for this error it has granted a new trial.

The supreme court says that even if it were conceded that, had there been a conductor on the car, he could, and, in the exercise of due care in the performance of his duty, should, have intervened between the motorman and the plaintiff, and prevented this accident, still there was no evidence in the case which warranted the jury in finding that the defendant was negligent in failing to have a conductor on the car. In the absence of any valid law or ordinance regulating the matter, the mere fact that in a particular instance an injury might have been averted if the street railway company had employed two men to operate and manage its car, instead of one, is not the test whether or not the company is negligent in failing to employ the second man. A number of other circumstances must be taken into consideration. Taking into consideration the expense of employing the second man on the car, are the amount of traffic on the streets, the amount of traffic on the cars, and the danger to be encountered in operating the cars over the particular route, so great that the company is negligent in failing to employ the second man? A street railway company may be guilty of negligence in failing to employ the second man in a large city, where the streets are crowded with pedestrians and vehicles, or the cars are crowded with passengers, or both, while it would not be guilty of negligence in failing to employ the second man in a small city, where there is less travel on the streets or in the cars, or both. Again, the rate of speed at which the street cars run, the absence or presence of grade railroad crossings which are dangerous, and other circumstances, should often be considered. Of course, the negligence of the company in failing to employ the second man must also be the proximate cause of the injury.

The burden, the court holds, was on the plaintiff to show that the defendant was negligent in failing to employ a conductor or second man on its cars, or on this particular car. There was, as stated, no evidence showing such negligence in this case, and the court holds that if the company was not negligent in failing to employ a conductor, it was not liable at all, if the motorman used proper care. True, proper care is care commensurate with the occasion, but, the court holds, the test is not the amount of watchfulness and care which two men might in this particular instance have used, when it was not the duty of the company to employ two men. The parts of the charges condemned were misleading in that they left the jury to infer that it was the duty of the one man to exercise as much watchfulness and care as the two would, under the circumstances, have exercised.

CARE REQUIRED IN OPERATING CAR DRAWN BY MULES.

Brown v. Louisville Railway Co. (Ky.), 53 S. W. Rep. 1041. Nov. 23, 1899.

Where a street car is drawn by mules, the court of appeals of Kentucky applies the same rule which it long ago laid down in the case of a street car propelled by horse power, namely, that the carrier of passengers for hire operating it must use the utmost care and skill which prudent men are accustomed to use under like circumstances.

USUAL NOISE OF POWER PLANTS NOT ACTIONABLE.

Hughes v. General Electric Light & Power Co. (Ky.), 54 S. W. Rep. 723. Jan. 6, 1900.

Where a noise produced in the operation of an electric plant used

to furnish power for a street railway and electric lighting is only the usual and ordinary sound incident to a careful operation of such plants, the court of appeals of Kentucky holds that no action for damages can be maintained therefor by an adjacent landowner.

SOME THINGS REQUIRED OF PERSONS DRIVING ACROSS TRACKS.

Ponsano v. St. Charles Street Railroad Co. (La.), 26 So. Rep. 820. Dec. 4, 1899.

The supreme court of Louisiana says in this case, wherein it affirms a judgment for the defendant company, that those who drive across railroad tracks, unlike those who, as passengers, submit themselves to the control of the carrier, and who are not called upon to do more than remain strictly in their places, must exercise some vigilance, and they must not assume unnecessary danger. They must guard against the danger of thoughtlessness and pre-occupation, and avoid reckless driving to cross in advance of a coming car.

CARE REQUIRED IN GOING TO MEET ANOTHER CAR.

Hudson v. People's Street Railway Co. (Mass.), 55 N. E. Rep. 464. Dec. 6, 1899.

When going to meet another car beyond the regular place of meeting, even under orders, when he has every reason to believe that such meeting will not be expected by the conductor or motorman on the other car, the supreme judicial court of Massachusetts holds that it is a motorman's duty, after passing the regular turnout, to run his car very carefully, and, except in places where the road is visible for a long distance before, very slowly, using special care if going down hill on slippery rails.

EJECTED TOO SOON BY SECOND CONDUCTOR.

Vining v. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 80 N. W. Rep. 1080. Dec. 12, 1899.

Two street railway companies, one operating what might be termed a rural and the other a city road, having an arrangement whereby the former used the tracks of the latter, coupon tickets being employed, and each company having its own conductor on its own portion of the line, the supreme court of Michigan holds that, where the city conductor took the wrong coupon, and the rural conductor got on the car and demanded that coupon before the car reached the point to which the city coupon entitled the passenger to ride, the rural road company was liable to him in damages for an ejection before the limit of his right to ride had expired, he having in his possession the city coupon and delivered it to the rural conductor, although, presumably, for the rural ride, which he was refused on it.

CAN BE PROHIBITED BY LAW FROM BURNING SOFT COAL AT POWER HOUSE.

City of Brooklyn v. Nassau Electric Railroad Co. (N. Y.), 61 N. Y. Supp. 33. Nov. 21, 1899.

Chapter 322, Laws of New York of 1895, entitled "An act to prevent the burning of soft coal in factories in the city of Brooklyn," which provides under penalty of a fine for a violation thereof, that "no factory, engine-room or electrical station shall use what is known as soft coal for fuel in the furnaces of such factories, engine-room or electrical stations within a radius of four miles of the city hall in the city of Brooklyn, except for the purpose of heating or welding iron or steel," the appellate division, second department, supreme court of New York holds within the police power of the legislature to enact and therefore constitutional.

OPERATION OF ROAD ACCEPTANCE OF SPEED LIMIT IN FRANCHISE ORDINANCE.

Chouquette v. Southern Electric Railroad Co. (Mo.), 53 S. W. Rep. 897. Nov. 14, 1899.

It would be illogical, the supreme court of Missouri, division No. 1, thinks, to hold that a street railway company which had obtained its franchise and right to use the streets of a city under an ordinance limiting the speed of its cars should require any further

assent thereto than is implied and shown by the operation of its road upon the streets of the city in pursuance of the ordinance granting the franchise. Indeed, it expressly holds that, where, by the provisions of an ordinance under which a company acquired its franchise, its cars could be run only at a prescribed rate of speed, the operation of the road under such ordinance was a sufficient acceptance thereof, and bound the company to an observance of its provisions with respect to the rate of speed.

SUDDEN STOPPING OF SLOWLY MOVING CAR NOT GROUND OF LIABILITY.

Hoffman v. Third Avenue Railroad Co. (N. Y.), 61 N. Y. Supp. 590. Dec. 15, 1899.

The rule applied to steam railroads, that where trains running at a great rate of speed leave the track, and passengers are injured, presents a question which calls for an explanation from the company, the appellate division, first department, supreme court of New York declares, has never been applied to street cars in a city, proceeding at a slow pace. More particularly, does it hold entirely different from the cases in which the nature of the accident is of itself evidence of negligence the case presented where a car, going at a rate that a man can walk, suddenly comes to a stop upon a crowded street, when it affirmatively appears that the gripman who controlled the car had nothing to do with stopping it. And, not being prepared to say that in every case where a passenger in a street railway car, without apparent cause, is injured, there is a presumption of negligence, it holds it improper to submit to a jury a case such as that just mentioned.

WAY ATTORNEY'S LIEN AFFECTS SETTLEMENT.

Schriever v. Brooklyn Heights Railroad Co. (N. Y.), 61 N. Y. Supp. 644 Dec., 1899.

Section 66 of the New York Code of Civil Procedure gives the plaintiff's attorney a lien on the cause of action for his compensation, and says that "lien cannot be affected by any settlement between the parties before or after judgment." Nor, it is settled, need any formal notice of such lien be given to the opposite party, the statute itself being notice. However, an attorney's lien, Mr. Justice Gaynor holds, at a special term of the supreme court, King's county, is subject to the right of the parties to settle the action. The policy of the law that litigation have an end, he thinks, would seem to forbid a contrary suggestion. But, he holds, if the money be paid over to the client, without the consent of his attorney, and such client is irresponsible, and does not pay the attorney, and the money cannot be reached by the court, the party paying it does not escape the attorney's lien. He must nevertheless pay the attorney the amount of his lien. The sum paid in settlement serves as a basis for fixing the amount of his lien, the same as a judgment would.

COLLISION WITH AMBULANCE.

Buys v. Third Avenue Railroad Co. (N. Y.), 61 N. Y. Supp. 113. Nov. 28, 1899.

A judgment in favor of a hospital surgeon for damages for personal injuries which he sustained in a collision wherein one of the rear wheels of an ambulance going to answer a call was struck by a cable car is here affirmed by the appellate division, second department, supreme court of New York. It says that it has been held that a violation of a municipal ordinance is some evidence of negligence, and holds that it was proper on this trial to place before the jury the ordinance of the city of New York giving to ambulances the right of way, as that was one of the restrictions under which the defendant company operated its cars. At street intersections the rights of all vehicles, in the absence of municipal or statutory regulations, it states, are equal, but considerations of humanity step in, and determine that ambulances shall have the right of way, and the defendant owed the duty to the public of operating its cars with reference to that ordinance. The duty to give the right of way is not absolute; it must "yield the right of way where possible," continues the court, apparently quoting from the ordinance referred to; and, it holds, it was proper that the jury should have this ordinance in view when determining the question of the defendant's negligence.

DELAY OF 10 YEARS TO BUILD ROAD ACCOUNTED GROSS LACHES.

East St. Louis Connecting Railway Co. v. City of East St. Louis (Ill.), 55 N. E. Rep. 533. Oct. 16, 1899. Rehearing denied Dec. 13, 1899.

In this case the supreme court of Illinois adopts the opinion of the appellate court, holding, in effect, that, notwithstanding that there may have been in an ordinance granting a right of way no limit of time in which the road must be constructed, and notwithstanding that a repealing ordinance passed a few days after the granting ordinance may have been ineffective on account of a prior formal acceptance of the latter by the payment of the small consideration charged therefor, nevertheless, a delay of more than ten years to build the road was such gross laches, when the conditions of the city had greatly changed in the meantime, it having doubled its population and built a \$50,000 school house on one of the streets, that a court of equity would not decree a specific performance of the contract, or, in other words, would not restrain the city from preventing the construction of the road.

GIVING UP SEAT TO WOMAN AND RIDING ON RUNNING BOARD.

Brainard v. Nassau Electric Railroad Co. (N. Y.), 61 N. Y. Supp. 74. Nov. 28, 1899.

Custom, even at Coney Island, the appellate division, second department, supreme court of New York insists, has not deadened all sense of courtesy; and, if it had, it goes on to say, it should continue to think that the law of negligence has still a sufficient respect for the amenities of life as not per se to charge as negligence the surrender of a seat by a man to woman. So it holds here that the fact that a man had an opportunity to occupy a seat he had by his wife, and voluntarily surrendered such right to another passenger, did not charge him with contributory negligence, as matter of law. Such question, it explains, is usually one of fact, and is dependent upon the circumstances. In this case the surrender, it says, was made to a woman, who may be presumed to have been weaker than the man who gave up his seat. The car being crowded with passengers, the court holds that riding upon the running board was not in itself or per se negligence. On the other hand, it holds that the evidence being such as to warrant the conclusion that the man was thrown from the car by reason of a sudden violent jerk inconsistent with its prudent and careful management, this condition was sufficient to warrant a finding of negligence in the operation of the car. It moreover holds it fair to assume that the man, as he stood upon the running board of the car, was using such means as were furnished for security to a person standing thereon.

ATTEMPTING TO RESCUE CHILD FROM IN FRONT OF CAR NOT CONTRIBUTORY NEGLIGENCE.

Hirschman v. Dry Dock, East Broadway & Battery Railroad Co. (N. Y.), 61 N. Y. Supp. 304. Dec. 8, 1899.

As a mother and her little child, between 2 and 3 years of age, were sitting on a stoop in front of the house one afternoon, a horse car approached at a rapid rate, and the child ran away from its mother, and upon the track in front of the car. The mother ran after it, and, apparently being unable to reach the child, seized the horses by their heads and attempted to stop them. In this attempt she was unsuccessful, was thrown down, and was seriously hurt. For the personal injuries which she thus sustained she brought this action to recover damages. In disposing of the case, the appellate division, first department, supreme court of New York says that it is but fair to state that, from the testimony, the child was in imminent danger of death when the mother went to its rescue. It also declares that the rule is well established in that state that it is not contributory negligence for a person to put himself in a place of peril for the purpose of rescuing another who is in serious danger of injury because of the negligence of the defendant. And it holds that, so far as the question of contributory negligence was concerned, the plaintiff, brought herself within the foregoing rule. But failing to find any evidence that the plaintiff was guilty of negligence by reason of which the child was in peril, the only inference to be drawn from the evidence being that it ran upon the track so unexpectedly, and so close to the rapidly approaching car that the driver had no opportunity to take any steps to stop the car or to

save the little one from injury, it holds that it was proper to dismiss the complaint.

INFERENCES AS TO ACCEPTANCES OF ORDINANCES FROM GIVING OF BONDS.

Murphy v. Lindell Railway Co. (Mo.), 54 S. W. Rep. 442. Nov. 14, 1899.

That an agreement to observe a city ordinance may be inferred from a covenant in a bond to indemnify the city against any damages that may occur to the city by reason of the failure of the obligor to comply with the terms and conditions of the ordinance is, the supreme court of Missouri, division No. 1, thinks, quite reasonable. But acceptance of an ordinance providing that the motorman, conductor or other person in charge of a car shall keep a vigilant watch for all vehicles and persons in front, either on the track or moving towards it, and on the first appearance of danger to stop the car in the shortest time and space possible, the court holds, is not to be inferred from the giving of such a bond, because the city could not be held in damages for any failure of the company giving the bond or any one else to obey the provisions of such an ordinance. At the same time, the court says that the admission of a company that it was operating a street railway under a lease from another company would put it in the shoes of such other company, and it would be bound by the agreement of the latter to observe the provisions of the ordinance, if proven.

ARREST AND DECLARATION OF DRIVER ON RETURN TRIP NOT EVIDENCE AGAINST COMPANY.

Seipp v. Dry Dock, East Broadway & Battery Railroad Co. (N. Y.), 61 N. Y. Supp. 409. Dec. 8, 1899.

In an action brought to recover damages for the death of a person alleged to have been caused by injuries received in a collision between a street car and an ice wagon, the appellate division, first department, supreme court of New York holds that it was clearly error to permit the plaintiff to prove, under the defendant's objection and exception, that, on his next return trip after the accident, the driver of the car was arrested by a police officer, and that, upon the arrest, he told this police officer that he was the man he wanted. The fact of the arrest, the court holds, was irrelevant and its admission, it says, was likely to influence the jury adversely to the company's contention that the car never struck the wagon, but that the accident was caused by the latter's jolting against another company's tracks at a crossing, and it deems it especially likely to influence the jury adversely with regard to the driver's credibility, whose testimony on the trial supported the company's contention. Then, the declaration of the driver, made on a subsequent trip,—a declaration from which the jury might fairly have inferred that he deemed himself at fault, and was looking for the policeman to make a voluntary surrender,—it holds was equally inadmissible, the authorities being all one way on this point.

FAVORS MAKING TIME CONDITION SHORTER THAN STATUTORY LIMIT AND REQUIRES PROOF OF CONSENTS.

Dusenberry v. New York, Westchester & Connecticut Traction Co. (N. Y.), 61 N. Y. Supp. 420. Dec. 5, 1899.

The appellate division, second department, supreme court of New York does not consider that by sections 93 and 99 of the railroad law the legislature of that state has imposed an absolute rule of limitation as to the time within which a street railroad shall be constructed after it has obtained the consent of the proper authorities, but holds that the persons or body authorized to give the consent may impose a condition that it shall be constructed within a shorter time. In other words, as it views the statute, and the purpose which it sought to accomplish in imposing a three years' limit, it thinks that its proper construction is to confer upon the persons or body authorized to give the consent the authority to impose a condition requiring it to construct its railroad within a less period than the limit prescribed by the statute; and as the railroad is in no sense misled, and is the moving power in securing the consent, it holds that it does not lie in its mouth to say that the condition which it voluntarily assumed is void and unenforceable. To claim that such a condition is against the interest of the com-

munity, and therefore void, as against public policy, the court declares, is to ignore the facts, and vest in the railroad company power to defeat the very object which the interest of the community requires for its good. Wherefore it holds the imposition of such a condition clearly upheld by public policy. At the same time, it holds that a forfeiture for failure to comply with such a condition should be declared through legal proceedings, although the language in the consent might be broad enough to work a forfeiture without any legal proceeding, as it might very well be that conditions had existed which furnished a legal excuse for noncompliance. For example, it says that it was competent for the commissioner giving the consent to waive exact compliance with its terms. But no excuse being shown by the papers in opposition to a motion therefore, the court holds that a temporary injunction should be continued pending the action to have a forfeiture declared. It also holds that the defendant, having no right to construct the road until it obtained the requisite consents of owners, when challenged as to its right in this respect, it imposes no harsh rule to compel it to produce and clearly establish such authority.

RIGHT OF PASSENGERS ALIGHTING IN SUBURBS AND AT NIGHT TO PROTECTION FROM OTHER CARS.

Wise v. Brooklyn Heights Railroad Co. (N. Y.), 61 N. Y. Supp. 530. Dec. 12, 1899.

This was an action brought to recover for personal injuries sustained by a passenger who alighted from a very slowly moving car, at about 10 o'clock at night, at a trolley station in a long block, in a thinly populated suburban section of the city, and was struck by the fender of a car running at a high rate of speed on the adjoining track, and which car was distant, according to the testimony of the motorman on his car, from eight to twelve hundred feet when he alighted. At the close of the plaintiff's evidence his complaint was dismissed on the ground that he had been guilty of contributory negligence in failing to observe the approach of the car. But the appellate division, second department, supreme court of New York reverses that judgment.

The court thinks it easy of deduction that a person, in the light of day, with nothing to obstruct his vision, ought to discover the approach of a car, if he used his eyesight; and yet, at the same place, by reason of darkness and the existing obscurities, he might not, in the exercise of prudence, determine that the car was too close to be dangerous to attempt the crossing of the track. Under these latter circumstances, it holds, the question of contributory negligence is for the jury, and not to be determined by the court.

Even more certain is the court that while it is true that in the thickly settled parts of a city the practical operation of cars does not admit of the actual stoppage of an approaching car at a street crossing where a car running in the opposite direction is at a standstill for the purpose of permitting passengers to alight, as such stoppage might continually embarrass the traffic of the street, yet such rule does not apply to suburban localities, where the burden of use of the street is practically limited to the passage of cars thereon, and few vehicles. Under such conditions, it thinks it does not establish any harsh rule, or mitigate in any sense the doctrine of ordinary care, for the passenger to assume that, during the time necessary for him to alight and reach a place of safety upon either side of the street, the company will not make the surrounding conditions dangerous to him. There is scarcely justification under such circumstances, the court holds, for the company to run its cars at a high rate of speed past the standing car, which it knows is in that position for the purpose of permitting passengers to alight; and, as the whole situation is the creation of the company, it holds it ought not to be excused for inflicting injury upon a passenger whom it has carried to that point, unless such passenger be the willful or heedless instrument of his own injury.

When a car has come to a standstill, or is moving so slowly as to permit persons to alight, and passengers do alight at such place, the company, the court insists, is chargeable with notice that the passenger thus alighting is as likely to pass to one side of the street as to the other; and under such circumstances the company ought to be, and is justly, held to a rigid degree of care in making the place safe for the passenger to reach either side of the street.

Hence, it holds that this case was one to be submitted to the scrutiny of the jury. One justice concurs in the opinion. Two concur in result. One dissents.

THEFTS OF WIRE.

Numerous thefts of trolley and feed wire were committed last month. The International Traction Co., of Buffalo, secured the conviction of two men who took 875 lb. of wire from the Buffalo & Niagara Falls line. In Chicago the Union Traction company had 500 ft. of trolley wire cut down from the Ogden Ave line, and the police captured a horse and wagon containing over a ton of feeder wire taken from the South Chicago City road. The Chestnut Hill line at Norristown, Pa., for the third time within six months had feeders and bonds stolen.

March 23d over 500 ft. of trolley wire was taken from the lines of the Wilmington & Chester (Pa.) company.

March 21st the Cleveland & Chagrin Falls Electric Ry. had 1,500 ft. of bond wire stolen from the tracks in Orange township.

BILLS FOR BUFFALO.

Two bills have been introduced in the New York Legislature which it is said will particularly affect the street railway companies operating in Buffalo and vicinity. One of these has passed the Senate and provides that the corporate existence of street railway and certain other companies, the stocks of which are owned by other stock corporations, may be extended at any time to coincide with the term of the corporate existence of the possessor corporation, by filing in the office or offices in which the original certificates of incorporation of the subsidiary companies were filed, a certificate of such extension properly executed.

The second bill is an amendment to the general railroad law and provides that: "Any street surface railroad corporation, whose route as stated in its certificate of incorporation or in any proposed extension or branch thereof is wholly within towns, villages or cities of less than 50,000 inhabitants, may abandon any portion of its route not built upon and which it may deem unnecessary for the successful operation of its road and the convenience of the public by filing a declaration of such abandonment, approved by the Board of Railroad Commissioners in the office of the Secretary of State."

SOME SPECIAL OPERATING PROBLEMS IN BROOKLYN.

Mr. R. L. Russell, assistant engineer of the Brooklyn Heights, in a paper read before the New York Railroad Club in February last gave some interesting data concerning the power station equipment of the Brooklyn Heights road and the methods adopted to keep up the voltage on the excursion lines running down to the beach resorts.

The first permanent power station of the company is located at 52d St. on the river front four miles from the city hall, and has 16 Babcock & Wilcox boilers, 250 h. p. each; 12 G. E. 500-kw. generators belted in pairs to Allis horizontal compound engines, and two 350-kw. G. E. boosters, one direct connected and one belt connected to a Westinghouse vertical compound engine. When put in operation, Jan. 14, 1893, this was considered a model station.

The second large station was completed Dec. 2, 1893, and is on the river front at Division Ave., and is known as the Eastern Power station. Its equipment comprises 34 Babcock & Wilcox boilers, four 1,500-kw. G. E. generators and two 1,600-kw. Walker generators each direct connected to a Reynolds-Corliss cross-compound condensing engine. The Walker machines were installed in 1896.

In July, 1893, a station at Wyckoff Ave. and Madison St. was opened. This station now has four 250-h. p. Babcock & Wilcox boilers and six 300-kw. G. E. generators belted to three McIntosh & Seymour tandem compound high speed engines.

On acquiring control of the Nassau road two more stations were added to the system. The first of these is at Third Ave. and First St., built by the Atlantic Avenue R. R. in 1892; the engine room was enlarged in 1898 and it has now seven 500-kw. generators belted to C. & G. Cooper tandem compound engines, two direct connected 800-kw. generators, and two boosters; one of these is a belted Westinghouse machine, 200 volts and 1,150 amperes, and the other a belted G. E. multipolar, 165 volts and 1,212 amperes.

The second Nassau station, built in 1895, is at 39th St. and has 10 B & W boilers of 250 h. p. each, Westinghouse generators, 2 of 1,120 kw. and 2 of 660 kw., direct-connected to Cooper engines, and

one direct-connected Westinghouse booster, 200 volt and 2,800 amperes.

The average current output of the power stations of the Brooklyn Heights system has risen from less than 200 amperes in January, 1892, to 8,000 amperes in January, 1895, to 15,000 in 1898 and the first week in January of this year was 27,000. The maximum output early in January, 1900, was nearly 50,000 amperes. Roughly speaking, diagrams giving the current output of the stations, show the average to be about one half the maximum; the winter loads, both the average and the maximum, are heavier than the summer loads, by about 25 per cent.

The development of excursion lines to the beach resorts introduced some interesting problems in current distribution. On the Bergen Beach line, built in 1895, the extreme ends of the feeders are 8.8 miles from the nearest power station. Only sufficient copper was put up to provide for a service, 30 cars requiring not more than 600 amperes, a pressure on the line as low as 400 volts being considered permissible.

This line was opened on Decoration Day, 1896, and the facilities provided could not even begin to meet the heavy traffic. To provide for the extra load the following arrangement was made: One of the generators in the 52d St. station was provided with sufficient resistances in the shunt field to bring the voltage down to 125 volts, and it could be raised, if desired, to 600 volts. When the load increased beyond the 600 amperes (or 400 h. p.), for which the line was designed, this generator was connected in series with the feeders and the station bus, thus raising the electrical pressure at the station to a sufficient amount to take up the increased line loss. There were three wires on the line; two were fed through the temporary booster, while the third remained connected with the main station feeder bus. This was so that the reading on its ammeter would show whether the pressure on the line exceeded that at the power house, and therefore determine if the line pressure was dangerous to motors and lamp circuits. After a little experimenting, it was found that this rough method gave very satisfactory results and it was possible to keep the electrical pressure at any desired amount, regardless of the number of cars running on the line; in fact, a large number of cars was a safeguard against getting the voltage too high. The points to be emphasized are these: The wires were made to carry three times the designed amount of electrical current by taking up the losses, thereby increasing the pressure, and this rise in pressure was obtained without special machinery, and carried much higher than ever before attempted in electrical railroad practice.

When the Sea Beach R. R., a double track line 6.13 miles long to Coney Island, was acquired by the Brooklyn Heights it was at once connected with electric system giving a through service by trolley cars from New York to Coney Island. This road has always been a popular line for excursionists but the traffic has increased since the electrical equipment has been put on; with steam the maximum daily traffic was 55,000 passengers, last summer it rose as high as 105,000 per day.

In distributing the load on this line a radical departure was made from established methods of figuring the necessary copper for feeders. The carrying capacity was the only thing considered in the arrangement. It was estimated that 1,900 amperes (or 1,275 h. p.) would be very near the average maximum on the line, and, as a matter of fact, readings showed that on the day of heaviest travel the greatest load during the maximum hour was 2,060 amperes or 1,380 h. p., about 8 per cent increase over the original estimate. The feeder problem was the first to be met and solved. To keep the uniform voltage, so that a high speed schedule could be maintained, two boosters designed especially for the work were direct connected to comparatively inexpensive engines. These boosters were so designed that any desired increase of pressure from 25 to 400 volts above that of the power station could be secured. They were so wound that they would be in a measure self-regulating, but contained also shunt field coils, which could be easily adjusted to take up the fixed current of the system, and divide proportionately the load between the two machines and the feeders, which were direct-connected on the station bus. The beginning of the line was a little over three-quarters of a mile from the station, and so a certain portion of the road could be easily operated without raising the voltage. Each of the two boosters were "cut in" at two points and these four wires and the direct-feed wire were connected by an equalizing wire. That is, the feed for this section of 12 miles of trolley

ley wire was supplied from the station bus at 575 volts, and from two independent boosters of different voltage. This line, running in multiple, operates with entire satisfaction, the average voltage of the line during its heaviest hours running from 486 to 510 volts.

More recently another difficult problem has arisen in connection with the running of the heavy electric elevated trains over former steam roads, such as on the Brighton Beach line. These trains will take from 700 to 800 amperes when starting and an average load of 400 amperes for four-car trains, when making an average schedule of 28 miles an hour. This low schedule speed is accounted for by

SINGLE RAIL SUSPENSION RAILWAY AT BARMEN.

In our issue of last month, page 155, we gave some notes on the novel single rail suspension railway now building to connect Barmen, Germany, with Elberfeld and Vohwinkel, and showed line drawings giving an idea of the construction. Mr. Charles Bouchsein, United States consul at Barmen, in answer to our request recently made a report to the State Department giving additional data concerning this undertaking and by courtesy of Mr. Scanlon,

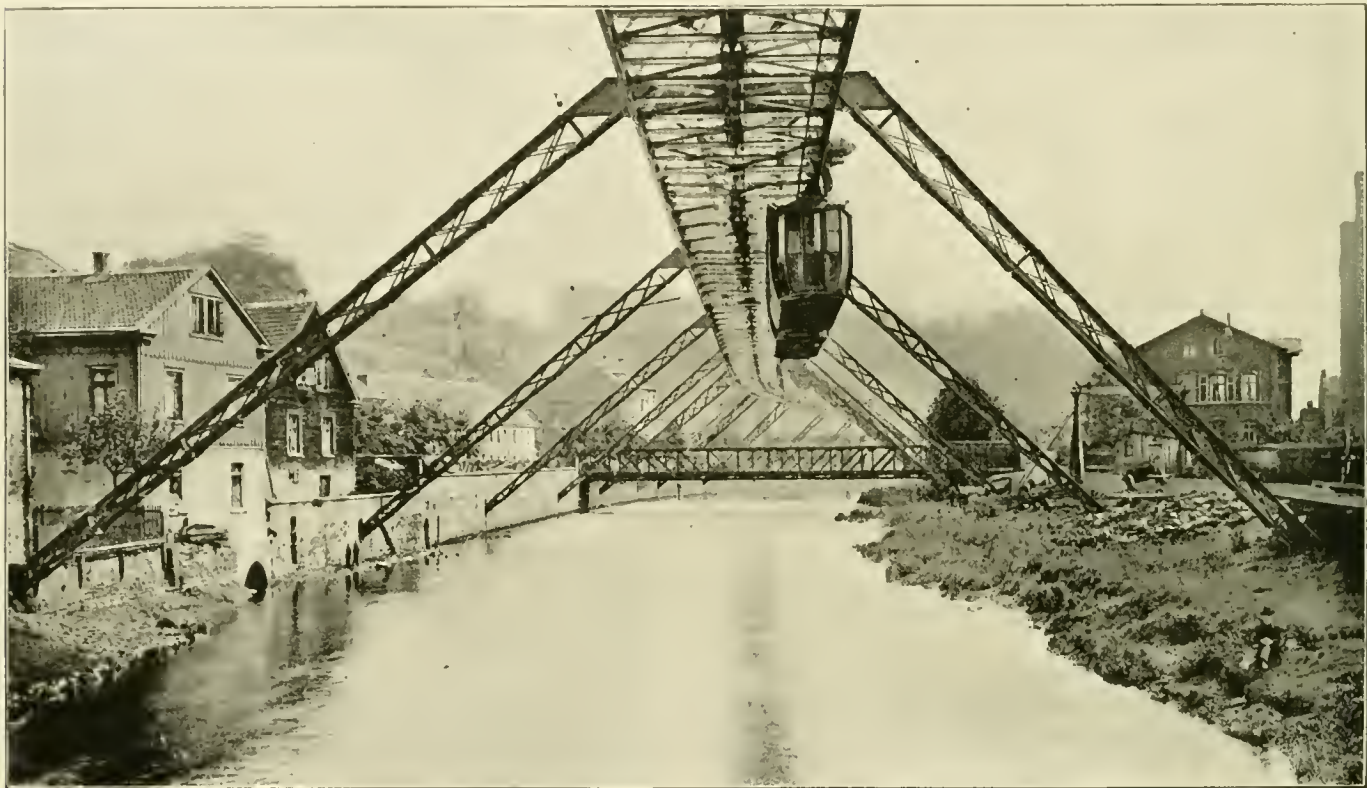


FIG. 1—VIEW OF THE STRUCTURE OVER THE RIVER, FROM BENEATH.

the fact that connections to the steam road make it possible to run surface cars over a part of the line. It will thus be seen that the stoppage for any reason of one elevated train makes a considerable difference in the load carried on one section and consequently greatly affects the local voltage. Specially designed boosters could, however, keep these fluctuations well under control, providing wires were carried to enough points on the line, so that a change of load would not greatly affect the pressure over any considerable portion of the line; but if one of the trains stopped and then immediately started again, the current used would run up to 800 amperes and drop immediately to zero. If there were no trolley cars interspersed between the elevated trains and the current for lighting the cars of the elevated road were supplied from some source other than that used for the trolley cars, a sudden rise in voltage would do no harm whatever, for the motors would be taking current until the controller was thrown off, and so the voltage would not rise abruptly until the current circuit was opened; consequently, no damage could be done. Under existing conditions, however, these varying loads cannot be handled without expensive machinery and the erection of a larger amount of copper than would pay for excursion lines.

One end of this line connects with the elevated railroad at a point where it is advantageous to put in a storage battery to take up the fluctuations on the road during the winter months. At a point about 6,000 ft. from the Brighton beach terminal are some disused car sheds and it is proposed to mount a second battery on old freight cars and then transport the whole battery to the yards of the elevated road for use during the winter.

The Lewiston (Pa.) & Reedsville Electric Ry. between Lewiston and Burnham was opened March 14th.

acting chief of the bureau of foreign commerce, we are permitted to publish this matter simultaneously with its appearance in the Consular Reports.

The total length of the road is 8.3 miles, and from the terminus at Barmen through Elberfeld to Sonnborn, a distance of 6.9 miles, it follows the course of the River Wupper. After leaving Sonnborn

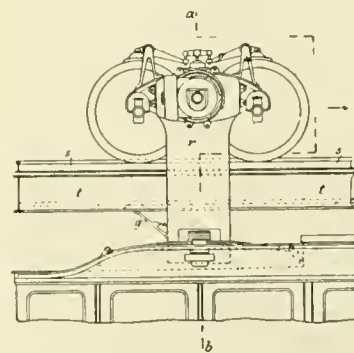


FIG. 3.

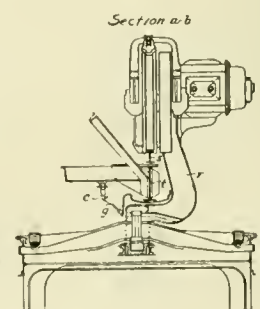


FIG. 4.

it is built over the public highway. Fig. 1 shows a view of the structure over the river, taken from below. Fig. 2 is a side view of the river portion and shows the exterior of the cars.

The maximum gradients are 4.5 per cent; wherever possible the curves are made of 300 ft. radius though near the Vohwinkel terminus there are some of only 100 ft.; in the terminal station and yards the radii of curves are as short as 27 ft.

The cars are suspended on two-wheel trucks spaced 26 ft. 2 in.

center to center; between the two axles on each truck is mounted a 36-h. p. 500-volt electric motor. Current is taken from a conductor (c, Fig. 3) in the usual manner. To prevent derailments the arm extending from the truck to the car body is so shaped and of such dimensions that the wheels can not lift so as to let the flange clear

brakes. 2. Hand brakes. 3. An electric brake. 4. A special return current electric emergency brake.

The rails are of T section laid on iron plates which are bolted to the structure with a layer of felt between to reduce vibration and noise.

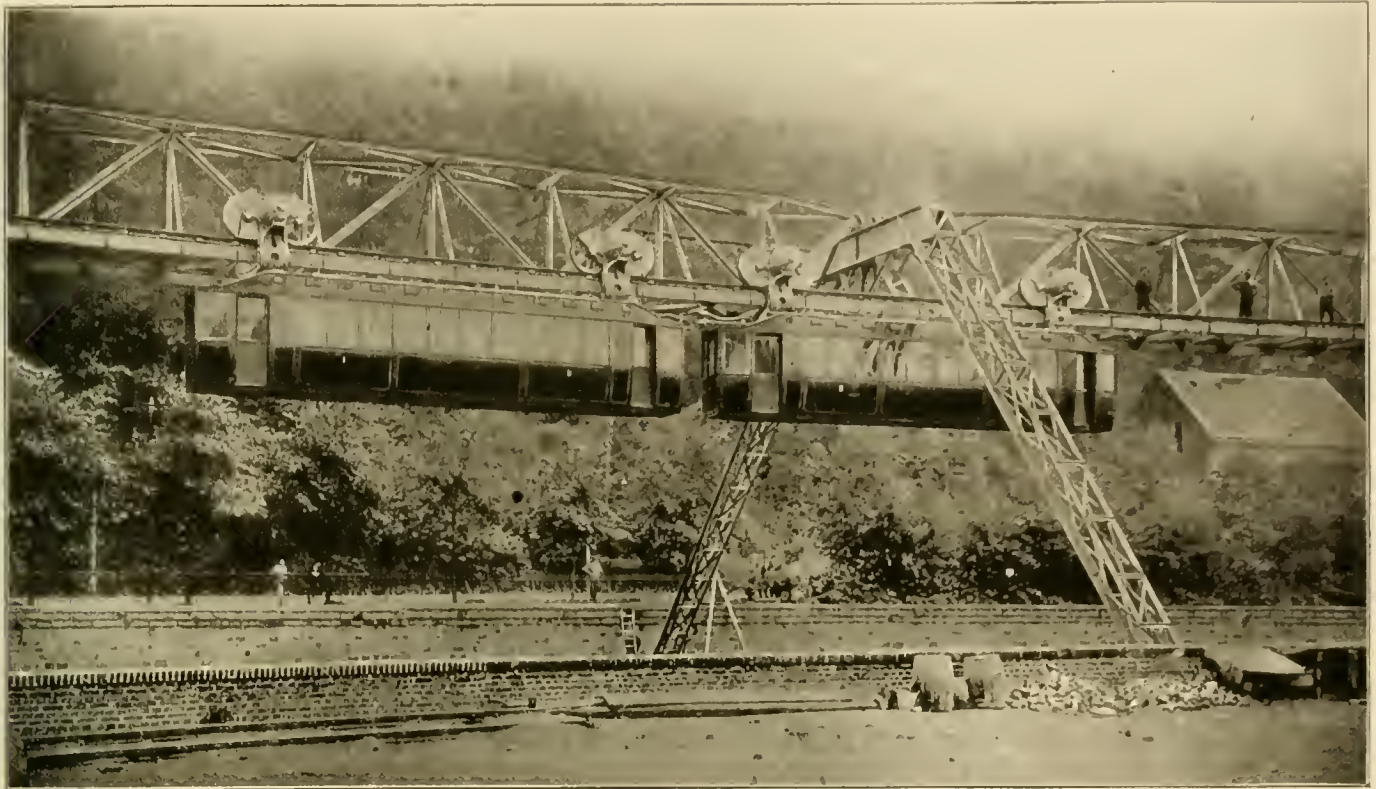


FIG. 2—SIDE VIEW, SHOWING CARS.

the rail, nor can the car swing more than a limited distance from the normal position laterally.

The control is similar to that on ordinary street railway lines. The schedule speed is to be 25 miles per hour between stations, and 18¾ miles including stops. There are 18 stations on the line.

Each car has a capacity for 50 passengers and is divided into first and second class and smoking compartments. It is the present in-

Notwithstanding the long spans over the River Wupper, the total weight of the structure and metal supports is only 838 lb. per lineal foot; over the highway it is 783 lb. per lineal foot. The cost of

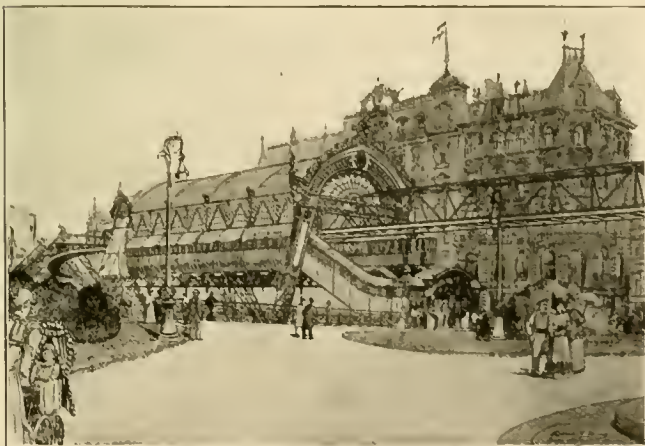


FIG. 5—EXTERIOR OF STATION.

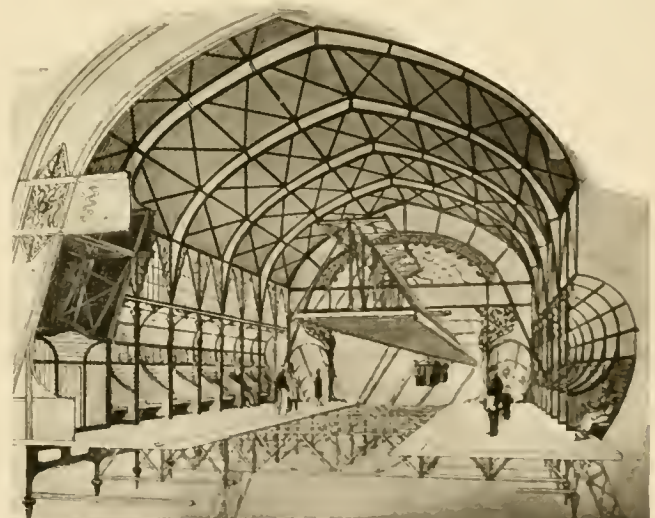


FIG. 6—INTERIOR OF STATION.

attention to operate trains of two cars, though the station platforms are long enough for four-car trains. The headway is to be 3 minutes.

An automatic block signal system is installed and special precautions for braking have been taken. There are: 1. Westinghouse air

construction is between \$200,000 and \$225,000 per mile including the foundations and stations. Figs. 5 and 6 show exterior and interior views of one of the proposed stations.

The road is now over half completed and it is expected that cars will be in operation early in 1901.

Detroit 3-Cent Ordinance Held Invalid.

Last year when the municipal ownership fight was pending at Detroit, Mayor Maybury, who was opposed to Governor Pingree's plans, embodied his own ideas of the proper solution of the street railway question in ordinances which were passed by the council and approved in August last.

The Detroit Citizens' Street Railway Co. at once secured a temporary injunction against the enforcement of the ordinance, filing a bill in the United States Circuit Court (Judge Henry H. Swan). Arguments were heard last fall and the court took the matter under advisement; March 19th Judge Swan rendered his decision, which was in favor of the company's contentions, and made the injunction permanent.

The opinion quotes sections of acts of the Legislature of 1855 and 1867, and from the company's bill of complaint which alleges violation of its rights under these acts. From the history of the street railways of Detroit from the original contract with Eben N. Wilcox, Nov. 24, 1862, it appears that a rate of fare not exceeding 5 cents could be charged. By ordinance of Jan. 3, 1889, additional lines were provided for and the fare was to be 5 cents. Other lines have been acquired and are operated by the complaining company.

The ordinances which authorized the several lines have been amended by the joint action and consent of the common council and the railway companies, apparently in consideration of mutual concessions and undertakings of the contracting parties. The principal changes effected by these amendments were the privileges of transfer over various lines to a passenger paying a single fare of 5 cents, and the company's consent to sell eight workingmen's tickets, so-called, good during specified hours, for 25 cents.

Aside from these modifications, which were prices paid by the railway companies for the extensions and changes in their lines, and extensions of the term of their easements in the streets of the city, and other rights and privileges, the rate of fare established by the agreement of the city and the companies was, and has been from the first, uniformly 5 cents, which was prescribed by the ordinances, and accepted by the grantees, as appears in the municipal legislatures declaring the terms and conditions on which the city's consent to the use of its streets was granted, and accepted by the grantees. These several ordinances contain differences of expression, but none of substance or meaning.

Each permits the company to charge a 5 cent fare, except an eight-for-a-quarter for workingmen during certain designated hours.

After quoting the section relative to the fare of 5 cents that is authorized in the franchise for each and every line, the opinion proceeds as follows:

All these ordinances were accepted in writing by the respective grantees. Other ordinances affecting the street railways were passed by the council between the time of the grants conferred by the city in 1862 and 1865, and the passage of the ordinances of Aug. 17, 1899, but they contain nothing germane to the question involved in this suit, with three exceptions. On the 14th of November, 1879, the common council passed an ordinance making certain requirements from the Detroit City Railway Co., which had become the owner of all the street railways then in operation excepting the Fort Wayne & Elmwood Railway Co. and its extensions, and the Grand River Railway Co. and its lines.

This ordinance was the culmination of many differences which had arisen between the city and the Detroit City Railway Co., notably controversies concerning the taxes payable by the railway companies to the city, and was an adjustment of the relations of the city and the company as to the controverted matters. It exacted of the company the extension of certain of its lines, and that its cars on all lines should be operated as the public convenience might require and the common council order.

In consideration of the acceptance of this ordinance by the Detroit City Railway Co. as a compromise of the differences existing between it and the city, and in view of the expenditure required of the grantee to comply with the demands of the city council, by section 5 of the ordinance it was enacted:

"The powers and privileges conferred and obligations imposed on the Detroit City Railway Co. by the ordinance passed Nov. 24, 1862, and the amendments thereto, are hereby extended and limited to 30 years from this date."

By section 6 the ordinance was made to take immediate effect when written acceptance of the terms thereof were filed in the office of the city clerk of Detroit by the Detroit City Railway Co., the Detroit & Grand Trunk Junction Street Railway Co., and the Central Market, Cass Avenue and Third Street Railway Co., or their successors, which two latter corporations had assigned their rights and property to the Detroit City Railway, and:

"From that date, all ordinances or parts of ordinances in conflict with the provisions hereof, shall stand repealed, and all ordinances and parts of ordinances not in any conflict herewith shall be affirmed and continued in force."

By section 7, the "right to amend or repeal this ordinance in case of its vio-

lation by said company or companies," is expressly reserved. A like ordinance was passed June 30, 1880, giving to the Fort Wayne & Elmwood Street Railway Co. an extension of the powers and privileges conferred upon it under its original corporate name by the ordinance of Jan. 31, 1865, and the amendments thereof, for 30 years. This ordinance is apparently identical, mutatis mutandis, with that applicable to the Detroit City Ry. above quoted. These ordinances were accepted in writing by the grantees. Both the city and the railway companies assumed that the easement or franchise in the streets by the ordinances of 1862 and 1865 were limited to 30 years. By a similar ordinance, approved Dec. 3, 1885:

"The powers and privileges conferred and obligations imposed on the Grand River Street Railway Co. by the ordinance passed May 31, 1868, and the amendments thereto, are hereby extended and limited to 30 years from and after the first day of January, A. D. 1886."

All of the railways named in the bill, except the Grand River Ry. and the Fort Wayne & Belle Isle company, were acquired by the Detroit City Railway Co., which in September, 1891, sold and conveyed the same, with the rights, easements or franchises belonging thereto, to complainant, which also acquired, Oct. 1, 1891, all of the rights and property of the Grand River Railway Co., and subsequently became the lessee of the rights, privileges and property of the Fort Wayne & Belle Isle Railway Co. Since its acquisition of said several lines, complainant has lawfully operated, and still is so operating the same.

Section 14 of the act of 1867 provides that "after any city, village, or township shall have consented, as in this act provided, to the construction and maintenance of any street railways therein, or granted any rights and privileges to any such company, and such consent and grant have been accepted by the company, such township, city or village shall not revoke such consent, nor deprive the company of the rights and privileges so conferred."

When the original grant to the Detroit City Railway was re-enacted and extended, Nov. 14, 1879, and that to the Fort Wayne & Elmwood Railway Co. was re-enacted and extended in 1880, and the original grant to the Grand River Street Railway Co. was re-enacted and extended in 1885, the provisions of this street railway act were in force, and by the express terms thereof the grantees, although incorporated under the train railway act, became entitled to the benefit and protection of all provisions of the street railway act. This is true also to the subsequent grants made by the city to the various street railway companies, which are the constituents of complainant's system, including also the Fort Wayne & Belle Isle Railway Co., which it holds by lease.

The charter of the city of Detroit, approved June 7, 1883, sections 121 and 122, clothed the common council with power over the streets, highways and alleys, to establish, open, widen, extend, straighten, alter, vacate, etc., and generally to "control, prescribe and regulate the manner in which the highways, streets, avenues, lanes, alleys, public grounds and spaces within said city, shall be used and enjoyed."

Section 19 of the ordinance of Nov. 24, 1862, provides:

"It is hereby reserved to the common council of the city of Detroit, the right to make such further rules, orders or regulations as may from time to time be deemed necessary to protect the interests, safety, welfare or accommodation of the public in relation to said railways."

The later ordinance, granting consent to railways for the occupancy of the street and extensions of easements previously granted, contained similar provisions.

Aug. 16, 1899, the common council of Detroit passed five ordinances, which the mayor approved, requiring complainant, its successors and assigns, and the railway companies named in said ordinances:

"To keep on sale on its cars in service at all times, tickets to be sold in strips or packages of eight tickets for twenty-five cents, each of which tickets shall be accepted by such railway company, its successors or assigns, for a single ride for any distance in either direction over all lines or routes operated by said railway company, its successors and assigns, on a car on which it is presented, and a passenger presenting such ticket, or on the payment of one single fare charged by said company, shall be entitled to a transfer ticket good for a continuous ride over any other line or route of said company, provided such transfer ticket is presented on the next regular car of such other route, or within 15 minutes after such passenger leaves the car on which he received said transfer ticket."

It will be seen that these ordinances not only reduced the rate of fare fixed by the original consent ordinance of 1862, and ratified in that of Nov. 14, 1879, and the other ordinances above recited, and which had been recognized as a lawful rate over each separate route or line ever since the street railway service was introduced, but also required complainant to transfer a passenger free of charge over any other of complainant's lines or routes to which he might request a transfer ticket.

It is the claim of complainant that these ordinances violate its agreements with the city, evidenced by the ordinances granting the consent of the city to the use of the streets by complainant, its grantors and predecessors, and accepted by the latter as the terms and conditions of the easement granted, and impaired the obligation of its contracts with complainant, its grantors and predecessors, and is null and void.

A restraining order was issued, staying the enforcement of the ordinances of August 16th, pending the hearing of a motion for a perpetual injunction. No answer to the bill has been made, but defendant has filed certified copies of the various consent ordinances and the amendments thereto, and these copies have been submitted in connection with the charter of the city, and the acts of 1855 and 1867, and the amendments thereto, as the city's answer to the motion for injunction. Both parties concede the jurisdiction of the court.

The controlling question in this case is the effect of the ordinances of consent, and their acceptance by the railway companies. These ordinances were enacted under express legislative authority conferred on the city authorities to prescribe the terms and conditions an easement in the streets should be granted to street railway companies. The constitution of Michigan, section 38 of article 4, provides:

"The legislature may confer upon organized townships, incorporated cities and villages, and upon the board of supervisors of the several counties, such powers of a local legislative and administrative character as they may deem proper."

With the two limitations of this broad power, this case has no concern. "Municipal corporations derive their sole source of power from legislative enactments." "The power of a municipality to grant an easement in a street to a street railway is not inherent, but is derived from the legislature." (*Street Railway Co. v. City of Detroit*, 110 Mich. 390; *Detroit Citizens' Street Railway Co. v. Detroit Railway*, 171 U. S. 48.)

In the exercise of this constitutional power, the legislature gave to the city, by the acts of 1855 and of 1867, authority to grant or deny to a railway company, the use of its streets for the construction and operation of its railway. The franchise of corporate capacity had been acquired by the railway companies under the laws of the state, and this was all that the legislature had to bestow. It left the acquisition of the easement in the streets to the action of each municipality from which it was sought, and by making it the subject-matter of agreement between the city and the railway company, vested the city with the power to prescribe, and the grantee to accept or reject, the terms and conditions of consent offered. Both parties had capacity to enter into the contract.

The only limitation upon the exercise of that power, was that the state requires that the city's consent should be evidenced by ordinance, and that acceptance of the railway company, should be in writing. The fact that the early ordinances gave an exclusive right to the grantee has lost significance by the decisions in: *Street Railway Co. v. Detroit*, 110 Mich. 384, and *Detroit Citizens' Street Railway Co. v. Detroit Railway*, 171 U. S. 46.

The acceptance of the terms and conditions of the city's consent, and of the obligations imposed upon, and the reciprocal undertakings given by the railroad company to the city, constitute a sufficient consideration, and supply all the essentials of a contract. It "constitutes a contractual ordinance conferring an easement which is irrevocable"—*Mayor of Knoxville v. Africa C. C. A.* 77 F. R. 508; *Township of Hamtramck v. Rapid Railway*, 6 *Detroit Legal News*, 821; *Iron Mountain R. Co. v. Memphis*, 96 F. R. 128; *Louisville Trust Co. v. Cincinnati*, 76 F. R. 209 (C. C. A.); *Electric Railway Co. v. Grand Rapids*, 84 Mich. 257; *Union St. R. Co. v. Circuit Judge*, 113 Mich. 645-6; *City Railway Co. v. Citizens' Co.* 166 U. S. 567.

The rule which requires a strict construction of the powers of municipal corporations, and the equally familiar principle that all public grants must be strictly construed, leaving nothing to inference, find no room for application in this case, for the grant of authority is explicit and unqualified. The legislature expressly reserved to itself, in the acts of 1855 and 1867, what the constitution gave it, independent of such reservation—the right to alter, amend or repeal those acts at any time. In the train railway act, the affirmation of this power in section 31 was thus qualified:

"But such alteration, amendment or repeal shall not operate as an alteration or amendment of the corporate rights of the companies formed under it, unless specially named in the act so altering or amending this act. * * *"

The legislature has not exercised its constitutional or reserved power in any particular affecting this case, except in the enactment of the second proviso to section 34 of the act of 1855; nor has it delegated, even if it could, the power to the city to modify its consent. On the contrary, by the second proviso of section 34 of the act of 1855, quoted above, and section 14 of the act of 1867, providing that after the consent of a municipality to the use of its streets by a street railway company has been accepted by the latter, "such townships, city or village shall not revoke such consent, nor deprive the company of the rights and privileges so conferred," it has expressly forbidden any impairment of the grant.

The force of this prohibition is supplemented by section 29 of the same act, giving to street railway companies organized under prior legislation "the same powers, rights, protection and privileges," and subjecting them "to all the liabilities as are hereby provided for companies and corporations organized under the provisions of this act."

It is plain, therefore, that whatever construction might have been given to section 34 of the act of 1855 prior to the enactment, March 27, 1867, of the second proviso thereto, the inviolability of its consent declared by section 14 of the act of 1867, was a right and protection acquired under section 29 which could not be nullified by a city ordinance.

In *Detroit City Railway v. Guthart*, 51 Mich. 183, construing section 31 of the train railway act referred to supra, Justice Cooley said:

"The rights intended by that section are the essential and important rights of corporations formed for the particular purposes which the act had in view, as distinguished from the privileges and immunities which are not so fundamental, but which may nevertheless have value. An attempt to enumerate the rights here would be presumptuous and without value, but in general terms it may be said that the franchise to construct and operate a road, and to levy and collect remunerative tolls or charges, would be corporate rights."

The acts of 1855 and 1867 being in pari materia, no reason is perceived why this definition of the word "rights" should not be applied to the same word in sections 34 of the act of 1855, and 14 of the act of 1867. (*Reiche v. Smythe*, 13 Wall, 162.)

By section 20 of the act of 1867 the rate of fare was made matter of agreement between "such company and the corporate authorities of the city or village where the road is located," and therefore, "when established by agreement," a right vested in the railway company which is protected by section 20 of the act of 1867, as well as by the federal constitution.

It is replied to this that section 34 of the act of 1855 was added to that act twenty-two days after the act of 1867 was approved, and must therefore be regarded as the latest expression of the legislative will upon this subject; that under the first proviso to that section, prohibiting a railway company from constructing its road in "the streets of any town or city without the consent of the municipal authorities of such town or city, and under such regulations and terms and conditions as said authorities may "from time to time prescribe," the city was empowered to change the rate of fare.

This is not an exact statement of the amendments to section 34. All that part

of the section preceding its second proviso was added April 13, 1861. The second proviso says:

"After said consent shall have been given and accepted by the company or corporation to which the same is granted, such authority shall make no regulation or condition whereby the rights or franchises so granted shall be destroyed or unreasonably impaired, or such corporation be deprived of the right of constructing, maintaining and operating such railway in the streets in such consent or grant named, pursuant to the terms thereof."

This was approved Mar. 27, 1867. Its clear intent, purpose and effect was to bring the act of 1855 into harmony with that of 1867, but primarily and beyond question, to take from the city the authority, if any it had, to prescribe further regulations and conditions "from time to time" impairing the consent thus granted, and its enjoyment "pursuant to the terms thereof." This is evidenced also by section 36 of the same act, also added Mar. 27, 1867, by which it is provided that:

"It shall be a sufficient description of the route or routes thereof to declare that said railway is to be constructed and maintained in such streets or public ways of the particular city as has been or shall hereafter from time to time be granted to said company for that purpose by the proper municipal authorities of such city; and it shall be lawful to build, maintain or extend the railway of such company according to the terms and conditions of such grant or grants."

The street railway act of 1867, entitled: "An act to provide for the organization of street railway companies," was approved Mar. 5, 1867. While it does not repeal the act of 1855, but is in pari materia, yet by its thirtieth section, quoted supra, it so far displaced it as to require that all street railway companies thereafter formed, should be organized under its provisions.

This act is complete in itself, and in marked contrast with the heterogeneous provisions of the act of 1855, which, for want of a more suitable statute, was amended to adapt it to objects not within its original scope and purpose. The later act was the product of a more enlightened conception of the character and necessity of the new system of urban passenger transportation, and obviously recognized the impolicy and injustice of subjecting the large investments of capital needed for such enterprises to the caprice of fluctuating municipal bodies.

By leaving to the city or village authorities the right to give or withhold consent to the use of its streets by such railways "under such rules, regulations and conditions as the local authorities might impose," it enabled municipalities to protect themselves by the ordinance of consent, and, by section 14, secured the protection of the grantee of the servitude by the acceptance of that ordinance as the irrevocable contract of the parties.

The justice and necessity of this provision was approved by the same legislature 22 days thereafter, by adding the second proviso to section 34 of the act of 1855, which, differing in phraseology, is identical in purpose and effect with section 14 of the later act, and was doubtless enacted to harmonize the two acts, the latter of which was made the only basis for the organization of street railway companies thereafter.

The city and the railway companies have, ever since the original ordinances, practically and uniformly construed the consents as controlling their mutual rights and obligations, except in those particulars in which they have been changed with the consent of both parties. What the railway companies have consent to do by such modifications as have been made furnishes no measure of its rights under the consents, or sanctions their impairment. (*Lake Shore Ry. Co. v. Smith*, 173 U. S. 64, 697; *Highland Park v. Plank Road Co.*, 95 Mich. 480, 491.)

With full knowledge of their provisions, 12 years after the enactment of the second proviso and the act of 1867, the city authorities also expressly renewed and ratified these ordinances and their acceptance as the lawful agreement of the city and companies. The rights of the parties must be measured by the law as it now stands, and by their agreements thereunder.

By the ordinance of Nov. 14, 1879, section 5, "the powers and privileges conferred, or obligations imposed, on the Detroit City Ry. by the ordinance of November 24th and the amendments thereto, are hereby extended and limited to 30 years from this date."

By the ordinance of June 30, 1880, a like proviso was made relative to the Fort Wayne & Elmwood Street Railway Co. confirming and extending for 30 years its grant under the ordinance of Jan. 31, 1865. Like ordinances were passed in favor of other lines.

The practical construction given by the parties to their agreement prior to Nov. 14, 1879, ever since the enactment of the second proviso of section 34 of the act of 1855 and the act of 1867, a period of 37 years, is a fair standard in itself of their rights thereunder (*Chicago v. Sheldon*, 9 Wall, 50-54), and when supplemented and adopted by these confirmatory ordinances, which the statute authorized, the fact that the original ordinances antedated the second proviso of section 34, is a matter of no moment.

The second proviso of section 34 is therefore clearly in confirmation and adoption of the spirit and purpose of sections 14 and 29 of the act of 1867, not in the least degree detracting from the absolute interdict of section 14 against the revocation of the consent granted. It does not profess to amend or repeal any part of the act of 1867, or to qualify the rights it granted or the liabilities it imposed.

This conclusion is confirmed by the fact that the amendment of 1867 to section 34 of the act of 1855, was made by proviso, "the general purpose of which is to except the clause covered by it from the general provisions of a statute of some provisions of it, or to qualify the operation of the statute in some particular."

George Banking Co. v. Smith, 128 U. S. 181; or, as said in *Wyman v. Southard*, 10 Wheat. 1, 30: "The proviso is generally intended to restrain the enacting clause, and to except something which would otherwise have been within it, or in some measure to modify the enacting clause."

Both provisos to section 34 were evidently made with this intent. The first modified the broad grant of authority to street railway companies to use and operate street railways by making the consent of the city or village under such regulations, terms and conditions as its authorities might "from time to time prescribe," a condition precedent to the use and operation of such railways in the streets of a municipality.

The second proviso modified all that preceded it in the section by prohibit-

ing impairment of the rights and franchises named in the accepted grant, or deprivation of the right of constructing, maintaining and operating such railway in the streets in the consent named, "pursuant to the terms thereof" (of the consent.)

Prior to the enactment of the second proviso the city had never exercised or claimed the power to vary its consent in any degree or particular.

That it was competent for the legislature to withdraw from the city the apparent authority to prescribe further terms and conditions to its consent "from time to time," is unquestionable. (*Board of Park Com'rs v. Common Council*, 28 Mich. 230. *New Orleans v. N. O. Water Works Co.*, 142 U. S. 91.)

The act of 1867, and the second proviso of section 34 of the act of 1855, should be considered as a ratification of these ordinances. (*City Railway Co. v. Citizens' Railway Co.*, 166 U. S. 567, 590.)

The ordinances of 1879 and 1880, and their acceptance, had all the force and effect of a new consent, which was authorized by the legislature and protected both by section 34 of the train railway act, as it then stood, and by section 20 of the street railway act of 1867, against destruction or impairment by the municipal authorities, and are sustained by sufficient consideration. (*City Railway Co. v. Citizens' Railway Co.*, 166 U. S. 568.) The argument that it is not claimed in the bill that by a reduction of fare from 5 to 3 cents, the contract is "unreasonably impaired," and therefore is a "regulation" which the city authorities may lawfully make under section 34 of the act of 1855, and section 19 of the original consent ordinance, is untenable:

"An objection to a law on the ground of its impairing the obligation of a contract can never depend upon the extent of the change which the law effects in it. Any deviation from its terms by postponing or accelerating the period of performance which it prescribes, imposing conditions not expressed in the contract, or dispensing with the performance of those which are, however minute, or apparently immaterial in their effect upon the contract of the parties, impairs its obligations" (*Green v. Biddle*, 8 Wheaton, 184; *Walker v. Whitehead*, 16 Wall. 314.)

That the original and subsequent ordinances, accepted by the complainant and its assignors, established the right of the street railway companies to a 5-cent fare is as clear as that the attempted reduction of that fare by the enactment of the ordinances of Aug. 16, 1899, impaired the obligations of the contract of consent between the city and the companies.

It is as idle to claim that the change of rate did not "unreasonably" impair that consent as to deny that the proposed reduction of fares is not the deprivation of the railway company's "right of constructing, maintaining and operating such railway in the streets in such consent or grant named, pursuant to the terms thereof."

By any change of its terms, or any regulation diminishing its value or altering its conditions, to the prejudice of either party, a contract is "unreasonably" impaired. It is not the degree, but the fact of impairment, that determines the validity of legislation effecting it. In the case at bar, the "regulation" that the company shall sell eight tickets for 25 cents, each of which tickets shall be valid for the carriage of a passenger for whose transportation the company, under its agreement with the city, is authorized to collect 5 cents, is so clearly the deprivation of a right valuable to the company that the effect "goes without saying."

In *Detroit vs. Detroit & Howell Plank Road Co.*, 43, Mich., 140, 146, it was sought to compel the respondent company to remove 2½ miles of its road from within the city without compensation, and in violation of its chartered rights. The proceedings were taken under the act of the legislature forbidding the company to take tolls on paved roads within said limitations. Justice Campbell said:

"What the city claims a right to do, is to deprive the respondent of the privilege any longer to take tolls for the travel and traffic on two and one-half miles of its road. If it may do this in respect to one part of the road, it may in respect to any other part. If it may exclude the respondent from Detroit, it may from Howell also, or from any other township on the line, and a single section of the statute may annihilate the property of respondent altogether. A statute which could have this effect would not be a statute to amend franchises, but a statute to confiscate property; it would not be a statute of regulation, but of spoliation."

A fortiori, as the city derives all its powers from the legislature, which has prohibited its recession from its consent, the attempted abrogation of that contract, and the deprivation of the rights which it confers, is an indefensible usurpation.

The argument that the ordinances of Aug. 16, 1899, were passed in the exercise of the "police power" of the state by its agent, the city, affords no justification to the defendant. Without attempting to specify what is included in the elastic term "police power," the view taken of the contractual relations of complainant and the city negatives the defense asserted on that ground. In the language of Mr. Justice Peckham:

"This (the police power) must, however, be exercised in subordination to the provisions of the federal constitution. If, in the assumed exercise of its police power, the legislature of a state directly and plainly violates a provision of the constitution of the United States, such legislation would be void." (*Lake Shore Ry. Co. vs. Smith*, 173, U. S. 680, 690.)

These ordinances contravene the provisions of the federal constitution forbidding the impairment of contracts and the deprivation of property without due process of law, and equally the statutes of Michigan from which alone the city obtained the power to grant its consent unless that consent has reserved the power to modify its terms and conditions.

This result necessitates the proposition that the ordinances of Aug. 16, 1899, are a proper exercise of the powers reserved to the city by section 19 of the ordinances of consent of 1862 and 1865, and therefore do not impair the contract of the parties. This contention is without merit.

That section reserved the power to enact "such further rules, orders and regulations as may from time to time be deemed necessary to protect the interests, safety, welfare or accommodation of the public in relation to said railways."

Similar sections are contained in the later ordinances granting consent to the construction and operation of the new lines owned by complainant.

The terms, "further rules, orders and regulations," for the purposes specified, are inapt to express a purpose to vary the "consent, permission and authority" granted, but are a declaration of the right and purpose of the city authorities to "further" exercise the police power in regard to all matters incident to the construction and operation of the road; such as the location of the tracks in the streets, the placing of switches and turn-tables, the repair of the pavement between the tracks, the removal or limitation of the number of tracks, in the interest of public travel (*Grand Rapids Railways*, 43 Mich. 433; *Baltimore Trust Co.*, 166 U. S. 673), the frequency with which cars should be run for the public convenience, the stopping of cars at street crossings, the use of fenders, the rate of speed to be maintained, the sale of tickets (*City of Detroit vs. Railway Co.*, 95 Mich. 456), and, generally to details of the conduct and operation of the railway which experience might show to be necessary in addition to or in amendment of those specified in the consent, for the protection of life, the accommodation of the public and the avoidance of injury to private property. Such regulations are not invasions of the contract rights of the company, and are just and reasonable. (*Lake Shore & Mich. Southern Railway Co. vs. Ohio*, 173 U. S. 285, 305.)

But the right of the grantee to use its franchise in the city, and to take the stipulated fare for the carriage of passengers are vested rights of property under the consents, and clearly distinguishable from immunity from the duties and requirements necessitated by the new easement, and consistent with its full enjoyment, and from which even the legislature could not release the grantee.

The entire abolition of fares might, for a time, conduce, in a degree, to the material "interest" and "welfare" of the traveling public, and be a public "accommodation," but the rule, order or regulation which would require free transportation of the public would differ only in degree from the ordinances in question, which have no relation to the comfort, safety or welfare of society. (*Cooley's Cons. Lim.* p. 577; *People vs. Jackson Plank Road Co.* 9 Mich. 306.)

If the city may sequester two-fifths of the grantee's earnings, why may it not take all? Such a power is neither expressly given nor can it be implied. It is a confiscation.

Besides the considerations already stated, which conclusively repel this defense, may be added that the canons of statutory construction also exclude it. The rate of fare having been nominally fixed by one section of each of the many ordinances of consent, and by Section 20 of the act of 1867, are not within the general authority to make "rules, orders or regulations" committed to the discretion of the common council by section 19. The general words of that section must yield to the specific provision fixing the rate of fare. (*Hornor v. Collector*, 1 Wall. 486, 490; *Reiche v. Smythe*, 13 Wall. 162, 165.)

The same rule of interpretation must be applied to municipal ordinances as obtains in construing statutes. A thing which is given in particular shall not be taken away by general words. (*Churchill vs. Crease*, 5 Bing. 180.)

The fundamental principle of construction applicable both to legislative and municipal enactments, is that the intention of the legislature is to govern. (*Sedgwick on Stats. & Cons. Law*, p. 360; *Pease vs. Whitney*, 5 Mass., 380, 382.)

It has never been claimed for section 19, and the corresponding sections in all the numerous ordinances of consent passed by the common council, that they authorized any interference with the rates of fare prescribed by all the consent ordinances from 1862 to 1899 inclusive. This disclaimer for a period of 37 years also negatives the relation of that section to the subject of fares.

The objection to the validity of the consent ordinance that the common council was without power to grant an easement in its streets for 39 years, and therefore the rate of fare could not be fixed so as to be beyond the control of the city authorities for that period, has been determined adversely to the defendant in *Detroit Citizens' Street Railway Company vs. City of Detroit*, 64 F. R., 628-646.

There is nothing in the charter of the city which sanctions the action of its common council.

The arguments have taken a wide range, and many questions have been presented relative to the power of the legislature to prescribe or change the rates of transportation of railway companies, and otherwise alter or amend the organic acts under which they were formed, but those questions are foreign to the issues here involved. While the authorities cited have been carefully examined, nothing has been found which controls the determination of this case.

It follows from what has been said that the motion to vacate the restraining order must be denied, and that the complainant is entitled to an injunction against the enforcement of the ordinances of Aug. 16, 1899, and such injunction will issue accordingly.

THE CENTER-BEARING LORD BALTIMORE MAXIMUM TRACTION TRUCK.

The Baltimore Car Wheel Co., Baltimore, Md., has recently sent to managers very handsomely mounted photographs showing the center-bearing "Lord Baltimore" maximum traction truck. In this truck, which was illustrated in our Daily Edition, October, 1899, one-third of the weight is carried on the bolster which is placed midway between the wheels, the other two-thirds of the weight being carried on roller side bearings. The frame supporting the rollers rests at one end on the bolster and at the other on a helical spring seated in a pocket on the truck frame near the driving axle. The distribution is such that the large wheels carry from 68 to 71 per cent of the total load.

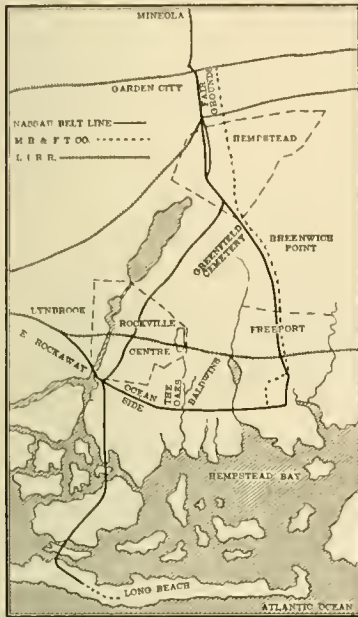
It is stated that freight will be carried on the Brooklyn elevated railroads. This service will be performed at night and will relieve the streets of a great deal of heavy trucking.

ELECTRIC LINES IN NASSAU COUNTY, N. Y.

There are two rival companies incorporated to build electric railways from Mineola, the county seat of Nassau County (erected in 1808 out of a part of Queens County), south to Long Island Sound. This territory is traversed from east to west by three branches of the Long Island R. R., but there is great need of north and south lines such as it is proposed to build. An electric line would prove a valuable feeder to the Long Island R. R. and the latter has thrown no obstacle in the way of promoting the former.

The most extensive of the proposed lines is that of the Nassau Belt Line Traction Co., which plans to operate 30 miles of road. This company was organized Mar. 17, 1899, and has obtained its consent from the Railroad Commissioners and all the consents of abutting property owners that are required by statute; it also has franchises from all the villages through which it passes except that for Hempstead—two miles—thus having franchises for 28 out of the 30 miles desired.

President Ames was recently quoted in an interview as follows: "We have only 18 miles to build in order to secure our 30 miles



of road. We are to run over the already completed lines of the Long Island R. R. from Mineola to Hempstead, a distance of 2½ miles and over the line of the same road from Lynbrook to Long Beach, 7 miles, and over one or two other short sections. We will have to build 9 miles from Hempstead to Mineola; 6 miles from Freeport by way of Woodcleft Inn to East Rockaway and a portion of the 5½ miles between East Rockaway and Hempstead."

The rival company is the Mineola, Hempstead & Freeport Traction Co. It seeks to build a line that would parallel the eastern branch of the Nassau Belt and the Mineola extension, but as yet

has only secured a franchise for 2½ miles and the promise of a franchise through the village of Hempstead. A number of the gentlemen interested in this company are representatives of electric supply houses.

A third company which by reason of similarity of name is sometimes confused with the Nassau Belt Line, is the New York & Nassau County Railway Co. The promoters of this line, who are connected with Tammany Hall, purpose to parallel the Long Island R. R., but as yet no applications have been made for local consents or to the Railroad Commissioners.

DRY SEAT AND FENDER PRIZES.

The promoters of the International Tramways and Light Railways Exhibition to be held in London June 2 to July 4, 1900, offers two prizes to exhibitors: 1. A prize of £25 (\$125) for the best invention for securing a dry seat on the tops of tram cars and omnibuses in all conditions of weather. 2. A prize of £25 for the most practical and efficient life saving guard or fender for tram cars.

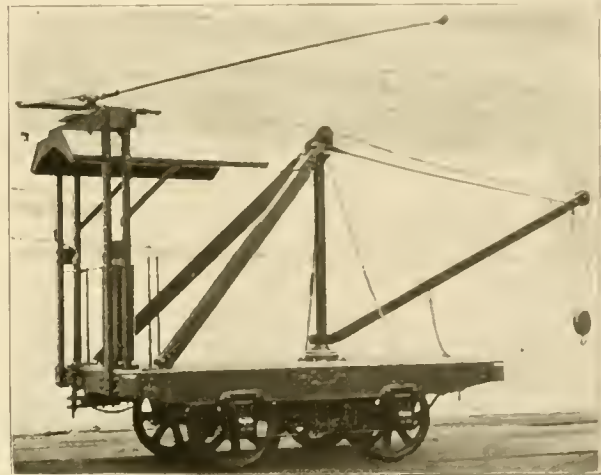
Competitors must exhibit a full size and complete apparatus and pay a nominal admission fee of £1, which entitles them to space in the exhibit hall. Every intending competitor must send to the office of the Tramway and Railway World, Amberley House, Norfolk St., London, W. C., not later than June 1st, a statement of his intention to exhibit and a typewritten description on foolscap paper of his intention to exhibit.

The Southwest Missouri Electric Ry. last month received 13 cars of rail from the Pennsylvania Steel Co., which will permit the early completion of its extensions.

COMBINED ELECTRIC LOCOMOTIVE AND CRANE.

The accompanying illustration shows an interesting car built by the J. G. Brill Co., which is an electric locomotive and power crane combined. The combination is more effective than either machine would be singly and will prove peculiarly valuable where weights greater than can be lifted by one or two men are to be loaded and transported, as is the case in and about shops and in railway construction. It is stated that with a crew of three or four men this machine will easily do the work usually performed by a gang of 15 or 20 laborers. In the yard it serves the same purpose as hoists and overhead trolleys or traveling cranes in the shop.

The car illustrated is 12 ft. long with a wheel base of 5 ft. Where it is not necessary to carry loads on the deck of the machine ad-



COMBINED ELECTRIC LOCOMOTIVE AND CRANE.

hesion may be obtained by piling ballast in the form of castings or pig iron upon the platform; where so desired the machine has pockets between the sills which are filled with scrap iron. The crane is of the ordinary type, with the improvement of a hollow mast made of 4-in. wrought iron pipe, through which the rope descends to the winding drum beneath the deck. The jib is of iron and is supported by a rod and in the design shown swings through about half a circle. Where the load is to be lifted at right angles heavier ballasting and a stronger mast are necessary. In case of necessity the platform can be made longer so as to use it for carrying freight, and if still greater extension is needed double trucks may be employed. In the type illustrated, by increasing the amount of ballast and using large motors more than 200 h. p. can be readily made available. The builders have recently made one of these machines for their own use and it has already demonstrated its usefulness in and about the works.

TUNNEL ORDINANCE IN CHICAGO.

March 20th the Chicago city council passed an ordinance directing the Chicago Union Traction Co. to lower the three tunnels under the Chicago River, which are used by it, so that there shall be a depth of 23 ft. of water above them at all times. It is provided that work on the La Salle St. and Washington St. tunnels shall begin by June 28th and be completed in one year.

Litigation will undoubtedly follow, as the company cannot afford to undertake the work without some agreement as to franchise extensions.

TROLLEY PARADE AT KANSAS CITY.

The Priests of Pallas Association, of Kansas City, have enlisted the co-operation of Mr. W. H. Holmes, president of the Metropolitan Street Railway Co., and will plan to have a trolley parade, buying the necessary trucks. The advantages of using the car tracks are that the floats may be made heavier, and better illumination can be had.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

REMOVING DUST FROM BOILER ROOMS.

Mr. Albert A. Cary in a paper before the American Society of Heating and Ventilating Engineers describes the plan adopted by him for removing dust from the boiler room of a manufacturing plant engaged in making rubber covered insulated wire where dust in the work rooms would be a most serious matter.

The steam plant has its boiler room and engine room adjoining. The boiler room contains four horizontal tubular boilers, 6 in. in diameter, and 18 ft. long, with 80 3-in. tubes, having a nominal rating of 100 h. p. each. The smoke flues are connected to the rear of these boilers. I have provided a dust house next to the engine

suction pipe, as shown in Fig. 2, and the lower end of the duct is thereby raised out of the way.

After the dust enters the ducts it is discharged by the Sturtevant steel-plate exhauster (placed in the engine room) into a centrifugal dust collector placed in the dust house. The heavier particles are discharged through the bottom pipe of this collector, and, as a further precaution, to catch any light floating particles which may escape through the upper or air delivery end of the collector, a pipe is run from this top opening, and, bending downwards, terminates within 2 in. of the surface of water held in a tank placed below the level of the floor in the dust house. The bottom-discharge pipe from the dust collector also terminates similarly, and thus all the

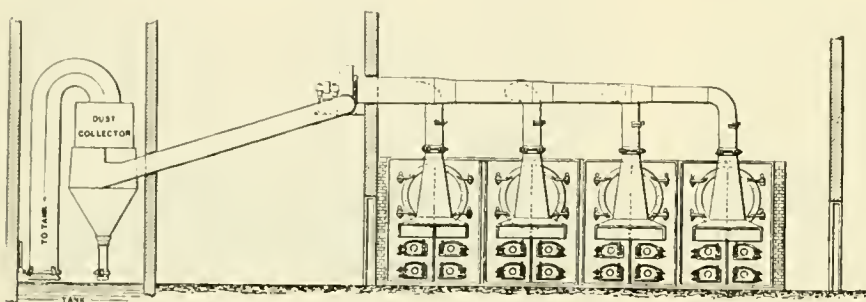


FIG. 1.

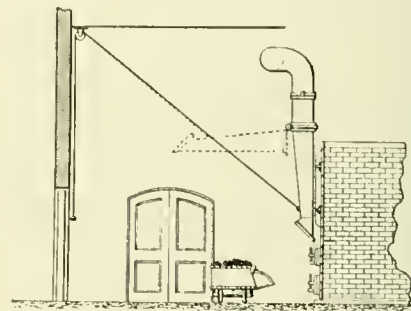


FIG. 2.

room, but on the opposite side from the boiler room. This dust house is designed so as to receive another 100-h. p. boiler, which will doubtless be required as the demand for steam increases. Surrounding conditions made it impossible to erect this house at the opposite end of the boiler room, where it would otherwise have been placed.

Figs. 1 and 2 show the general arrangement of ducts, exhaust fan, etc. It will be seen that the four suction ends of the ducts terminate in comparatively narrow open mouths, extending almost across the entire width of the boiler front, and they are placed directly above the firing doors. All coal is brought into the boiler room on an industrial railway in Hunt's charging cars, made for this purpose,

each car carrying one ton. These cars are filled from a distant coal pocket, and are then pushed by one man in front of any boiler which may need coal. The side of the car is then dropped like a hinged shelf, and coal is shoveled direct from the car into the furnace. As the car is easily moved from one boiler to another, no loose coal is dumped on the boiler room floor.

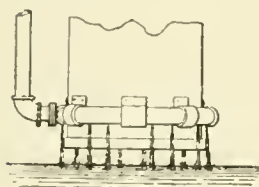


FIG. 3.

It will now be seen that any dust rising from the shoveled coal will be drawn into the suction mouth of the exhaust dust, since the shoveling operations take place only in front of these mouths.

When the boiler furnace is being cleaned, any dust accompanying the ash and clinker, as they are pulled out of the firing door, is drawn directly into the suction mouths, and this is again the case when this refuse is shoveled from the floor into an empty charging car, to be taken out of the boiler room.

Before following this dust out of the boiler room I would call attention to the construction of the vertical suction pipes above the firing doors. These pipes, it will be seen, are directly in front of the upper cleaning doors of the boilers. In order to open these doors, when the tubes require cleaning, a hinged joint is provided in the

dust, etc., is projected upon the surface of the water, where, as it gradually becomes soaked, it sinks to the bottom of the tank, from which it can be either washed out with a hose and stream of water, or else be shoveled out as mud.

In order to catch any particles of dust which might otherwise escape, a 1-in. water pipe is bent to a circle and secured concentrically around the lower ends of each of these delivery pipes, as shown in Fig. 3. The lower sides of these pipe rings are perforated with 1/8-in. holes, so as to produce a constant shower of water around the outlets.

This arrangement leaves a free escape of air, essential for best results with the type of fan used. A sewer connection near the top of the tank keeps the water at a constant level, and the added water from the sprays thus has a tendency to float off a considerable amount of the lighter floating particles before they have time to sink.

MONUMENTAL CHIMNEYS AT PARIS.

The power plant at the Paris Exposition is divided into two sections, one for French, and one for foreign machinery. Each section is to have a monumental chimney of brick; the two are of the same general dimensions and cost approximately \$40,000 each. The total height of the masonry construction of the chimney for the foreign section is 88 m. (289 ft.) of which 8 m. (26 ft.) are below ground. The base for a distance of 13 m. (42.5 ft.) is ornamented and also the top portion; the intermediate section, 20 m. (65 ft.), is plain white brick. The foundation rests on 133 oak piles, about 12 in. in diameter and 23 ft. long, which were driven until they no longer moved under the hammer; they were then cut off and concrete cast about them. The block of concrete is 18 m. (59 ft.) in diameter and 1.5 m. (4.9 ft.) thick. On this is a hollow truncated cone of masonry, 5.65 m. (18.5 ft.) high, 16.5 m. (54 ft.) external and 4.36 m. (14 ft.) internal diameter at the bottom and 12.9 m. (42 ft.) external and 6.9 m. (22.5 ft.) internal diameter at the top. Into this hollow space two tunnels, 4.7 x 2.6 m. in section, conduct the gases.

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH, 1899.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lbs. Water per Lb. Coal.	Lbs. Fuel per k.w.h.	Price of Fuel per Ton of 1,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.							Total.
1.	Oct.	1,679,927	.251	.144	.026	.029	.025	.475	3.57	.923	11.17	2.39	\$2.10	Bituminous
1.	Nov.	1,768,268	.257	.135	.041	.028	.046	.507	3.62	.882	10.76	2.44	2.11	"
*5. Metropolitan Elevated, Chicago....	Oct.	1,515,356	.406	.177	.020	.023	.008	.633	2.4	1.44	6.02	4.87	...	"
*5 " "	Nov.	1,671,982	.429	.160	.015	.032	.025	.661	2.2	1.26	5.44	5.12	...	"
*5 " "	Dec.	1,928,577	.443	.141	.017	.020	.033	.654	2.6	1.34	5.79	5.16	...	"
6.	Oct.	598,148	.669	.238	.045	...	.269	1.221	...	...	...	2.57	.880**	Oil
6.	Nov.	616,932	.602	.232	.052	...	.125	1.011	...	...	...	2.46	.750**	"
6.	Dec.	642,856	.614	.224	.020	...	.093	.951	...	...	...	2.47	.760**	"

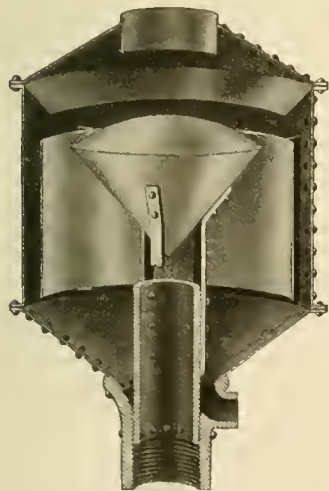
*During the months of October, November and December the supply of condensing water, which is taken from the Chicago River through a tunnel, was cut off for a few days by reason of work on the Chicago Drainage Canal, and the station was in consequence run non-condensing at those times.

**Cost of Oil per Barrel.

Above the ground the chimney comprises a pedestal 16 m. (52.5 ft.) in height, a shaft of 54 m. (177 ft.) and a capital of 10 m. (33 ft.). There is no core and the internal diameter is 6.2 m. (20 ft.) at the base and 4.5 m. (15 ft.) at the top; the thickness of the wall varies from 2.9 m. (9.5 ft.) to 1.35 m. (4.4 ft.) for the pedestal, and from 3.5 m. (11.5 ft.) to 1.6 m. (5.2 ft.) for the shaft and crown.

BURT EXHAUST HEAD.

We illustrate herewith a sectional view of the Burt exhaust head made by the Burt Manufacturing Co., of Akron, O. The construction is readily apparent; the steam emerging from the exhaust pipe strikes the cone immediately above the inlet and is deflected, the greater volume rising to the small projection extending around the top of the head. A portion of the vapor is condensed by contact with the metal surfaces of the head and this together with the entrained oil and water flows down between the double walls to the drip below.



BURT EXHAUST HEAD.

The heads for pipes up to 6 in. in diameter have a threaded base to which the upper portion is riveted; for larger sizes the base is flanged. The head is of heavy plate, lapped, riveted and soldered, and is protected against corrosion by anti-rust paint.

The advantages claimed for the design are that the increased volume secured by making the sides cylindrical instead of conical reduces the back pressure, and by reducing

the velocity of flow gives a more complete separation of the entrained oil and moisture; that the greater area of wall surface gives more condensation, hence more water is returned to the boiler room; that the absence of baffle plates and tortuous passages for the steam gives a free passage for escape and renders the head noiseless.

WATER IN THE BOILER.

Mr. J. W. Williams, a practicing chemist of Hamilton, Ont., recently discussed the subject of "Boiler Feed Water" before a Canadian engineering society and gave the following explanation of why corrosive action takes place in boilers.

Water in its ordinary state has a temperature of about 40° to 50° F., and the solvent quantity differs according to temperature. In many instances water will dissolve more when hot than cold, but conversely the earthly salts usually formed in water supplies are precipitated mainly because these salts are held in solution by

carbonic acid gas, and this with other gases is much more soluble in cold water than warm, and is dissipated from hot water, with the result of the throwing out of solution of the earthly salt. This, together with the evaporation of water leaving the solids behind in making steam, is the cause of scale and boiler mud.

Not only is the mud left behind, but the elements which form the chlorides, sulphates, etc., remain also, and these, under the influence of the high temperature in the presence of moisture, decompose with the liberation of the radical or acid part of the substance, which is then free to act on the iron plates or tubes, which it does to the sorrow of many a boiler owner.

The combinations which previously existed will be broken up and other combinations will occur, and the metal of the boiler is called on to take its part in forming these combinations. A water containing chlorides is fed into a boiler and concentrated by the evaporation of the water. This concentration brings with it the breaking up of the chlorides. Carbonic acid gas being present, free and also combined, is liberated by the decomposing effect of high temperature as referred to already, and by that law which governs matter and which couples atoms, to themselves if nothing else is available, this carbonic acid gas displaces the chlorine combined as chlorides, and this in turn seeking to obey this law of combination, unites itself to its heat affinity, the iron of the boiler plate.

It will here be concluded that the chlorine having done its best or worst is out of the game, but no, chloride of iron is not more stable than chloride of calcium, magnesium, potassium, sodium or any chlorides which may pass into the boiler in the feed water. Chloride of iron will take up oxygen, which as atmospheric air is taken into the boiler, dissolved in the water, and if this were not there the water would be called on to furnish oxygen, and an oxy-chloride formed passing on with a further addition of oxygen, and the formation of an insoluble oxide of iron and the chlorine is again on its cruel mission after an atom of iron. As with the chlorine, so with the other salts; just the exact changes and processes it is not presumed to define, but the foregoing will throw light on the cause of the corrosion of boilers. Having surveyed to a limited extent the origin of scale and the cause of corrosion, we will consider the action of boiler purges. We have observed the liberation of corrosive acid elements, and to neutralize these most purges are alkalies, and remembering the decompositions just referred to, we can see that if these neutralized acids now in the form of salt, generally a soda, are allowed to remain in the boiler, we can expect to experience similar results again, calling apparently for more alkali, but the precautions which will best combat these dangers are emptying the boiler, washing out and filling with fresh water. This has its limit, however, and must of necessity be controlled by fuel, time and circumstances, but it can be seen how valuable is blowing off—which only deducts from the contents of corrosive matter in the ratio of what is blown off—and more especially cleaning out.

A remonstrance has been entered by the Union Traction Co., of Philadelphia, against the granting of licenses for saloons near its car barns.

CINCINNATI, NEWPORT & COVINGTON.

In our issue for February last, page 108, was a summary of the earnings of the Cincinnati, Newport & Covington Ry. for the year 1899, and we give herewith further data taken from the report of Pres. James C. Ernst, published under date of February 21st.

The gross receipts were \$713,385, an increase of \$31,713 over 1898; the net earnings were \$270,780, an increase of \$76,552; and the surplus after paying fixed charges amounted to \$94,208, about 3 per cent. on the capital stock. Table I shows interesting statistics.

Total cash	\$ 707,551.90	\$ 671,734.60	\$ 35,817.30	
Total operating expenses	433,596.62	478,235.66		\$ 41,639.04
Average earnings per day	1,938.50	1,840.37	98.13	
Average earnings per car	31.93	29.30	2.63	
Expense per car.....	19.59	20.86		1.30
Net earnings per car.....	12.37	8.44	3.93	
Total Passengers	1,457,4360	1,383,4546	73,9714	
Mileage	3,201,165	3,236,498		35,333

Total 5 cent fares.....	14130041	13420649	709392	
" 3 cent fares.....	34995	35750		755
" compliment'y tikts..	143434	123290	20144	
" employe tickets ..	60658	118664		58006
" badges.....	295132	136193	68939	
" transfers	2227149	2210992	16157	
" Cin. locals from L. & N. and Crot. Bridges...	55856	62778		6922
" Owl car receipts.....	\$2,843.50	\$934.41	\$1,909.09	

Bridge Crossings:

Suspension Bridge	470047	476644		6597
Central Bridge.....	108090	28802	79288	
L. & N. Bridge.....	282653	332251		49598
Licking River Bridge...	86884	100435		13551

Through Passengers:

Suspension Bridge	5805428	5400448	404980	
Central Bridge	852761	297687	555074	
L. & N. Bridge.....	4521702	5076737		552035
Licking River Bridge...	947392	928237	19155	

Ratio of expense to earnings:

			DECREASE.
With tolls.....	52.32	61.26	8.94
Without tolls	40.12	50.18	10.06

The average number of cars operated per day in 1899 was 60.71, a decrease of 2.10 compared with 1898. The average mileage per car per day was 144.44.

The following table shows the expenses per car-mile itemized:

	Per car mile.	
	1898.	1899.
Interest on Bonds.....	5.57c	5.63c
Interest on Real Estate Loan.....	.14	.14
Interest on Current Loan.....	.03	.03
Rent .....	.08	.08
Telephone Rent .....	.04	.03
Track Rent.....	.03	.03
Insurance .....	.06	.06
Damages .....	.68	.56
Printing and Stationery.....	.03	.04
Legal Expense .....	.10	.17
Officers' Salaries .....	.26	.33
Stable Expense .....	.04	.04
Expense .....	.24	.11
Office Service .....	.18	.17
Tolls, Suspension Bridge.....	1.70	1.87
" Central Bridge .....	.17	.32
" Licking River Bridge.....	.09	.10
" Newport and Cincinnati Bridge.....	.37	.43
Taxes	1.11	1.12
Store House Expense .....	.04	.04
Building Repairs .....	.01	.03
Track Repairs .....	.91	.52
Line Repairs .....	.36	.26
Car Repairs	1.13	.46
Motor Repairs .....	.32	.23
Power House Machinery Repairs.....	.17	.04
Miscellaneous Equipment Repairs.....	.01	.01
Shop Tools and Machinery Repairs.....	.02	.01
Power House Expense.....	1.14	1.11
Hired Power .....	.16	.17

Car Service	4.42	4.34
Car House Expense.....	.24	.23
Motor Expense .....	.05	.05
Car Expense .....	.61	.58
Total expense per car mile.....	20.48c	19.34c
Receipts per car mile	21.06c	22.28c
Net profit per car mile.....	.58c	2.94c

Table III shows the itemized statement of power house expenses. Twelve "American" stokers were installed in March, 1899, and have proved their efficiency as smoke preventers and greatly reduced the cost of fuel and labor. The Newport power station of the company was abolished and the equipment of the Covington station increased by the addition of a 1,200-h. p. engine built by the C. & G. Cooper Co., of Mt. Vernon, O., and an 800-kw Westinghouse generator.

This plant now has a capacity of 4,250 amperes, the engines being rated at 4,000 h.p. and the boilers at 3,100 h. p.

OPERATING EXPENSES OF THE POWER HOUSE.

1899	Coal Cost K. W. Hour	Labor W. Hour	Misc Expense	Total Cost K. W. Hour	Avg. K. W. Hour per day	Lbs. Coal K. W. Hour	Total Coal per day	Total Cost
January,	00.368	00.237	00.058	.663	15423	6.85	52.84	\$3,279.48
February,	00.409	00.242	00.120	.771	15075	7.39	57.14	3,403.88
March,	00.386	00.240	00.213	.838	14409	7.01	60.53	3,836.12
April,	00.381	00.246	00.055	.682	13856	5.74	59.23	2,838.56
May,	00.369	00.263	00.043	.655	13727	5.59	49.84	2,920.16
June,	00.360	00.230	00.094	.670	14088	5.34	37.07	2,860.85
July,	00.370	00.231	00.050	.651	14499	5.61	39.07	2,923.30
August,	00.366	00.214	00.126	.705	14701	5.46	40.29	3,224.84
September,	00.365	00.210	00.108	.680	14326	5.77	41.67	2,911.66
October,	00.400	00.198	00.082	.680	14656	5.14	46.22	3,123.20
November,	00.369	00.188	00.061	.616	13571	5.48	42.66	2,878.56
December,	00.308	00.151	00.071	.530	13711	4.73	40.74	2,824.56
	00.372	00.218	00.092	.663	14847	5.95	44.12	3,170.29.16

NOTE.—The total cost includes repairs amounting to \$1,427.06

During the year 58,000 ft. of new trolley wire was put in place. October 1st a new car house was completed. This building is of brick and iron, with a frontage of 90 ft., and depth of 275 ft., with capacity for 100 cars; eight tracks run the entire length of the building, with pits 60 ft. long, between each track for overhauling of cars; each pit is supplied with steam pipes for the drying out of cars and equipment. On lower floor is the Division Master's office, a fire proof oil room, repair room and first-class lavatory for use of the men, which is supplied with porcelain bath tubs and latest sanitary plumbing. On the second floor is the reporting room for men where they make out their daily reports, and lockers are provided for each crew; here are also the office of Inspector in Chief and Superintendent of Line Department; reading room, where can be found magazines, papers, etc., which the men thoroughly appreciate and enjoy. This building was erected at a cost of \$23,909.

Upon the completion of the new car house, the Dayton, Newport and Main St. car houses were abandoned, and the system was reorganized, making two distinct divisions. All lines east of the Licking River belong to the Newport Division, and all lines west of the Licking River belong to the Covington Division. By this centralization of the work, the results have been not only satisfactory, but the work has been simplified in every respect.

New shops in close proximity to the car house and power house have been fitted up.

During the year considerable work has been done on the track and roadbed, and on the Ft. Thomas line a substantial trestle of over 100 ft. long was put in. The system now embraces 56.25 miles, 24.11 in Kenton County, 25.87 in Campbell County, 3.52 on the four bridges and 2.75 miles in Cincinnati.

Ten new convertible cars mounted on Peckham trucks were added at a cost of \$15,422, which included also the Westinghouse controllers.

In conclusion President Ernst said:

"The company is to be congratulated upon the very few accidents which have occurred during the year, and the damage to property was in every instance slight. The total amount paid out during the year for claims amounted to the insignificant sum of \$4,300, and to carry 14,574,260 passengers without the loss of a single life or even serious injury is a record of which the company may well feel proud.

"This record is in a measure due to our custom of giving prizes

to motormen having no accidents during the year, as it has a tendency to make them both cautious and careful in the handling of their car, and although accidents of every character are charged up against them 17, out of 125 motormen received the first prize of \$25, as they had no accident of any nature during the entire year. Prizes of same amount are awarded to conductors taking the best care of the car and for general deportment while on duty.

"Owing to the steady increase in travel, our car equipment will be increased by the purchase of ten or fifteen more cars of the latest design, and will be ready for use in time for the summer travel.

"The car house at State and Madison Sts. will soon be thoroughly overhauled and remodeled, and capacity for the storage of cars enlarged, as well as the fitting up of rooms for the convenience of the men similar to the car house in Newport."

The officers are: President, J. C. Ernst; vice-president, Julius Fleischman; secretary and treasurer, George M. Abbott. The operating company is the South Covington & Cincinnati Street Ry. with the same officers, save the vice-president, John A. Simpson.

NEW YORK RAPID TRANSIT BEGUN.

The work of excavating for the New York Rapid Transit tunnel was formally begun on the afternoon of March 24th, when the mayor of New York thrust a silver spade into the ground at a point near the city hall. The mayor was followed by Mr. McDonald, the contractor, and then by President Orr, of the Rapid Transit commission, Vice-President Starrin, Comptroller Coler, and others, each throwing up a spadeful of earth. It is said that 20,000 people witnessed the ceremony, which was made the occasion of appropriate addresses by the mayor, Mr. Coler, Mr. Orr and others.

When it is considered that the dirt thrown out by these distinguished persons had already been once removed by the workmen who took up the pavement over it, and then returned and left loose so that the silver spade would handle it easily, and that the hole will have no connection with the tunnel, its only function being to provide something for the bronze commemorative tablet to cover, this ceremony appears to be somewhat of a farce, and a poor way of spending \$5,000.

CHISHOLM & MOORE EXHIBIT.

The Chisholm & Moore Manufacturing Co., of Cleveland, was the only supply company which had an exhibit at the meeting of the American Railway Engineering and Maintenance of Way Association, held in Chicago March 14th to 16th, and was represented by Col. W. E. Ludlow, manager of the railway department. Col. Ludlow's exhibit, which was displayed in one of the parlors of the Victoria Hotel, the association headquarters, consisted of the well-known "American Standard" rail joints and special track and shop tools.

The joint exhibit comprised sample joints, as assembled with the rails, for 60, 70 and 80 lb. A. S. C. E. sections, and the handsomest joint model that was ever shown at a convention; this was a full size model, the rail of polished brass and the joint castings of aluminum, mounted on a plush covered brass table. This model was made by Col. Ludlow, himself, and he was well repaid for his trouble by the attention which the "16 to 1" model attracted.

The tool exhibit comprised: A regular No. 2 Chisholm & Moore air drill for iron, a No. 2 reversible air drill, a pneumatic chipper and calker, a boiler flue expander and a flue cutting-off tool. The air drills are made in five sizes Nos. 1 to 5, and are designed so as to be very light for the capacity, the casings being of aluminum. The drill for iron, which was mounted for drilling rails in place with an "old man" designed by Col. Ludlow, had recently been in a competition with other drills where it drilled a 1 1/4-in. hole through 2-in. steel in 2 1/2 minutes, the second best doing the same work once in 7 minutes and sticking at the second attempt; on lighter work, 1-in. holes through the web of a 70-lb. rail, the time ranged from 32 to 38 seconds. The reversible drill is an entirely new tool, the one exhibited being the first made by the company.

The boiler tube expander mentioned is adapted for hand working or may be used with a power drill; it is self-feeding, that is, it enters the tube by virtue of its rotary motion and needs no end pressure. The tool has ball bearings so that friction is reduced to a minimum.

Among the other new devices made by the company is a rectangular frame for supporting a rail drill; it is mounted on four wheels that roll on the rails so that it can be easily moved from point to point. The exhibit also included Avery cast iron tie plates.

THE UNION AT INDIANAPOLIS.

On March 22d a number of the employes of the Indianapolis Street Ry. held a meeting to perfect organization as a branch of the Amalgamated Association of Street Railway Employes. The company having in mind the experience of the old Citizens' company with the organization among its men, naturally did not regard the movement with approval, and on March 28th it was announced that the local union had been dissolved.

There has been no union among Indianapolis street railway men since 1894; the organization disbanding at that time participated in three strikes, two of which lasted weeks and tied up all the lines. In the first strike arbitration was reached, and a temporary conciliation effected, but soon after there was another source of friction, and another strike was begun. The third was in the fall of 1893, on the day Nancy Hanks was to trot against the world's record at a race meeting, the G. A. R. encampment being there at the same time, the lines were suddenly tied up by order of the executive board at noon, and remained dead until night.

EMPLOYES' BALL AT OAKLAND, CAL.

The Carmen's Social & Benevolent Society, composed of the street railway employes of Oakland, Cal., recently entertained its friends at its third annual dance given in one of the large halls of the city. From one of the souvenir programs of the affair sent us by the secretary, Mr. D. Hughes, we notice the names of a number of the waltzes and polkas were changed to suit the occasion. Among the dances were: Got a Flat Wheel, Fares Please, Walk Back a Block and Au Revoir—The Owl is Waiting. The social features of the society are in charge of a competent committee.

Jan.	July	35M	6	7	8	9	10	11	12	P	M	2	DANCING				
	Aug.	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	8:30				
Mar.	Sept.	3M	4	5	6	7	8	9	10	11	12	9:00	Grand March				
April	Oct.	THIRD GRAND BALL											Home, Sweet Home				
		GIVEN BY THE											1 A. M.				
May	Nov.	Oakland Carmen's Social & Benevolent Society											Music by				
		REED HALL											Homeier's				
June	Dec.	10TH AND HARRISON STREETS											Concert Band				
		Fare, <i>Edy and Gentlemen, 50c. ^{1/2} Mrs. Luby, etc.</i>															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	P

The tickets for the ball, as shown herewith, were designed in imitation of the transfer slips used on the lines of the Oakland Transit Co., properly punched as to date and time limit.

LAKE STREET ELEVATED LITIGATION.

In 1896 the Lake Street Elevated R. R., of Chicago, filed a bill in equity to remove the Farmers Loan & Trust Co., of New York, as co-trustee under its first mortgage, on the ground that it had not complied with the state statutes by depositing \$200,000 with the state treasurer. An injunction was also obtained preventing the Farmers Loan & Trust Co. and Wm. Ziegler, who owned \$600,000 of bonds, from foreclosing the mortgage.

The decisions in the state courts were in favor of the Lake Street company, but on March 26th the United States Supreme Court held that the cause should have been removed to the Federal courts, and it will now be retried in the United States Circuit Court.

The Newport News & Old Point Railway & Electric Co. will endeavor to prove in court that the license tax imposed by the city is illegal.

PERSONAL.

MR. H. B. VANDEGRIFF has resigned as superintendent of the Wilmington (Del.) City Ry.

MR. W. J. COLE resigned as cashier of the Fond du Lac Street Railway & Light Co. on March 15th.

MR. T. J. CARMACK has succeeded Mr. F. W. Sweet as manager of the Charleston (W. Va.) Traction Co.

MR. S. L. NELSON, the newly appointed manager of the lines at Wichita, Kan., was a "Review" caller last month.

MR. CHARLES A. ALLEN, author of the Illinois Allen law, is a candidate for speaker of the state house of representatives.

MR. CHARLES T. VERKES has been chosen chairman of the board of directors of the Northwestern Elevated R. R., Chicago.

MR. E. E. CLARK was appointed temporary receiver for the Benton Power & Traction Co., St. Cloud, Minn., on March 11th.

MR. JOHN P. MORSE, president of the Brockton (Mass.) & Plymouth Street Railway Co., last month resigned from that office.

MR. RICHARD R. QUAY, son of Senator M. S. Quay, of Pennsylvania, has been elected president of the New Castle (Pa.) Traction Co.

MR. T. P. POPE, formerly with the Edison Electric Co. at New Orleans, has been appointed superintendent of the Virginia Electric Railway & Development Co.

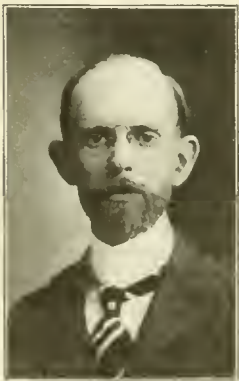
MR. JOHN DAY, as president of the St. Louis & Belleville Traction Co., recently subscribed \$5,000 to the fund for the St. Louis World's Fair, to be given in 1903.

MR. GEORGE O. NAGLE has accepted a position with the well-known engineers, Ford, Bacon & Davis, New York City, and has taken charge of an engineering department.

MR. HENRY D. COOKE, president of the Compressed Air Motor Co., of Chicago, will, it is understood, succeed Mr. H. H. Vreeland as president of the American Air Power Co.

MR. CHARLES F. WOODWARD has resigned as president of the Waterville (Me.) & Fairfield Electric Railway, Light & Power Co., and has been succeeded by Mr. George K. Boutelle.

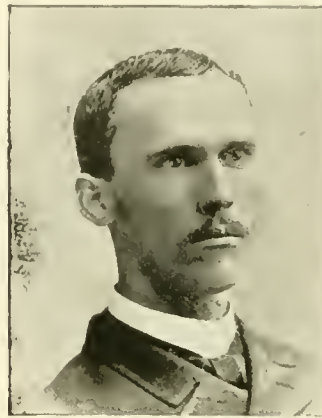
MR. CHARLES L. HULL, formerly master mechanic of the Chicago General Railway Co., has been made general manager and purchasing agent of that company, with which he has been connected since 1890. He came from Washington, D. C., in that year and was appointed clerk in the office of the promoters of the General Railway, his name appearing as one of the incorporators of the original company. His ability to handle details and master the difficulties of the work made his advancement rapid and from city buyer in 1894 he has been promoted to the positions of general bookkeeper, store-keeper, cashier, purchasing agent, master mechanic, and now has been made manager of the entire system. Mr. Hull has a large circle of acquaintances, all of



C. L. HULL.

whom will wish him well in his new position. The Chicago General Railway Co. originally commenced business with five cars and 10 miles of road, operated by one 100-kw. generator. It now owns 26 cars and 29 miles of road.

MR. GEORGE W. BAUMHOFF, formerly general manager of the Lindell Railway Co., and since the consolidations superintendent of the Lindell division of the St. Louis Transit Co., was on



G. W. BAUMHOFF.

March 27th chosen general manager of the entire system, to succeed Mr. Jilson J. Coleman, who had tendered his resignation some ten days before. Mr. Baumhoff is a practical street railway man, having spent nearly all his life since boyhood with the Lindell company, where he became thoroughly familiar with all departments of the service. Beginning as the driver of a horse car he worked up through the various grades of barn service and entered the general offices as a bookkeeper; continued promotions brought him to the top of the ladder in the operating department, and the present appointment makes him manager of one of the large street railway systems of the country. Mr. Baumhoff has the best wishes of a host of friends who feel confident that he will earn new laurels in a wider field.

MR. C. D. SHEPARD, for two years the superintendent of the Palmer & Monson Street Ry., has resigned to become superintendent of construction for Fred T. Ley & Co., of Springfield.

MR. GEORGE L. WELLINGTON, president of the Cumberland (Md.) Electric Ry., has succeeded Mr. J. A. Milholland as president of the Edison Electric Illuminating Co., of Cumberland.

MR. ALEXANDER CHAMBERS, secretary of the Newtown (Pa.) Electric Ry., accompanied by his brother, is soon to return to Honduras, where they are interested in railways and copper mines.

MR. WILLIAM D. GRANT, the mayor of Willimantic, Conn., has been chosen to succeed Mr. John Pettis as president of the Willimantic Street Railway Co. The company has not yet commenced to build its line.

MR. EDWARD P. BURCH, of Minneapolis, Minn., on March 21st delivered a lecture before the upper classmen of the Nebraska University on "Heavy Street Railway Engineering" illustrated with 50 lantern slides.

MR. PARIS L. DAVIS has taken up his new duties as superintendent of the Marquette City (Mich.) & Presque Isle Street Ry. He was for a number of years connected with the railways at Benton Harbor and St. Joseph, Mich.

MR. F. J. STOUT, formerly superintendent of the Wheeling & Lake Erie R. R., with headquarters at Toledo, O., has just been appointed general manager of the Toledo, Fremont & Norwalk Electric Ry., a new line under construction.

MR. E. P. BRYAN vice-president and manager of the St. Louis Terminal Ry., will be general manager of the company now organizing to operate the Rapid Transit road in New York. During construction he will act in a consulting capacity.

MR. E. E. HIGGINS, editor of the Street Railway Journal, of New York City, is devoting considerable time to Success, a new periodical in which he has recently become interested. We wish him all that the name of the new paper implies.

MR. HARRY DE STEESE, formerly manager of the railway supply department of the Western Electric Co. in New York, was a "Review" caller recently. Mr. De Steese is now on his way to Europe, where he will represent the Sturtevant Engineering Co., of London.

MR. E. G. CONNETTE, general manager of the Nashville Ry., and the Cumberland Electric Light & Power Co., resigned to become general manager of the Syracuse (N. Y.) Rapid Transit Co.,



E. G. CONNETTE.

assuming his new duties April 1st. He was also chosen a director of the company. Mr. Connette was born in Indiana, and at an early age entered the railroad business in the service of the Cincinnati Short Line. He was with this company when the Louisville & Nashville purchased the road, and he continued his connection with the Louisville & Nashville until 1899, when he resigned to accept the position of superintendent of the United Electric Railway Co., a position he held for one year, and since then has been general manager, until last April, when the various properties were consolidated. Since the consolidation of the properties, Mr. Connette has been General Manager of the Nashville Railway and Cumberland Electric Light & Power Companies, a position he filled with entire satisfaction to the owners of the properties.

MR. O. F. GAITHER, of Chicago, having disposed of his holdings in the Consolidated Street Railway Co., of Grand Rapids, Mich., has resigned as secretary. The new stockholders on March 16th elected four new directors, George E. Hardy, George Hefferan, C. M. Clark, Anton G. Hodeppyl.

MR. CHARLES E. FLYNN, general manager of the Easton (Pa.) Transit Co., has the sincere sympathy of all his friends in the recent death of his wife. Although Mrs. Flynn had been an invalid for several years, her death was quite unexpected. The funeral was held at Winona, Minn., her former home.

MR. GEORGE S. WHIPP, formerly with the Standard Air Brake Co., will hereafter represent the railroad department of the Boston Woven Hose & Rubber Co., of Boston and New York. Mr. Whipp has been in the supply business for many years and his large circle of friends will wish him every success in his new venture.

MR. A. H. FORD, secretary and treasurer of the New Orleans (La.) City Railroad Co., on April 1st retired from that office to accept the position of general manager of the New Orleans & Carrollton R. R.



A. H. FORD.

Mr. Ford was born in New York City, July 28, 1859, and his early business life was spent in the employment of various steam railroad companies. At the age of 17 he held the office of clerk to the receiver and local ticket agent of the Lake Erie, Evansville & Southwestern R. R. From 1880 to 1884 he was secretary of the Evansville & Eastern R. R., assistant auditor of Evansville, Rockport & Eastern R. R. and when the two companies were consolidated he became traveling auditor. From 1886 to 1892 he was successively auditor of the Kentucky & Indiana Bridge Co., treasurer and auditor of the Louisville & Southern R. R. and secretary and treasurer of the Southern Contract Co. He left Louisville in 1893 and since that time has been associated with the New Orleans City Railroad system, enjoying the fullest confidence of its officers and stockholders. His resignation was accepted with much reluctance.

Asked in regard to the rumored consolidation of all the street railway companies in New Orleans, Mr. Ford said to a reporter: "I have always been a strong advocate of consolidation and I am

sure it will eventually be consummated." At present there are four distinct systems in the city.

MR. T. J. FELDER, vice president of the Nashville Ry., has assumed the executive duties of the office vacated by Mr. Connette. Mr. George Swint will be superintendent in charge of the operation of the railway, and Mr. J. M. S. Waring, electrical engineer, will be superintendent of the Cumberland Electric Light & Power Co.

MR. J. CLIFTON ROBINSON, superintendent of the London United Tramways, writes on "British Tramway Development" in the February issue of Cassier's Magazine. He makes the statement in his opening paragraph that the initial attempt to introduce tramways in Great Britain was made at Birkenhead in 1860 by George Francis Train.

MR. MORMORU JIO, electrical engineer for the Kansas City (Mo.) & Leavenworth Electric R. R., has been appointed superintendent of a proposed system of electric railways between cities in Japan. Mr. Jio comes from one of the best Japanese families and is spending several years in this country in order to become thoroughly informed regarding American street railway practice. He is a graduate of the department of electrical engineering at Kansas State University.

MR. JOHN H. ROBERTSON, superintendent of the Third Avenue R. R., of New York, on April 7th tendered his resignation, to take effect April 30th, which was accepted with regret by Receiver Grant. Mr. Robertson has been in the service of this company for 33 years, during 7 of which he was in entire charge of the shops and all other mechanical work, and 19 as superintendent. In this time the system of motive power has been twice changed, from horse to cable and from cable to underground electric, the work being under his personal supervision. Mr. Robertson is a native of Edinburgh, Scotland; he served in the 69th New York in the Rebellion, and in 1867 began work in the shops of the Third Avenue company.

MR. G. M. BRILL, who for the last three years has been assistant manager of the construction and mechanical departments for Swift & Co., has resigned that position and opened offices at 1143-4 Marquette Bldg., Chicago, to engage in practice as consulting mechanical and electrical engineer. Mr. Brill is well fitted for this work, having had nearly 10 years' experience in designing and building power houses, shops and refrigerating plants. After graduating at Cornell University in 1891, he went with the Salvay Process Co., of Syracuse, N. Y., as engineer of experiments and tests, and later was chief engineer in charge of construction when the company built its Detroit works. In 1897 Mr. Brill became general engineer for Swift & Co., and during the three years he was with them his work was largely in a consulting capacity.

OBITUARY.

MR. ALLEN FOLLICK, master mechanic of the Oakwood Street Railway Co., Dayton, O., died on March 14th.

MR. WILLIAM R. PRALL, paymaster of the Staten Island (N. Y.) Rapid Transit Co., died March 19th, after an operation for appendicitis.

MR. JOSEPH H. BROWN, formerly a director of the Lowell (Mass.), Lawrence & Haverhill Street Ry., died at his home in Lowell on March 26th, aged 81 years.

MR. N. H. BECKER, vice-president of the Geneva (N. Y.), Waterloo, Seneca Falls & Cayuga Lake Traction Co., died at Constantinople on February 1st, aged 60 years.

MR. CORNELIUS PIERPONT, of New Haven, Conn., who built some of the horse car lines now forming part of the Fairhaven & Westville system, died on March 20th, aged 70.

MR. ADDISON C. RAND, president of the Rand Drill Co., died suddenly at his home in New York on March 9th. Mr. Rand was

one of the pioneers in developing rock-drilling and air-compressing machinery and was identified with many mechanical and engineering associations.

MR. FRANK O. MASON, superintendent of the New Castle Traction Co. and the New Castle Electric Co., of New Castle, Pa., died on March 22d, of typhoid fever, after an illness of three weeks.

MR. BERNARD M. SHANLEY, president of the Consolidated Traction Co., of Jersey City, N. J., and largely interested in electric railway and lighting companies, died at his home in Newark on March 19th.

MR. JOHN R. BULLARD, of Boston, died at his home March 16th; he was interested in electric railways and was for years a director of the Norfolk Suburban, West Roxbury, Roslindale and Norfolk Central companies.

MR. GEORGE E. NEWLIN, formerly treasurer of the West Chicago Street Railway Co., and since the consolidation associated with the Chicago Union Traction Co., having charge of the rentals, died suddenly on April 2nd.

MR. JAMES H. FROTHINGHAM, for many years treasurer and later receiver of the Kings County Elevated Railway Co., of Brooklyn, died recently at the age of 67 years. He was one of the original promoters of this road and assisted in the recent reorganization of the company.

MR. CHARLES R. BROWN, manager of the railway department of the Michigan Malleable Iron Co., Detroit, died in that city on Sunday, March 11th. He was sick but three days, and his death occurred at a hospital shortly after an operation. While Mr. Brown was more widely known among steam railroad men, he enjoyed a large acquaintance in our own field. He was for several years in the sales department of the Illinois Steel Co., and looked after such rail orders as were intended for street railway use. Mr. Brown possessed an unusually genial temperament, and was one of those men whom to meet was to like, and to know was to love. He leaves a widow and three children.

ELECTIONS.

THE NEW JERSEY & HUDSON RIVER RAILWAY & FERRY CO., which is a consolidation of the Bergen County Traction Co., of Fort Lee, N. J., the Ridgefield & Teaneck Railway Co., and the Riverside & Fort Lee Ferry Co., has elected the following directors: S. Davis Page, A. Merritt Taylor, Joseph De F. Junkin, Charles T. Calloday and William P. Clark, of Philadelphia; George W. Bacon, Frank R. Ford, Archibald S. White and Charles A. Liebe, of New York; Charles N. Black, of Norristown, and James C. Young, of Jersey City. The officers are: President, A. Merritt Taylor; vice-president, W. H. Clark; secretary and treasurer, W. N. Burrows.

THE BIDDEFORD & SACO RAILROAD CO. last month chose new directors who elected Charles H. Prescott (formerly treasurer and general manager) president, and E. A. Newman general manager.

NEW PUBLICATIONS.

"LA PEQUENA INDUSTRIA" is a paper just started at Valencia, Spain, to deal in a popular way with electrical developments in that country.

THE MINNEAPOLIS TIMES, of Minneapolis, Minn., is taking advantage of bright business prospects to issue a special edition called the "Times Northwest-Orient Edition." This deals with the present financial, commercial and maritime conditions of the Northwestern territory.

"SCIENCE ABSTRACTS" is published monthly by E. & F. N. Spon, 125 Strand, W. C., London, for whom Spon & Chamberlain, 12 Cortland St., New York, are sole American agents. The price is 25 or 50 cents per number; per year with index, \$6.

THE TRANSACTIONS OF THE PACIFIC COAST ELECTRIC TRANSMISSION ASSOCIATION, giving the proceedings of the third annual convention held in June last, have been received. The contents comprise the following papers, with the discussion had on them: "Tests and Calculations for a 40-mile Aluminum Transmission Line," by F. A. C. Perrine; "Hints on Long-Distance Transmission," by R. W. Van Norden; "Electric Lighting v. Gas," by John Martin; "The Regulation of Alternating-Current Generators," by C. L. Cory; "Electrically-Driven Centrifugal Pumps," by Lewis A. Hicks; "On the Determination of a Fair Return for Current Supply," by C. W. Hutton.

"ELECTRIC WIRING," by Cecil P. Poole, is a recent publication by the Power Publishing Co., of New York. It is designed for practical wiremen called upon to lay out their own work, and as a reference book for engineers having to make calculations for transmission circuits. In the preface the author states that all the tables given have been computed from fundamental formulas and their accuracy carefully verified. Wiring tables for alternating current motors are included and also tables giving the corrected drop in inductive circuits. It is believed that these are the only tables of the kind in print, and they should prove convenient and valuable. The book comprises 100 pages, pocket size, and is bound in flexible covers; price, \$1.00.

"THE JOURNAL OF THE ASSOCIATION OF ENGINEERING SOCIETIES" for January contains a paper from the Cleveland Society upon dock equipment for the rapid handling of coal and ore on the great American lakes, one from the St. Paul Society describing the removal of portions of a bridge crossing the Mississippi at that place, one from the Louisiana Society upon the progress of drainage in New Orleans and one from the Detroit Society upon masonry construction, earth pressures, etc. The report of the secretary, which is given in this number, shows that the membership of the allied societies has reached a total of nearly 1,500. The net cost of the Journal to members has been reduced from \$3.66 in 1895 to \$1.00 in 1899.

STEPHENSON WORKS TO BE SOLD.

The last chapter in the affairs of the John Stephenson Co., Limited, of Bayway, near Elizabeth, N. J., will be concluded on Wednesday, April 25th, when the receiver, Albert A. Wilcox, will dispose of all the real and personal property at public sale, without reserve. The material, such as lumber, iron, malleable, cast and rough stock; tool steel, cast steel and the hundred and one kinds of necessary supplies for such establishments, will be sold in lots. There is a large stock of well-seasoned, high-grade lumber which it is worth while for car builders and cabinet woodworkers to make note of. The plant, consisting of all the real estate, buildings, machinery, fixtures, motors, patterns, etc., will be disposed of in one parcel. The area of the grounds is about 90 acres, well located. Permits to inspect the premises can be had from the receiver at Room 709, No. 95 Liberty St., New York.

BATES FANS.

In anticipation of the demand for electric fans which develops with the approach of summer, D. L. Bates & Co., of Dayton, O., have issued a new descriptive catalog of their well-known fans and fan motors. The principal types offered this season are four-blade ceiling fans for direct current at 110, 167, 220, 250 or 500 volts; two-blade ceiling fans, direct current at any of these five voltages; electrolier ceiling fans with detachable blades, direct current, five voltages; stationary electrolier four-blade fans, direct current, five voltages; column fans, with or without lights, 110, 220, or 250 volts; desk fans for three speeds, made for direct current at 110, 220, or 250 volts; bracket fans. This firm has a national reputation for the excellence of its fans of which thousands are in use.

Mr. George H. Harris, electrical engineer of the Birmingham (Ala.) Railway & Electric Co., writes us that the company has convicted no less than a dozen persons of stealing rail bonds, the sentences being in some instances for three years.

FOREIGN FACTS.

The Swansea (Wales) Corporation Tramways are to be extended.

Contracts for electric tramways have been let by Newcastle on Tyne, Eng.

The Wolverhampton (Eng.) Corporation will take over the tramways at a price of £22,500.

Work has been commenced on the new power station of the Huddersfield (Eng.) Tramways.

An interim dividend of 4 per cent has been declared by the Cape Electric Tramways, of Cape Town, South Africa.

Another electric line has been opened in Liverpool, running from Aintree, at the north end of the city, to Aigburth St.

Dispatches from South Africa state that the tram cars at Kimberley were kept running through the entire period of the siege.

The Middlesex (Eng.) County Council is applying to the Light Railway Commissioners for rights to construct electric railways.

A concession for an electric railway in the Caucasus, Russia, from Tiflis to Kachetien, has been granted to Prince Tochawtschawodre.

March 9th the first electric railway, comprising a few miles of what will ere long be a large system, was opened at Havana, Cuba.

The building of an electric road connecting Salonica, Turkey-in-Europe, and Langaza is under consideration by the Turkish Government.

A majority of the members of the Glasgow tramways committee are opposed to the carrying of advertisements, either on the inside or outside of cars in that city.

Manaos, Brazil, has an electric railway 15 miles long, with seven miles additional under construction. The concession is owned by Chas. R. Flint, of New York City.

It is expected an experimental train will be run over the Central London Ry. within a few weeks, and the road will probably be opened to traffic a few months later.

Owing to the condition of the metal and money markets the Great Yarmouth (Eng.) tramways committee has decided to defer for the present the work of laying the tram lines.

The policemen at Hamburg, Germany, are instructed to watch the cars closely and if they find a car with a single passenger more than the law allows the conductor is fined 72 cents.

The technical institutions in Berlin, Germany, have filed complaints before the Reichstag respecting the electric and magnetic disturbances to various instruments caused by trolley currents.

By the bill deposited by the London United Tramways Co. for the next session of Parliament, power is sought to extend the system by the construction of new lines nearly 21 miles in length.

There has been incorporated at Naples, Italy, the Societe Generale des Tramways et Chemins de Fer du Centre, with a capital of 1,250,000 lire to construct electric tramways in the vicinity of Naples.

A bill has been introduced in the House of Commons empowering the South-Eastern Metropolitan Tramways Co., of London, Eng., to equip its system for electric traction at an estimated cost of £158,029.

A company has been formed for the construction of an electric railway connecting Kogoori, a station on the Sanyo Ry., with Yamaguchi, Japan, a distance of about nine miles. Count Yamada is one of the incorporators.

The Tokyo Tram Co. of Tokyo, Japan, has declared a dividend of over 30 per cent on its business for last year. On Jan. 1, 1900, the company carried 108,000 passengers, as compared with 96,700 passengers on Jan. 1, 1899.

Two electric tramway companies have been incorporated to build lines near Rome, Italy. These are Societa per le Tramvie Elettriche di Terni, and Societa delle Tramvie e Ferrovie Elettriche. The president of the latter is Count Carlo Rasponi.

The plan submitted by the Burma Electric Work Syndicate, Ltd., for building an electric railway has been accepted by the Mandalay (India) municipal committee. The tramway is to be commenced within one year and completed two years thereafter.

According to a London newspaper, in the first year of the corporation management, the Glasgow Tramways carried 60,000,000 passengers. Last year they carried 119,000,000 passengers, equivalent to the entire population of Glasgow three times every week.

The advantages of electric traction over horse haulage have been particularly well shown at Bristol, Eng., and Dublin, Ireland. In both of these cities traffic receipts have increased and operating expenses have decreased sufficiently to warrant an extra dividend of 1 per cent.

The electrical extensions of the City & South London Ry. to Moorgate St. have been opened to the public, and the new power station at Stockwell is now operating the system. There has been put in force a new tariff of fares, regulated on a ticket system according to the distance traveled.

Robert S. S. Bergh, U. S. Consul to Sweden, writes from that country as follows: "Electric railways and tramways are being planned for Gothenburg, Lund, Bjerrrod and Jonkoping. In this line, as in everything else, the Germans are always watchful; if necessary they send experts here to study plans, etc. If it is not practical for Americans to do likewise, they could possibly employ active agents to represent them here."

ELECTRIC RAILWAY DEVELOPMENT IN RUSSIA.

Prepared by the Philadelphia Commercial Museum.

Until quite recently little or no progress was made in the construction of electric street railways in Russia, but at the present time the construction of new lines is going on in all parts of the empire, and concessions have been granted for many others, so that now may be said to be an opportune moment for American manufacturers of street railway materials, rolling stock, electrical machinery and equipment, etc., to make energetic attempts to secure a market for their products in that country.

A correspondent of the Philadelphia Commercial Museum writes that institution from Riga to the effect that the city of Riga is seriously considering the question of building a network of electric street railways. The city had already taken the matter in hand and the Ministry of the Interior had expressed its willingness to assist the corporation by granting it a loan for the purpose. The estimated cost of this project is \$800,000.

Electric street railways are now in course of construction at Lublin and from Pabianice, via Lodz to Zgierz. A line is also proposed to connect Dombrowa, Sosnowice and Beddzin, and it is believed that work on this will shortly be commenced. We gave some interesting data concerning the street railways of Warsaw and Witebsk in the "Review" for November, 1899, page 797.

German manufacturers have sample warehouses established in the largest towns of Russia, and if American manufacturers want to enter into competition, they will certainly have to do likewise. They also should be properly represented by active agents.

Catalogs should be printed in the Russian language, or in default of this, in German, as those in English are absolutely useless, and the money spent in forwarding them is only wasted.

From New York to Reval, the nearest port to St. Petersburg, the present freight rate is 22s. 6d. (\$5.47) and 5 per cent prime per

ton of 2,240 lbs. or 40 cubic feet., ship's option. Particulars, however, can be obtained from the New York agents of the various steamship lines, as follows:

Funch, Edge & Co., Produce Exchange Annex.
 Furness, Withy & Co., Ltd., Produce Exchange Annex.
 Hamburg American Line, 37 Broadway.
 Sanderson & Son, 20 Broadway.
 John W. W. MacDonald in Warsaw desires to represent American manufacturers of tramway materials, etc.

Correspondence should be opened with and illustrated catalogs and price lists sent to the following selected list of importers of electric street cars and electric railway materials in Russia:

Max Kubitzky, Rue Grande Loubianska, Moscow.
 Henry A. Lehrs, Myasnitzkaya, House Baskakin, Moscow.
 Phillip & Co., Nachfolger, (Aussem & Co.), Naroscika, Haus Leonov, Moscow.
 E. Tillman & Co., Moscow.
 E. Bastian & Co., Bolschaja Morskaja, 27, St. Petersburg.
 Societe Energie, Nadeschdumskaja, 34, St. Petersburg.
 O. Spennemann, Tschernyschew, 12, St. Petersburg.
 Wossidlo & Co., St. Petersburg.

METROPOLITAN BUYS THIRD AVENUE, NEW YORK.

March 14th Mr. Hugh J. Grant filed his report as temporary receiver of the Third Avenue road, which showed the liabilities of the company to be:

Funded debt with interest.....	\$5,039,583.33
Mortgages and real estate, with interest.....	92,435.68
Judgments, taxes and assessments, with interest....	297,469.61
Loans on collateral with interest.....	7,251,764.73
Claims represented by liens filed prior to receivership	2,333,442.33
Claims represented by liens filed subsequent to receivership	186,027.78
Loans and bills payable with accrued interest.....	8,923,963.71
Accounts payable	837,220.82
Total liabilities	\$24,871,917.99

In addition to this are contingent liabilities as follows:

Indorsements on Union Railway Co. notes, \$1,105,000; claims in personal injury actions, \$10,619,447.69; total, \$11,724,447.69.

The sum required to complete the necessary changes in motive power was estimated at \$10,935,657.53.

March 16th Mr. Grant was appointed permanent receiver.

On March 20th the principal stockholder of the Metropolitan Street Ry. secured a controlling interest in the stock of the Third Avenue, thus giving the Metropolitan control of all the surface lines in Manhattan.

This action was a radical change of policy since on February 24th our eastern contemporary quoted Mr. Vreeland in a positive denial that his company intended to purchase or in any way seek control of the Third Avenue property. The reason for standing aloof was that "a fully developed property that can not earn the interest on its debts" did not offer any attractions.

The Metropolitan company has decided to spend \$10,000,000 during the present year, in improving and extending its lines.

All of the old power stations, seven in number, will be abandoned by July or August next, and the entire system will be operated from the new plant at the East River and 96th St., which has a total capacity of 70,000 h. p. During the present month the work of changing the cable lines to the conduit electric system will be commenced on Broadway, Columbus Ave. and Lexington Ave. About three-quarters of the material needed for the change has been delivered, so that the present condition of the iron and steel market will not delay progress. As soon as the necessary legal steps have been completed the company intends to commence the construction of two entirely new lines, one in the Boulevard, between 130th St. and 175th St., and the other in 145th St., from the Boulevard to Lenox Ave. Charters for these have been obtained. The new lines mentioned with several minor extensions to existing crosstown lines will amount to about seven miles of track.

The Union Elevated Railroad Co., of Chicago, is being sued for \$400,000, for alleged damage to the Palmer House property.

STREET RAILWAY MUTUAL BENEFIT ASSOCIATIONS.

In our issues for February and March of this year, pages 67 and 141, we gave data concerning quite a number of mutual benefit associations which have been organized among the employes of street railway companies. The following are brief statements concerning other similar associations:

The Louisville Railway Relief Association, incorporated under the laws of Kentucky for 25 years, was organized Feb. 14, 1900, with a membership of 254, and within two weeks there were over 50 applications for membership pending.

All present employes of the Louisville (Ky.) Railway Co. earning \$1.50 or more per day, who are under the age of 60 years, and men between the ages of 16 and 45 who may enter the service in the future, are eligible to membership. Membership in the association ceases when a member leaves the service of the company.

The officers are a president, a vice-president, a recording secretary, a financial secretary, a treasurer, and a board of managers of 18 members in good standing. At the present time the president is J. T. Funk, superintendent of the company, and the financial secretary, J. W. Mitchell; the Louisville Trust Co. is the depository. The financial secretary and the treasurer are permanent officers removable only for cause.

The dues are placed at 50 cents per month, but when the funds on hand shall amount to \$3,000, the dues may be reduced in the discretion of the management. The Louisville Railway Co. gave the association \$1,000, and promises further assistance if necessary.

The sick benefits are 90 cents per day (after the first seven days), but after six months' disability this is reduced to 50 cents. If the disability is local and apparently permanent, but the general health of the member such that he can engage in other pursuits, no benefit is payable. The death benefits are \$150 on the death of a member, \$50 on the death of a member's wife, and \$25 on the death of a member's child under 14 years of age.

The Lowell, Lawrence & Haverhill Street Railway Employes' Mutual Relief Association was incorporated under the laws of Massachusetts, June 7, 1894, having 77 members at that time. The initiation fee is \$2, and the dues 50 cents per month. Sick benefits are \$3 for the first week and then \$7 per week for 15 weeks; death benefit, \$100. The death fund is kept up by assessments. The total sick benefits paid amount to \$5,733; total death benefits \$500. The sick benefits paid in 1899 were \$1,448; death benefits paid in 1899 \$100. The membership at the present time 180. The officers comprise a president, two vice-presidents, one from the Haverhill division and one from the Lawrence division; a treasurer, a secretary, and four trustees, two from each division. Any employe of the company is eligible for membership if approved by the trustees. The company contributes \$100 annually towards the sick benefit. The association now has in the treasury \$984.

For the foregoing facts we are indebted to the secretary of the association, Edw. M. Tracy.

RESTRICTING THE USE OF 4-CENT TICKETS.

The Milwaukee Electric Railway & Light Co. announces that the 4-cent commutation tickets which it issues will positively not be accepted in payment of fares at any other time of day than the stipulated hours during the morning and evening; also that these low rate tickets are not legal tender and the company will not accept a 4-cent ticket and an additional cent in place of a cash fare of 5 cents. It has been necessary to make this ruling owing to the impossibility of properly registering such combination fares on the car registers now in use, and also to avoid difficulties in bookkeeping. The commutation tickets are not accepted at any time outside of the city limits.

A new freight ordinance has been proposed for Detroit, Mich. This provides that the street railways of the city may carry packages, merchandise and other light freight, milk, farm produce and garden truck, between 8 a. m. and 8 p. m. The freight cars must transport material and supplies for the various city commissions, and the company must pay the city a certain sum for every car of freight hauled over the lines.

ACCOUNTANTS' ASSOCIATION.

President Duffy and Secretary Brockway of the Street Railway Accountants' Association of America have issued the following circular No. 13 under date of April 10th:

In presenting this preliminary announcement of the fourth annual convention of the Street Railway Accountants' Association of America, it is deemed proper to make mention in a brief way of its organization and objects, and what it has accomplished, as well as the present status of the association.

It was organized at Cleveland, O., Mar. 24, 1897, with a membership of 25 companies. The object of the association is set forth in the Constitution as follows: "The object of this association shall be to bring together those engaged in the accounting department of street railway companies, for an interchange of ideas, to promote the adoption of a uniform system of accounts, and to improve the work of the accounting department."

There has since then been formulated and adopted a Standard System of Street Railway Accounting, covering the Classification of Construction and Equipment Accounts, Classification of Operating Expense Accounts and forms of monthly and annual reports, which has been adopted by the street railways of the United States, Canada and Mexico, thereby securing a uniformity of methods, so desirable, but heretofore considered an impossibility.

The standard system was adopted by the eleventh annual Convention of Railroad Commissioners, held in Denver, Col., Aug. 10, 1899, so that in every state where the boards of railroad commissioners exercise supervision over the books and accounts of street railways, the standard system will be followed.

The association's Department of Blanks and Forms is an important and valuable feature. There is a collection of some 12,000 blanks, classified and mounted in a series of books, for exhibition at the annual conventions. This exhibition appeals at once to the practical men in all departments of street railway work. An examination of this collection is always helpful, no matter how small or how large the road. There is a duplicate set of this collection in the secretary's office, which is at the service of the members; selections are sent for examination and use at any time.

The membership has increased in two years from 25 companies represented at the organization meeting in 1897, to 100 companies at the convention in Chicago in 1899. And although since then some members have been lost through consolidations, it has gained some new ones, which is especially gratifying in view of the fact that the annual dues for 1900 were increased from \$10 to \$20. The income with the annual dues at \$10 was not sufficient to meet the actual expenses, notwithstanding the affairs of the association were conducted with the most careful economy. No one makes any money out of the association; even the amount voted to the secretary is too small to be considered a salary, but is to defray his expenses incurred in attending the conventions. The traveling and hotel expenses of the officers and members of committees in attending meetings have not been paid by the association. The work has been with all a labor of love.

The work of the association has only begun, but now that the Standard System of Accounting has been made the standard system for the street railways of the United States, its sphere of usefulness and the work it proposes to undertake and successfully carry out will be more far-reaching in its effects and of greater benefit to the street railway interests.

The papers, reports and proceedings of each convention have dealt with practical accounting questions and the program for the fourth annual convention, to be held in Kansas City, Oct. 16, 17, 18 and 19, 1900, is along the same lines. The papers selected are as follows:

- "Material and Supplies Accounts."
- "A System of Department Accounts."
- "What Does the General Manager Want to Know from the Accounting Department?" (By a prominent general manager.)
- "Office Practices." (Referring to Stock Certificates and Ledgers, Dividend Books, Bond and Coupon Books, Filing Valuable Papers, Labor Saving Devices, etc.)

Annual reports will be read from the committee on Standard System of Street Railway Accounting, and the committee on Standard Unit of Comparison.

Informal Discussion on Street Railway Accounting. There will be a special time set apart for discussing informally all subjects

relating to street railway accounting, and will be of especial interest and value.

This program is one of the most interesting ever presented by this association, and a large attendance is urged and expected. In addition, Kansas City's reputation for hospitality and entertainment will be well sustained, as the action at the destruction of the convention building will demonstrate. The hotels are first class and close to the convention hall. At either the Midland, the New Coates, the Savoy or the Baltimore accommodations may be secured on the American or European plan at customary rates. The headquarters of the association will be at the Midland Hotel. Railroad rates will be on the certificate plan at one and one third fare for the round trip.

Secure your rooms at once and make your arrangements now to attend.

NEW YORK FRANCHISE VALUATIONS.

Beginning on March 6th the State Tax Commissioners of New York gave a number of public hearings at which representatives of the corporations to be taxed presented their protests. On March 29th the Commissioners made public the valuations fixed upon. Heretofore the corporations in New York City were assessed locally at \$70,018,025; the Commissioners have increased this to \$189,654,981. The same ratio holds for the rest of the state. The tax rate in New York City last year was 2.48 per cent.

The last assessments and the present franchise valuations for some of the larger roads are as follows:

Corporation.	Last Assessment.	Franchise Valuation.
Brooklyn Heights System.....	\$7,660,000	\$30,760,770
Metropolitan System	5,030,000	62,068,030
Third Avenue System	2,174,750	19,728,100
Buffalo Ry.	710,540	2,631,804
Buffalo Traction Co.	162,180	554,580
Crosstown St. Ry., Buffalo.....	550,575	2,455,735
Rochester Ry.	394,175	2,057,000
Rochester & Lake Ontario Ry.....	17,000	25,000

These assessments are subject to review by the commission after the corporations have been heard, when the final valuations will be fixed. Then the courts may be called upon to intervene, whose decisions may also cause a reduction in valuations. That the courts will very greatly reduce these valuations can scarcely be doubted when the condition of the street railway properties is considered. In 1898 only 18 street railways out of 103 reporting to the Railroad Commissioners paid any dividends and of the total sum so distributed five-sixths was paid by five New York City roads.

STREET RAILWAY MAIL SERVICE AT OTTUMWA, IA.

On March 28th the Ottumwa (Ia.) Electric Railway Co. inaugurated a mail collection service by means of boxes on its cars, similar in many respects to the system in vogue in Grand Rapids, Mich., which was described in the "Review" for January, 1900, page 45. The service will be tried experimentally for six months and if satisfactory will be continued. Collections from the street car boxes will be made four times daily, saving in many cases a day in the delivery of outgoing mail by enabling it to be placed on earlier trains.

TROLLEY FOR CHICAGO ELECTRIC TRACTION CO.

Ever since its reorganization the Chicago Electric Traction Co. has pursued a policy of extension and has now under way still further additions to its mileage, which will make it to a greater extent than before an interurban line. In view of this it was decided to equip the system for overhead trolley working, as it has been found that to use storage battery cars on such long lines it is necessary to build sub-charging stations as was done last year at Harvey.

Work has been commenced on a new brick car house for the Lebanon (Pa.) Valley Street Railway Co.

LARGE SHAFT FOR GLASGOW, SCOTLAND.

We illustrate herewith one of two hollow steel engine shafts of similar dimensions, made by the Cleveland City Forge & Iron Co., of Cleveland, O., for the Glasgow Tramways. These forgings will be used with E. P. Allis engines and are among the largest ever



LARGE SHAFT FOR GLASGOW.

attempted in this country. They each weigh 66,105 lbs., are 24 ft. 1½ in. long over all and 36 in. through the greatest diameter. The bore is 8 in. and 10 in. in diameter. The shafts were formed from ingots each weighing over 50 tons.

BROWN BROS. LOSE ST. LOUIS OPTION.

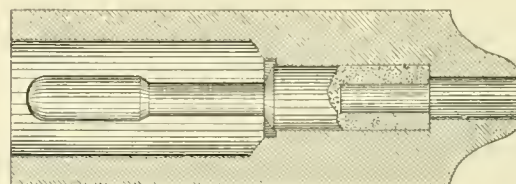
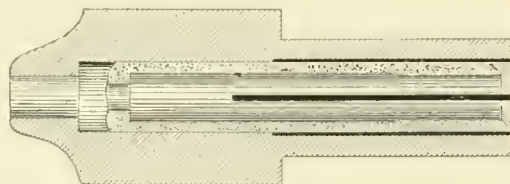
It is announced that Brown Bros., of New York, who a year ago secured options on the securities of the street railways now operated by the St. Louis Transit Co., have been unable to get the assent of 80 per cent of the certificate holders for an extension of the option and they will therefore before April 20th distribute the unsold bonds and stocks to the holders of certificates of beneficial interest. The securities not sold by Brown Bros. comprise nearly 11,000,000 United Railways bonds, over \$9,000,000 United Railways preferred stock, and over \$14,000,000 St. Louis Transit common stock.

The withdrawal of Brown Bros. will not affect the consolidation.

GARTON TRAILER CONNECTOR.

The accompanying illustration shows the Garton trailer connection, which is being extensively used, and overcomes a number of objectionable features found in other devices. As will be seen from the sectional views, the metal parts of the connection are completely protected, thus preventing accidents to trainmen, and the short circuits caused by contact of exposed couplers with the metal parts of the car.

By properly using these connectors in sets all the cars are matched, and may be connected when desired. The connectors are furnished complete with wire when so ordered. They are



GARTON TRAILER CONNECTOR.

strong and durable in severe service, and have proved to be all that was expected.

These connectors are sold and carried in stock by the W. R. Garton Co.; the company is also prepared to furnish the regular plug and socket trailer connectors, as well as the Wood connector. This company carries a very complete stock of electric railway and lighting supplies, tape, etc., and the business has shown a wonderful growth from month to month. Some very nice contracts have recently been secured for Keystone instruments, General equipment circuit breakers and "Multiplex" reflectors and headlights, and large orders are constantly coming in for Garton lighting arresters, of which the company has a large and complete stock.

ELECTRIC RAILWAY IN GENEVA.

The Consular Reports for March 27th give the following information concerning the electric railway in Geneva, Switzerland, which it is stated will be in operation within six months.

About two and one-half years ago Mr. Henry E. Butters, of San Francisco, visited Geneva and interested local capitalists in the plan to provide the city with a modern street railway system. A controlling interest in the Narrow-Gage Street Railway Co., operating about 45 miles, and an option on the property and franchises of the General Swiss Tramway Co., operating 10½ miles, were secured. This option will probably be exercised, the price being \$1,254,000.

The promoters have organized the Campagnie Genevoise des Tramways Electriques under a federal charter, but no stock is yet issued. An office is maintained at No. 43 Threadneedle St., London.

The new company was organized with a capital of 5,000,000 francs (\$965,000). It is understood that the money for the construction is being furnished by the Paris Bank of South Africa. London capitalists are also interested in the venture, and it is likely that the new company in a short time will own and control all the street car lines in the city and canton of Geneva. To put existing options into effect, to construct and equip all these lines on the American plan, and to exploit the extra exclusive rights of the new company will entail a total expenditure of about 15,000,000 francs (\$2,895,000). The company would then have about 150 kilometers (95 miles) of road traversing the city in every direction and serving the entire canton. The total population amounts to about 119,000. The canton is next to the smallest of the Swiss Confederation and has only about 12 square miles of territory. The lines would also cross the frontier into France and would serve various small towns in the French departments of Haute Savoie and Ain.

The engineer under whose management and direction the new lines are being constructed is Mr. Stephen D. Field, of New York. The work is progressing, and 15 kilometers (9 miles) of track have already been laid. One, at least, of the new lines will be in operation by June 1st. The American overhead trolley system is being used, and the American system of conduits for underground cables, for the first time in Europe.

The charter of the new company requires that the materials used in construction be bought either from Swiss manufacturers or from Swiss houses representing foreign manufacturers. This for the moment virtually bars United States manufacturers, as no American concern has a Swiss agency. Up to this time, all rails have been bought in Germany, and all contracts for the construction of cars have been placed with Swiss agencies of German builders. The cars, however, are being built on the American plan and one car has, by special permission, been shipped here from the factory of the J. G. Brill Co. in Philadelphia. France is largely furnishing the wire. The only American material that has yet been used is the Brown-Edison plastic rail bond.

Although Geneva has a large water-power force for generating

electricity, it is not believed that this plant will be able to furnish sufficient electric power for the new street railway. Mr. Field also thinks that the price asked by the city—12½ centimes (2¾ cents) per kilowatt hour—is unreasonably high. Electricity can probably be produced by steam in Geneva for from 6 to 8 centimes (1.6 to 1.9 cents) per kilowatt hour, and Mr. Field is willing to pay 8 centimes. The question is yet to be adjusted.

The tariff for street railway transportation in Geneva is fixed at 10 centimes (2 cents) per passenger for the first kilometer (five-eighths of a mile) and 5 centimes (1 cent) for each succeeding kilometer. Experts who have studied the situation do not doubt the profitable result of the enterprise.

MECHANICAL DEPARTMENT

HOME-MADE CARS FOR THE UNION TRACTION CO.

In the last issue of the "Review" brief mention was made of 70 single truck open cars and 15 double truck open cars, which the Chicago Union Traction Co. is building at its Madison and West

plan of floor framing for the double truck cars, which measure 41 ft. over the bumpers, and 8 ft. 5 in. wide over the running board. In the floor framing the best selected yellow pine was used for the sills, with cross timbers of oak. All joints are mortise and tenon. On reference to the floor plan it will be seen that care has been taken to thoroughly brace all parts in the direction of greatest

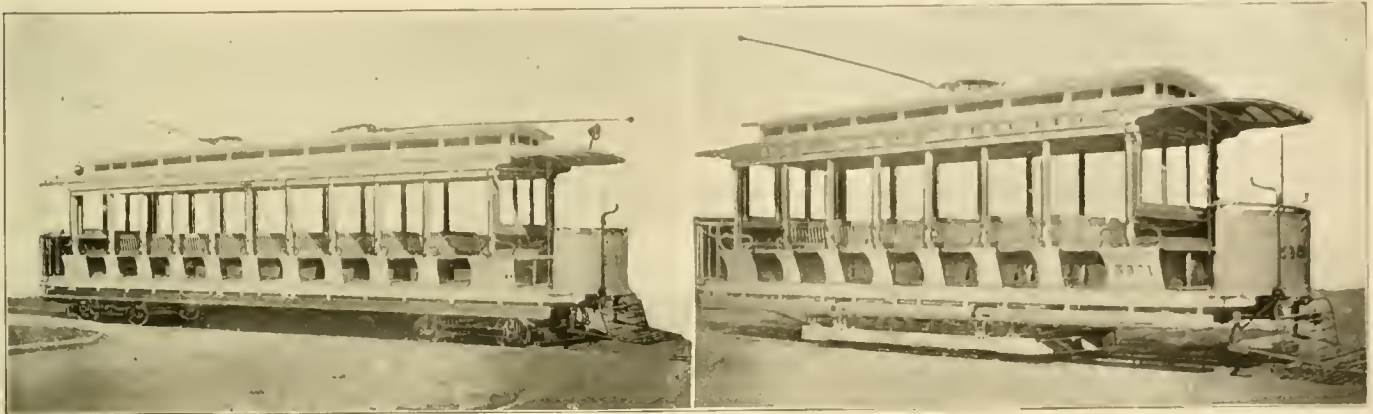


FIG. 1—NEW CARS FOR CHICAGO UNION TRACTION CO.—FIG. 3.

40th St. shops. Through the courtesy of Mr. F. T. C. Brydges, superintendent of shops, who made all the designs for the new cars, we are enabled to reproduce herewith the plans from which they are being constructed.

Fig. 2 shows the side elevation, seating plan, cross section and

stress. The first, second and third cross beams each way from the center, are joined by 3 x 3 in. diagonal timbers and at the first and third cross pieces are 3/4-in. tie rods. To properly support the ends of the car two 2 3/4 x 6 3/4 in. pine timbers are bolted to the two inside longitudinal sills, and tie bars are inserted at

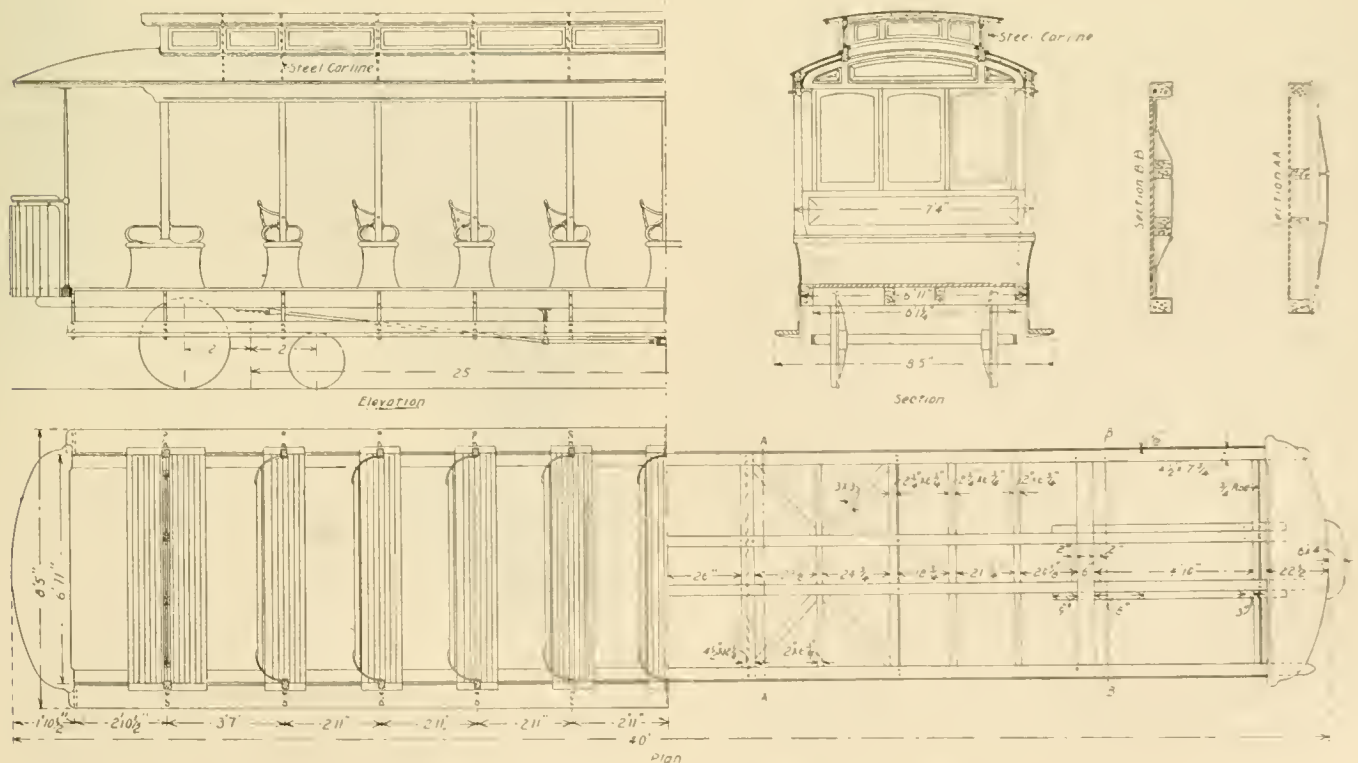


FIG. 2 40-FT. OPEN CAR FOR CHICAGO UNION TRACTION CO.

the end sills. The longitudinal truss rods are anchored to the side sills immediately over the truck centers. Sections AA and BB show the cross trusses and the body bolsters.

The wheel houses or covers, for the large wheels are under the platform seats, the tops of the covers being fitted with trap doors

rolling stock to meet the severe traffic conditions of Chicago's crowded streets. The principal dimensions are given on the drawings and a photograph of a finished car is reproduced in Fig. 3. The cars are mounted on Brill E 21 trucks with G. E. No. 52 motors. The seating capacity is for 50 passengers.

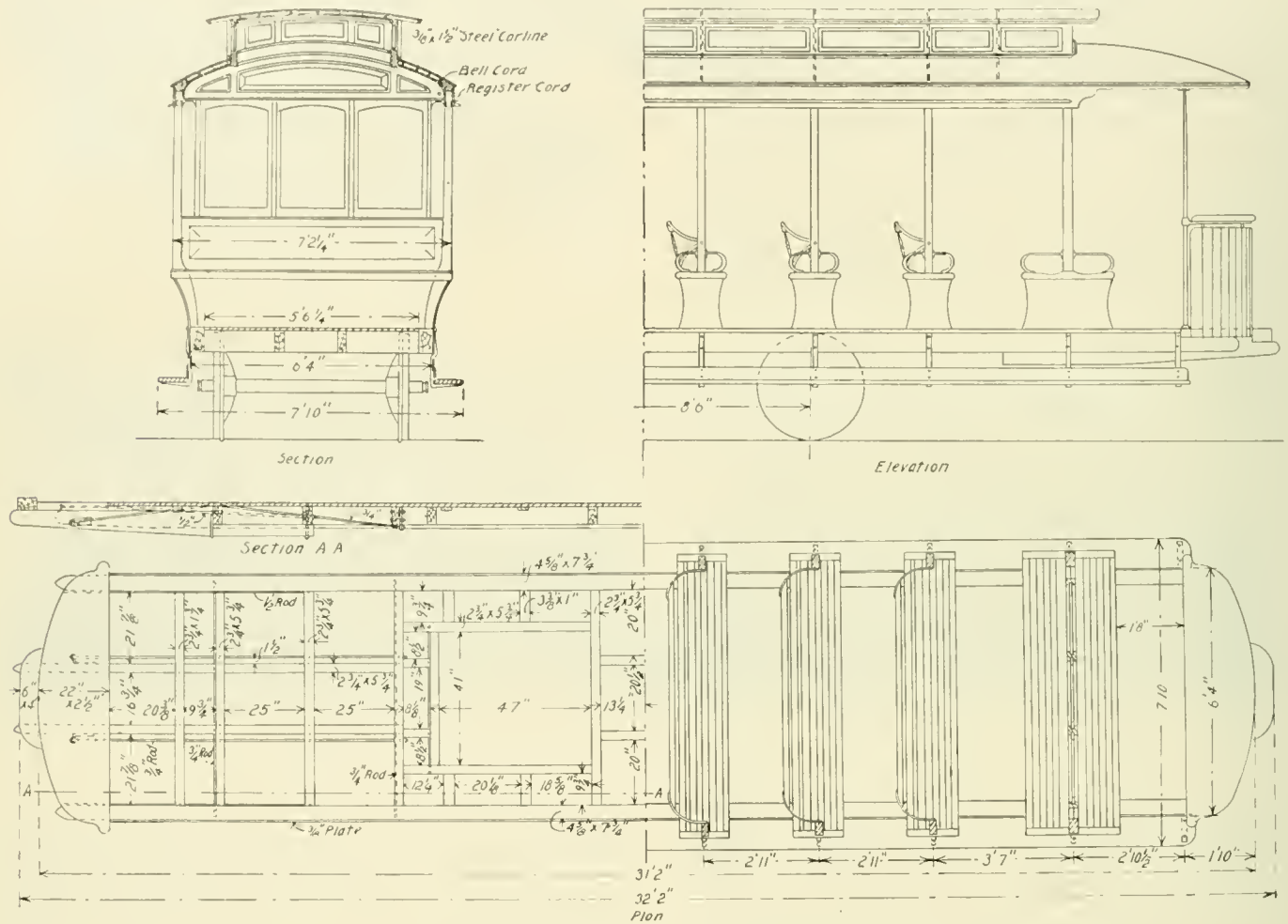


FIG. 4—31-FT. SINGLE TRUCK OPEN CAR.

for the purpose of giving access to the motor bearings and commutators.

Nine cross seats spaced 2 ft. 11 in. center to center with reversible backs, and two additional seats at each end placed back to back give a seating capacity for 65 passengers. At each side of the car are adjustable wooden bars to prevent egress and ingress from the wrong side. As it was found difficult to obtain material for these bars in sufficient length to form them in one piece, and also to secure greater convenience in lowering and raising, they are made in two sections joined by a hinge. When the bars are raised they are held in place by an ingenious automatic catch consisting of a metal acute-angle piece, loosely fastened at the lower end with the short side normally in a horizontal plane and having the long stem slightly curved. An extra amount of metal is cast into the curved side, causing the catch to drop back to its normal position after having been pushed in to permit the bar to pass.

Each end panel has three drop sashes fitted with plate glass lights. As two trolley poles are provided, one at each end, steel carlines, 1 3/8 x 7-16 in. were used to give the roof the necessary strength. The long car shown in Fig. 1 is mounted on McGuire maximum traction trucks and the remainder of the lot will be mounted on Peckham maximum traction 14 D-3 trucks. All the long cars will be fitted with Christensen air brakes, electric headlights placed on the hoods, G. E. 57 motors, and Duplex duck open car curtains with "Acme" fixtures, furnished by the Curtain Supply Co., of Chicago. The interior finish is in quartered oak supplied by Frost's Veneer Ceiling Co., of Sheboygan, Wis.

Fig. 4 shows the drawings for the single truck cars. These follow conventional lines, no attempt having been made to adopt radical features the one idea being to construct solid substantial

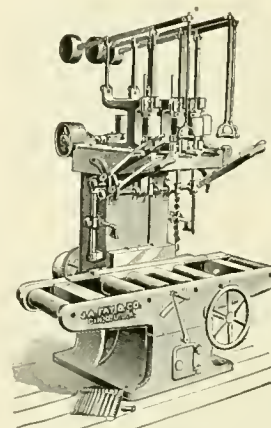
IMPROVED CAR BORER.

The machine shown herewith is the No. 2 three spindle vertical car boring machine just placed on the market by J. A. Fay & Co., 557 West Front St., Cincinnati, and embodies many new arrangements for rapid and accurate work. It is quite heavy and was especially designed for use in street railway car and repair shops. It is

arranged for three augers, the spindles being separately adjustable, either across the stick or vertically; the transverse adjustment is made by levers supplied with a friction lock and under instant control of the operator, and the vertical motion of the spindles is produced by the movement of a counter-balanced lever with a handle attached.

The augers will bore up to 14 in. of timber and are furnished with stop collars to gage the depth of bore; different sized pulleys vary their speed. Adjustable stops attached to either side of column prevent the material being lifted by the bits.

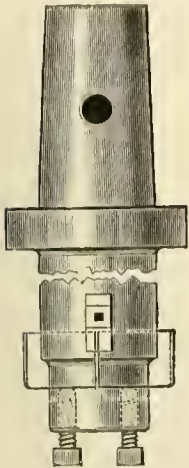
The table is fitted with a series of large rollers (the two outside ones being driven by chains and the internal rollers being connected and driven by gearing on the countershaft that operates in either direction, moving the timber by power to the right or left by the movement of a lever in front of the table and convenient to the operator. A hand-wheel is also



easily accessible to the operator for moving the timbers laterally, by hand.

FLUKES BORING BAR.

The accompanying illustration shows a special labor and stock saving tool which has been widely used in railroad shops. The ob-



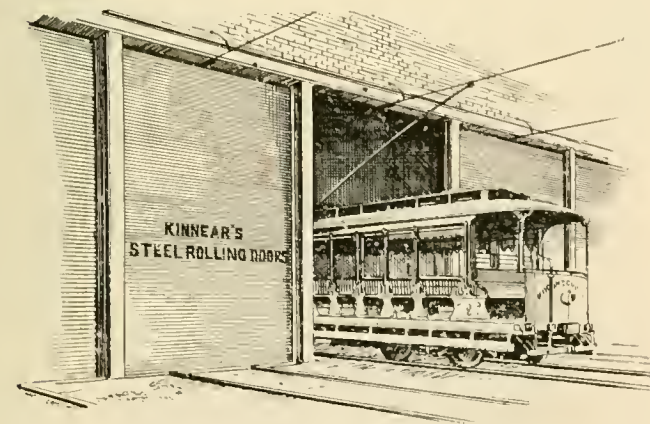
ject is to maintain a standard size of wheel seat by boring the wheels to fit the axles, instead of turning the axles to fit the wheels. The tool is quickly adjusted for its work and the mill can be operated by a low-priced mechanic, with a substantial saving in the cost for labor. The construction is shown in the illustration; the two cutters are adjusted by a V-shaped spreader moved by a square threaded screw and locked by set screws. With one of these bars from 25 to 35 pairs of wheels can be bored in a day of 10 hours, and it is stated that as a single pair of cutters will bore about 4,000

wheels, the bar will soon pay for itself in saving of steel. This bar is known as Flukes patent expansion boring bar and is handled by Carse Brothers Co., 62 Wabash Ave., Chicago.

KINNEAR STEEL ROLLING DOORS.

The accompanying illustration shows the Kinnear steel rolling doors applied to a car barn. These doors have met with great favor generally and are filling a long felt want in this direction, embodying as they do the prime features of simplicity, durability, compactness, ease of operation and fireproof qualities. The makers have devised a very simple and complete arrangement, which provides for a trolley connection when the doors are open, giving an uninterrupted wire and current for the trolley wheel.

The doors are made of No. 18 to No. 26 U. S. standard gage steel and of either black or galvanized stock as may be desired. They



ROLLING DOOR FOR CAR-HOUSES.

are of approved construction with spring balance, so that the doors are always properly balanced, and in cases of extreme size are so geared that they operate with ease.

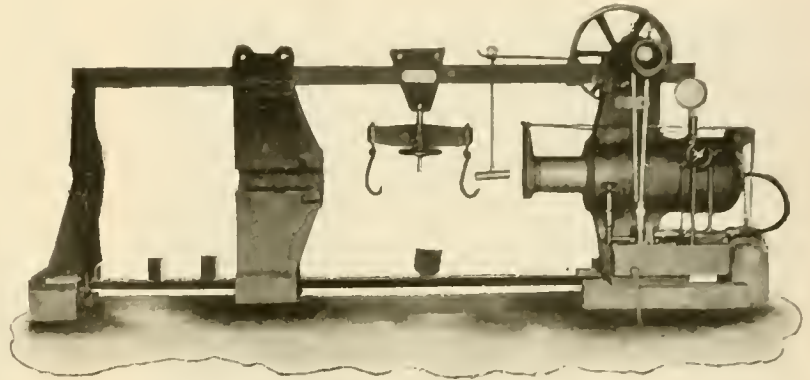
The Kinnear steel rolling doors, shutters or partitions are easily applied to either new or old buildings, the makers providing necessary arrangement or construction as conditions may require.

These doors are made by the well-known Kinnear Manufacturing Co., of Columbus, O., which will be pleased to send descriptive catalog upon request.

An ordinance has been passed by the Richmond (Va.) County Council requiring all street railway companies in the city to sprinkle the streets and alleys occupied by their tracks.

WHEEL PRESS FOR CAR SHOP.

To meet the requirements of street railway the J. T. Schaffer Manufacturing Co., of Rochester, N. Y., has designed for use with its hydraulic wheel presses a special gear and pinion attachment which enables the one press to answer all the various demands of street railway shops. The Schaffer company is the oldest maker of



SCHAFFER WHEEL PRESS.

hydraulic presses in this country and has in the course of its long experience perfected the designs of its product. A strong point is made of the superior construction of the presses, steel being used for the tension bars, crank shaft, yoke facings, etc., instead of cast iron as is the case with a number of other presses. The cylinders are absolutely water tight, and have steel linings which are cast in the cylinder instead of being pressed in. This company was the first to use the system of triple pumps and all its large presses are so fitted. By the use of the triple pump system the operator is enabled to handle at least 20 wheels more per day than he could with the single or double pump system. The ram movement is very smooth and positive and the entire working of the press greatly improved.

Since the company was reorganized a few months ago it has made rapid strides and there has been a remarkable increase in its business. The foreign trade is being developed and recent shipments of presses have been made to Belgium, Mexico and Japan. A general agency has been established in Japan for the sale of the company's product which includes all types of stationary and portable hydrostatic presses. The company does not claim that its presses are the cheapest but that they are the best.

The Buffalo, Rochester & Pittsburg Ry. has recently installed a 72-in. Schaffer press which the superintendent of motive power, Mr. Charles Turner, states has given perfect satisfaction.

The officers of the Schaffer company are: President, Charles J. Brown; vice-president, H. F. Atwood; business manager, Alvin H. Dewey; treasurer, A. M. McDonell.

IMPROVEMENTS AT AUGUSTA, GA.

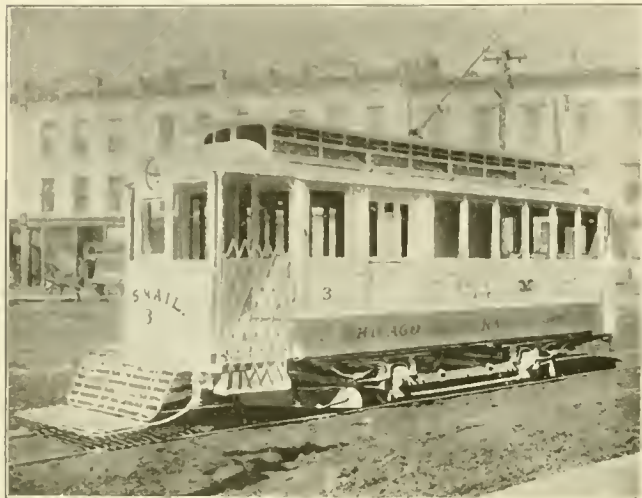
Mr. Walter M. Jackson, general manager of the North Augusta Land Co., writes us that the street railway lines have recently been extended about a mile to reach the highest elevation on his company's property. This makes one of the finest rides to be had in the state, as on a clear day the entire country for 20 or 30 miles can be seen from the car windows. The North Augusta Land Co. has set aside about 12 or 15 acres on the top of the hill for hotel purposes, and it is expected a popular winter resort will soon be established at this place.

The Augusta Railway & Electric Co., of which Mr. D. B. Dyer is president, has completed a belt line connecting the Monticello line with the Summerville line, making another pleasant route on which considerable purely pleasure traffic will undoubtedly be developed in the summer. Views in the park served by this company were published in the "Review" for May 1899, page 329.

By the completion of a street railway bridge across the Youghiogheny River there will be formed a continuous electric line from Pittsburg to Buena Vista, Pa., a distance of 26 miles, with but one change of cars.

NEW MAIL CARS ON CHICAGO CITY.

For several years the Chicago Postoffice has desired to extend the street railway mail service to the electric lines of the Chicago City Ry., but it is only quite recently that arrangements for this have been concluded with the company. Four single truck cars with 20 ft. bodies and 30 ft. over all, have been rebuilt in the company's shops under the direction of the master mechanic, Mr.



ELECTRIC MAIL CAR, CHICAGO.

Michael O'Brien, and we show herewith exterior and interior views of one of them.

A side door has been cut in each side and it will be noted that the sill is not at the floor level of the car but higher, so that it is even with the bed of a standard mail wagon. The interior fittings comprise a sorting table, pigeon holes and a sack rack.

One of the novel features is the location of the electric headlight. The car having too low a hood to permit of the light being placed underneath without interfering with the motorman's view, the hood was cut out and a sheet metal arch set in, as appears in the ex-



INTERIOR CHICAGO CITY MAIL CAR.

terior view of the car. Placing the light in this position permits the men to have access to it from the platform, which is an important consideration.

One of the cars is to have lights with the "Multiplex" reflectors, for which the W. R. Garton Co. is agent.

The car shown is mounted on a McGuire truck equipped with two 12A Westinghouse motors. It has Price's brake and G. E. K2 controllers.

The employes of the Carbondale (Pa.) Traction Co. have been granted a 25 per cent increase in wages.

NEW WEST VIRGINIA COMPANY.

We are indebted to Mr. E. W. McCormick, manager of the Kanawha Traction & Electric Co., of Montgomery, W. Va., for the following information. The company was incorporated in West Virginia by Geo. W. Champ, M. J. Simms, B. H. Early, C. W. Dillan, and E. W. McCormick, and has secured a perpetual right of way from the county courts of Fayette and Kanawha Counties, over so much of the county road as may be necessary, and also such private right of way as may be needed for the construction of an electric trolley line, between Mt. Carbon and Handley, a distance of seven miles. This road runs through one of the most thickly settled coal fields in West Virginia, and there are situated directly on the line 11 coal mines, and adjacent to the line are 11 more; all are producing mines. It is almost one continuous town from end to end. The company expects to handle not only passengers, but freight and express, and has arranged for the opening of a park during the coming summer, with attractions of all kinds for the amusement of the public. The capital of the company is \$100,000, and it proposes to issue an equal amount of first mortgage 5 per cent bonds. Bids have been received for the construction of this road, and contracts will shortly be closed, some of the machinery and other supplies having already been purchased. The principal office of the company will be at Montgomery.

MILWAUKEE SITUATION.

The Supreme Court of Wisconsin has refused a writ of mandamus to compel the dismissal of what is known as the Trentlage injunction suit. This was brought by Mr. Trentlage, a property owner, to enjoin the acceptance of the 4-cent ordinance by the Milwaukee Electric Railway & Light Co.; afterwards he wished to dismiss the suit, but the court substituted another plaintiff and refused to dismiss the case. This leaves a temporary injunction in force and the case has yet to be heard on its merits.

AIR CARS IN WINTER.

From a statement prepared by Mr. Wm. E. Selleck, general manager of the Compressed Air Motor Co., we take the following facts concerning the operation of the air cars on the North Side lines of the Chicago Union Traction Co. during the severe winter weather of February and March.

On February 4th when there was a severe blizzard with snow and sleet the air cars made their regular trips on schedule time and were also used to help stalled snow plows and for switching purposes at the barns.

On February 27th was the heaviest snow fall in 10 years, but the air cars found no difficulty in operating because of the snow.

SHORT STRIKE ON THE CHICAGO CITY.

On the afternoon of Friday, April 6th, the power house employes of the Chicago City Ry. went out on a strike. The company had but a few hours' notice of the intention to strike, but the men's places were so quickly filled that the down-town cables were not stopped and but slight delays occurred on the other lines.

GENERAL ELECTRIC BUYS SIEMENS-HALSKE.

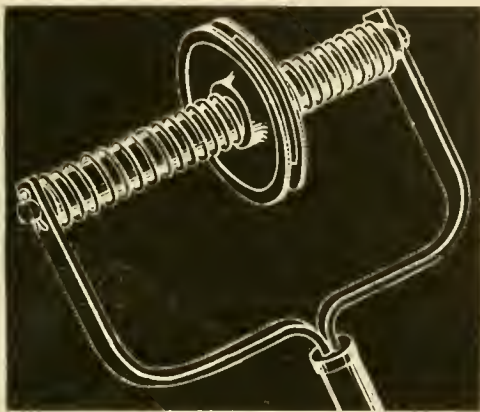
Early in April it was announced that the General Electric Co. had purchased a controlling interest in the Siemens-Halske Co. Details regarding the consolidation and the disposition to be made of the Chicago plant thus acquired have not been made public.

AN ADVERTISING POINTER.

The Northern Ohio Traction Co., of Akron, O., advertises its pleasure park on all its time tables as follows: "The Gorge affords photographers unusual opportunities for procuring good pictures, both in the winter and summer seasons. The scenery is wild and picturesque, combining fine tree, water and wood effects. You will be amply repaid by a visit to this spot if you make 'pictures'. Try it some day."

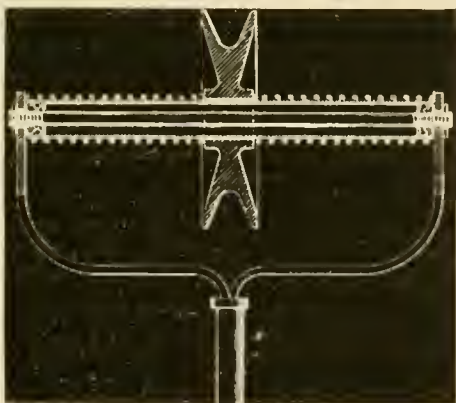
THE EDISON-JOHNSON TROLLEY HARP.

The device herewith illustrated is presented to the public as a design so combining the trolley wheel and harp that curves can be taken at almost any speed without danger of the wheel leaving the trolley wire and interfering with the span wires. The device consists of a harp with a sufficient spread to receive a 1/2 in. spindle, 12 in. in length on which is a 1x12-in. steel tube with ball bearings at each end between it and the spindle. The trolley wheel is mounted loosely, with graphite bushings, upon the tube and on each side of the wheel are spiral brass springs embracing the tube and tending to hold the wheel in a central position at about 4 1/2 in. from each side of the yoke or harp. On entering a curve, the spring gives way to the side pressure and the wheel slides in the direction of the pressure along the spindle, giving time for the trolley pole to turn upon its base and conform to the curve without forcing the wheel



THE "ANTI-OFF YOUR TROLLEY" HARP.

off the wire. This arrangement not only prevents the wheel from leaving the wire, but also relieves the side pressure on the wire and prevents side wear both to the wire and trolley wheel. On leaving the curve, the springs bring the wheel back to a central position. By the use of ball or roller bearings, the friction of the wheel is reduced to a minimum, in fact it is estimated that the friction is reduced to only one-fortieth. The graphite bearings of the wheel provide sufficient lubrication for the side motion of the wheel on the tube and the roller bearings avoid the necessity of much lubrication. Oil, however, can be used if desired by dropping a little upon the ends of the spindle, when it works its way into contact with the roller bearings. Copper washers at each end of the tube provide good electrical contact with the arms of the harp. The harp proper or yoke is made from a steel bar, 1/4x1 in. and the spindle is held



SECTION OF HARP.

in its position by means of cotter pins at each end, so that a worn wheel can be readily unshipped and a new one substituted. A thorough test has been given the device, and on a road where the trolley left the wire at least four or five times on a trip, the new wheel ran over 4,000 miles without once leaving the wire at curves. The device is made by the Edison-Johnson Electric Manufacturing Co., which was recently incorporated, with a capital stock of \$75,000.

The works are located at Cornwall on the Hudson where the company has recently erected a three-story machine shop having ground dimensions of 158.60 ft. and equipped with steam power and a generator for lighting purpose. The officers are: President, E. G. Johnson; vice president, Thomas V. Edison Jr.; treasurer, J. W. Mott; secretary, F. D. Palmer. The New York office is in the St. James Bldg., 1135 Broadway.

TROLLEY PARADE FOR DENVER AND WICHITA.

The 16 trolley floats forming the "Era of Electricity" parade at the New Orleans carnival, some of which were illustrated in the "Review" for last month, page 134, have been sold and will be used at Denver. After the Denver parade it is announced that they will form one of the attractions at a street fair to be held at Wichita, Kas., the first week in October. Arrangements have been made with Gen. Mgr. S. L. Nelson of the street railway company for the use of current.

CHICAGO GENERAL RY.

On January 29th last there was a reorganization of the Chicago General Railway Co., the immediate object in view being the sale of the property. The officers then chosen were: J. H. Witbeck, re-elected president and also made treasurer in place of Lawton C. Bonney; J. I. Jones, re-elected secretary; James P. Black, vice-president in place of Charles L. Bonney; Charles L. Bonney, general counsel.

Differences arose between Mr. Witbeck and the other directors and a few weeks ago he brought suit on a note for \$121,000, and also against L. C. and C. L. Bonney personally for \$45,000. April 6th other creditors of the company sued on past due notes aggregating \$229,000.

April 9th a special meeting of the directors was held at which the minutes of the meeting of January 29th were disapproved and ordered cancelled. Mr. Witbeck was ordered to return to the owners certain stock and bonds deposited with the treasurer pending negotiations for the sale of the property. April 11th the directors again met and Glenn E. Plumb was chosen president and general counsel and C. L. Hull, secretary and treasurer.

Three of the directors, James P. Black, Glenn E. Plumb and Lyman M. Paine, were appointed as a committee to act with the banks and arrange for a reorganization. None of the creditors except Mr. Witbeck are pressing their claims, the later suits having been commenced merely to place all of the creditors on the same footing; it is confidently expected that the affairs of the company will be amicably arranged. The directors, in addition to the three constituting the reorganization committee, are J. H. Witbeck, L. C. Bonney and C. L. Bonney, of Chicago, and N. D. Lawton, of New York. Mr. Jones recently removed from Chicago.

April 14th, Mr. Witbeck made application for the appointment of a receiver for the company.

CONSOLIDATION IN CHICAGO.

On April 14th the directors of the Chicago Union Traction and the Chicago Consolidated Traction companies completed the formalities for the consolidation of the two systems in accordance with the plan outlined in our January issue. The Union Traction acquires a large majority of the Consolidated Traction stock paying therefor with a bond issue, the purchased stock being held by a trustee as collateral security.

The employes of the Springfield (Mass.) Street Ry. are planning to enlarge the social features of their benefit associations.

Mr. G. L. Henderson, Cottage Hotel, Yellowstone Park, proposes a system of electric railways for reaching the many points of interest in the reservation with less discomfort and loss of time.

The National Power & Manufacturing Co. has been formed with a capital of \$2,000,000, to operate the various electric plants which now supply power to the North Hudson Street Railway Co., and the electric plants of Jersey City and Newark, N. J.

TRAMWAY EXHIBITION AT LONDON.

All arrangements for the Tramway and Light Railways Exhibition to be held at Agricultural Hall, London, from June 23d to July 4th next, have been perfected, and judging from the list of firms that have applied for space and the general interest manifested the complete success of the exhibition is assured. Mr. A. M. Willeox, editor of the *Tramway & Railway World*, who is directing the undertaking, writes us that almost all the available room on the ground floor of the hall has been engaged, a number of firms taking from 1,500 to 3,000 sq. ft. The largest American exhibit will be made by the J. G. Brill Co. of Philadelphia, which has reserved 1,000 sq. ft. Among the American devices entered in the fender competition to be held in connection with the exhibition, and mentioned elsewhere in this issue, is the Barrett-Hipwood fender for which R. W. Blackwell & Co. are selling agents. A diagram of Agricultural Hall was published in the "Review" *Convention Daily* for Oct. 20, 1899.

The London County Council is taking considerable interest in the enterprise, and it is probable that from the cars displayed it will select a type to be used on the electric tramways which it proposes to equip on the south side of the Thames. The Council has been authorized to spend £3,000,000 in the work of building these lines and 500 cars will be required.

The following is a list of companies that have been allotted space:

Askham Brothers & Wilson, Ltd., Sheffield.
 Abnion Clay Co., Ltd., London, E. C.
 Blackwell & Co., Ltd., R. W., London, S. W.
 British Westinghouse Electric & Manufacturing Co., Ltd., London, W. C.
 British Thomson-Houston Co., Ltd., London, E. C.
 British Insulated Wire Co., Ltd., Prescott.
 British Mannesmann Tube Co., Ltd., Landore, S. Wales.
 Brush Electrical Engineering Co., Ltd., London, E. C., and Loughboro.
 Bennis & Co., Ltd., London, E. W.
 Bergtheil & Young, London, E. C.
 Burton, Griffiths & Co., Ltd., London, E. C.
 Bilbie, Hobson & Co., London, E. C.
 Babcock & Wilcox, Ltd., London, E. C.
 Brown, Harold P., New York.
 Brill Co., The J. G., Philadelphia and London.
 Barnes Cylindorama Railway Co., Chicago.
 Crossley Brothers, Ltd., London and Manchester.
 Christensen Engineering Co., Milwaukee.
 Consolidated Car Heating Co., Albany, N. Y.
 Dick, Kerr & Co., Ltd., London, E. C., and Kilmarnock.
 Dennis & Co., W. F., London, E. C.
 Docker Brothers, London and Birmingham.
 Doulton & Co., Ltd., London, S. E.
 Demerbe & Co., Jemmappe, Belgium.
 Electric Tramway & Railway Carriage Works, Ltd., Preston.
 Electric Construction Co., Ltd., London, E. C., and Wolverhampton.
 Electrical Power Storage Co., Ltd., London, E. C.
 English Electrical Manufacturing Co., Ltd., Preston.
 Estler Brothers, London, E. C.
 Elliott Brothers, Lewisham.
 Electricite & Hydraulic Societe Anon., Charleroi, Belgium.
 Felten & Guillaume, Mulheim-on-Rhine.
 Glover & Co., London, S. W., and Manchester.
 Haacke & Co., London, N. E.
 Helios Actien Gesellschaft, Ehrenfeld-Cologne and Berlin.
 Lorain Steel Co., London, E. C., and Lorain, O.
 Le. Carbone, London, E. C.
 Miller & Co., Ltd., Edinburgh.
 Mossberg Roller Bearings, Ltd., London, S. W.
 Meldrum Brothers, Manchester.
 Manuelle, A. & F., London, E. C.
 Monorail Portable Railway Co., Ltd., London, E. C.
 Magann Air Brake Co., Detroit, Mich.
 Norris, Major S. L., York.
 Nell, Fred., London, E. C.
 Owen & Sons, Ltd., Liverpool.
 Omer Syndicate, Dayton, O.
 New York Car Wheel Works, London and New York.

Penn, H., Norwood.
 Perry, J. B., Toronto, Can.
 Parish's Patent Steam-Jacketed Cooker Co., Ltd., London, E. C.
 Roller Bearing Co., Ltd., London, S. W.
 Ohio Brass Co., Mansfield, O.
 Stone & Co., J. B., London, E. C.
 Suter & Co., Frank, London, W.
 Smith, C. G., New York and London, E. C.
 Turr's Acetylene Gas Syndicate, Ltd., London, E. C.
 Tangyes, Ltd., London and Birmingham.
 Witting Brothers, Ltd., London, E. C.
 Wilkins & Co., London, E.
 Wheeler Condenser & Engineering Co., London, E. C., and New York.

CONVENTION HALL, KANSAS CITY, BURNED.

The convention Hall at Kansas City, where the A. S. R. A. was to have had its meetings and exhibits in October next, was destroyed by fire on the afternoon of April 4th. The fire started over the furnace room of the building at 1:10 p. m., and burned very quickly. The fire spread and burned a church and a school building across the street and a block of residences in the rear of the hall, the total loss being estimated at \$340,000, of which \$225,000 is for Convention Hall.

The building was well insured and it is stated that it will be rebuilt on the old foundations and be ready for the Democratic National Convention which is to meet there July 4th.

AN INTERESTING LAW SUIT.

A special election was held at Ottumwa, Ia., to decide whether a tax should be levied for the benefit of the Ottumwa & Northern Ry. to assist in the construction of its line, and suit was brought against the city and the company to recover for the cost. This case was carried from the justice court to the district court and finally decided against the plaintiffs. They then brought another action against the county and succeeded in getting a judgment.

WHEN TO HEAT CARS.

Considerable trouble is often experienced, particularly at this season of the year, in securing a proper temperature in cars, owing to the different opinions of different conductors as to what constitutes cold weather. One conductor will consider the temperature in his car too high, and will turn off the heat, often forgetting that he has done so, with the result that the passengers are soon shivering; another conductor may keep his car uncomfortably warm. The Knoxville Traction Co. does not rely on the judgment of the individual conductors in this matter, but hangs in a conspicuous place in front of the general office, a red sign, with the inscription "Heat" when the temperature drops below a certain point. When the sign is not displayed the conductors turn off the heaters in their cars.

TROUBLE AT WICHITA, KAN.

The central labor union of Wichita, Kan., has ordered a boycott of the street railway which is now building some 15 miles of new track. The grievance is that men willing to work for \$1.25 per day have been imported to do the work; the local unions demand \$1.50.

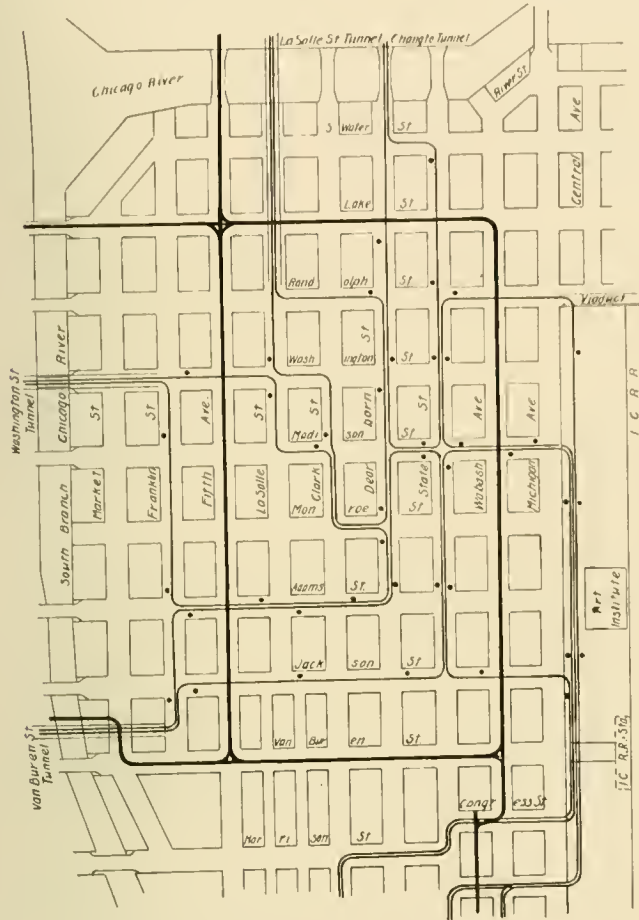
NEW AMUSEMENT RESORT.

The Cleveland, Berea, Elyria & Oberlin Ry. has purchased the Puritas Springs Park, near Linndale, about five miles from Cleveland, and will make it a summer resort during the coming season. The park includes about 26 acres.

President W. H. Holmes of the Metropolitan Street Railway Co., of Kansas City, Mo., has ordered a handsome special parlor car to be used for showing distinguished guests over the city. He expects to have it ready in time for the street railway convention in the fall.

PROPOSED SUBWAY SYSTEM FOR CHICAGO.

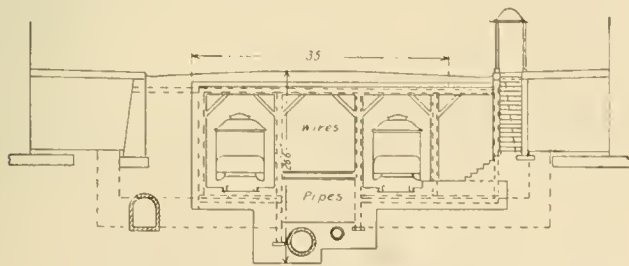
By direction of L. E. McGann, commissioner of public works of Chicago, R. W. Shuler, and W. S. MacHarg consulting engineer of the sewer bureau, have prepared plans for a system of subways in the down town district of the city which are shown in the accompanying illustrations. These plans provide for six underground



PROPOSED SUBWAY SYSTEM FOR CHICAGO.

loops for the different street car systems so arranged that there shall be no crossings, and for the reconstruction of the three tunnels under the river now used by the Chicago Union Traction Co. and the building of a fourth tunnel at Dearborn St.

For the North and West Side lines the subways connect with the down-town ends of the tunnels. For the Chicago City Ry. the subway commences in Michigan Ave. just south of Van Buren St.,



CROSS SECTION OF PROPOSED SUBWAY.

the electric lines now using Clark St. and also the two cable lines being brought east to Michigan Ave.

As shown in the sectional view the subways are 35 ft. wide and provide for the carrying of wires and pipes.

Mr. McGann is strongly in favor of having the street railways change their present tracks to a system of independent surface loops, even if the subway plans are not adopted at this time.

HALF FARES.

The Ft. Wayne (Ind.) Traction Co. is building a new car barn 150 x 60 ft

Vandals have been slashing the seat coverings on cars of Washington, D. C. roads.

The Peoria & Pekin Terminal Ry. ran its first electric car in Pekin, Ill., on April 4th

Postal cars are to be put in service on the lines of the Twin City Rapid Transit Co. in Minneapolis and St. Paul

Owl cars will be temporarily discontinued in Kansas City, Mo., to enable certain tracks to be repaired at night

The Northampton & Amherst Street Ry. has completed arrangements for a new bridge over the Connecticut River in Hadley

In March the South Side Elevated, Chicago, carried an average of 72,264 passengers per day, an increase of 8,355 over March, 1899.

The Toronto (Ont.) Railway Co. has been fined for not providing rear vestibules on its cars for the protection of conductors.

Slippery rails caused a rear-end collision between two cars at Newark, N. J., on March 10th, by which 10 persons were injured.

The Pottsville (Pa.) Union Traction Co. has voluntarily reduced the hours of the working shifts of its employes from 12 hours to 9 hours.

The first trolley car funeral ever attempted in St. Louis took place April 6th, without annoyance or inconvenience to any one concerned.

An ordinance fixing the maximum speed of street cars at 12 miles an hour and 6 miles on grades, has been passed by the Warren (O.) city council.

A reorganization of the Greensburg (Pa.) & Hempfield Street Railway Co. is now under way. Local capitalists will be interested in the new company.

The Hartford (Conn.) Street Ry. has given notice that it will call in and pay off its 5 per cent debentures; they are to be replaced by 4 per cent bonds.

The Pittsburg (Pa.) & Birmingham Traction Co. will replace the plush covered cushions in its cars by cane seats, sanitary reasons causing the change.

The first spike in the new electric railway between Greenfield, Ind., and Indianapolis was driven last month by F. G. Banker, the president of the company.

Work has been started on the Bedford Park extension of the Manhattan Elevated R. R. of New York. This involves 1 1/2 miles of structure and extensive yards.

Special smoking cars are to be added to the regular equipment of the Montreal (Can.) Street Railway Co. The company has recently fitted up club rooms for its employes.

The number of passengers carried daily on the Metropolitan Elevated of Chicago, for the month of February last, averaged 92,618, as compared with 75,344 for February, 1899.

The International Traction Co., of Buffalo, N. Y., and the allied companies have increased their subscriptions to the Pan-American Exposition, making the total \$100,000.

The Chattanooga (Tenn.) Electric Railway Co. recently engaged a vitoscope company to give free open air exhibitions of vitoscope pictures in one of the broad squares of the city.

A bill has been introduced in the New York Legislature providing that when cars are blocked for any reason, all fares must be returned to passengers or else tickets good for another ride be given.

To meet the competition of the electric lines the Flint & Pere Marquette R. R. has reduced the price of round trip tickets from Northville to Detroit and return to \$3.50 for bunches of 10.

Operation on the Greensburg (Pa.), Jeannette & Pittsburg Electric Ry. was resumed on March 31st, after an interruption of several months caused by the burning of the barns and rolling stock.

The Twin City Rapid Transit Co., of Minneapolis, has sold 3,000 shares of preferred stock from the treasury, and with the proceeds will retire the 6 per cent debenture bonds due May 1.

The falling of a heavy iron chute used for coaling engines just below Rector St. on the Ninth Ave. line of the Manhattan Elevated R. R., New York, recently wrecked a train and injured nine passengers.

Contracts have been let by the Delaware General Electric Co., of Dover, Del., for completing its electric line from Dover to Milford. The general contractors are McGlathery, Stone & Co., of Philadelphia.

An official of the Philadelphia & Reading Ry. is reported to have said that his company has under consideration the substitution of electricity for steam on that portion of the road between New York and Philadelphia.

A bill is under discussion in the Rhode Island Legislature providing that 10 hours, performed within 12 consecutive hours, shall constitute a day's work for all street railway motormen and conductors in the state.

On June 1, 1900, employes of the Findlay Street Railway Co. will receive an increase in wages of 20 per cent. Motormen and conductors will receive an advance of 25 cents per day and other employes \$5 per month.

The syndicate owning the Washington (D. C.) Traction & Electric Co., it is said, has offered \$100 per share for a controlling interest in the Capital Traction Co., the only road in Washington not included in the consolidation.

Press reports state that certain persons who do not wish their names known are to organize a street car transfer scalping bureau at Minneapolis and St. Paul to buy and sell unused transfer tickets of the Twin City Rapid Transit Co.

An ex-governor of Mississippi has entered suit against the Jackson (Miss.) Electric Railway, Light & Power Co. for \$2,000 damages because a motorman failed to stop for him when signaled to do so, thereby causing the plaintiff to lose a train.

The Butte (Mont.) Electric Co. has been incorporated as a reorganization of the Butte Consolidated Railway Co. and will take over all the property, franchises and privileges of the latter company. It is stated the same owners will continue in control.

For state and county purposes the street railway property of Detroit has been assessed at \$12,810,000, which is based on the selling price determined when negotiating with the Puigne commission; this assessment is an increase of about \$10,000,000.

Pres. Julius Runge, of the Galveston (Tex.) Street Ry., hopes to raise the necessary money, \$905,000, before July 1st and redeem the property which was sold February 5th to the Guarantee Trust Co., of New York, under a decree of the United States Circuit Court.

It is expected that the Kalamazoo-Battle Creek electric inter-urban line will be opened early in May, and branch to Gull Lake by June 1st. The Michigan Traction Co. which projected this road sold its interest to the Railway Companies General, of Philadelphia.

The six experts employed by the district attorney of New York City to go over the books of the Third Avenue Railroad Co. have reported that they could not find evidence of any misconduct in the management of the road, and the grand jury has dropped the case.

It is said the city council of Troy, O., has granted a franchise to the Dayton & Troy Electric Railway Co. with the stipulation that not to exceed one cent shall be charged for fare inside the city limits.

Seven cars which were being shipped by freight from St. Louis to the Black River Traction Co., of Watertown, N. Y., while in transit were stripped of all their brass work, including the railings, lamp chandeliers and the bells. It is believed this was the work of tramps.

A woman has been awarded a judgment for \$2,300 against the Nassau Electric Railroad Co. of Brooklyn, for injuries received by being sat upon by a "very fat man" while riding in a car. The man lost his balance as the result of a sudden application of the brakes.

The Saginaw (Mich.) Valley Traction Co. reports for the past year, gross receipts, \$133,380.78; operating expenses and interest on funded debt, \$138,427.51, leaving a net deficit of \$5,046.73. Nearly \$200,000 have been spent in improvements, paid for by bond issues.

An ordinance has been passed by the Detroit common council directing the committee on ordinances to meet and take under consideration the advisability of compelling all steam railroad trains to come to a full stop before reaching any street railway crossing at grade within the city limits.

Thirty open cars for the accommodation of smokers have been added to the equipment of the Broadway cable lines in New York, increasing the total number of cars regularly operated on those lines to about 320. Each of the special cars will bear a sign "Smoking Car" on the front dashboard.

The Consolidated Traction Co., of Pittsburg, has filed a protest against the proposition that the city should pay the cost of giving free Sunday band concerts at the public park. The company prefers to pay this cost itself so as to be in a position to select the class of music it thinks will draw the best.

A verdict of not guilty has been found by the jury that was trying a non-union conductor at Cleveland on a charge of murder in the second degree for fatally shooting a 19-year old boy during one of the street railway riots last summer. It was shown at the trial that the conductor acted in self-defense.

The township of Cicero, Cook County, Ill., has granted to the Aurora, Wheaton & Chicago Railway Co. a 50-year franchise, which provides for the sale of eight commutation tickets for 25 cents and reserves to the town the right to revise the fares after 20 years and again after 15 years if it desires to do so.

In order to reduce expenses the Brooklyn (N. Y.) Rapid Transit Co. is considering the advisability of closing the ticket offices in the elevated stations where the traffic is light and having the conductors collect fares on the trains, as is done on the elevated roads in Chicago. The men will be provided with portable registers.

An increase of \$50,000 per annum has been made in the pay roll of the Metropolitan Street Railway Co., of Kansas City, Mo. At the present time the wages of gripmen, motormen and conductors range from 15 to 18 cents an hour. By the new scale the men will begin at 15 cents and in the course of five years work up to 20 cents.

The new water power plant for furnishing power to the Ottawa (Ont.) Electric Ry. was placed in successful operation early in March. The station contains six water wheels, direct connected to a Westinghouse generator and was built and equipped under the supervision of W. H. Baldwin, hydraulic engineer to the company.

CHAS. J. MAYER,
President.

A. H. ENGLUND,
Sec'y & Treas.

THE MAYER & ENGLUND CO.

10 SOUTH TENTH STREET,

CABLE ADDRESS:

"MAYLUND" Philadelphia.
A. B. C. Code, 4th Ed.

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R. D. Nuttall Co., Gears, Pinions, Bearings, Trolleys, Etc.	Allegheny, Pa.	The International Register Co., Single and Double Fare Registers.	Chicago, Ill.
Van Wagoner & Williams Hardware Co., Dropped Forged Copper Commutator Segments.	Cleveland, O.	W. T. C. Macallen Co., Standard Overhead Insulating Material.	Boston, Mass.
The Protected Rail Bond Co., "Protected" Flexible Rail Bonds.	Philadelphia.	Bradford Belting Co., "Monarch" Insulating Paint.	Cincinnati, O.
American Electric Heating Corporation, Electric Car Heaters of Every Design.	Boston, Mass.	Sterling Varnish Co., Sterling New Process Insulating Varnish.	Pittsburg, Pa.
Chisholm & Moore Manfg. Co., Moore's Chain Hoists.	Cleveland, O.	Garton Daniels Electric Co., Garton Lightning Arresters.	Keokuk, Ia.
New York & Ohio Co., "Packard" Incandescent Lamps.	Warren, O.	D. & W. Fuse Co., Enclosed Non-Arching Fuses.	Providence, R. I.

Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

We carry the largest stock in this country of Strictly Electric Railway Material.

We are now occupying our entire building, five floors and basement.

Special Attention Given to Export Business.

Send for Catalogues.

Though over a hundred new cars were added to the rolling stock of the Montreal Street Ry. last year, the full staff at the company's shops is to be kept at work all winter and summer making new cars, and it is hoped that by the end of the year all of the old style cars will have been replaced.

The property of the Lock Haven (Pa.) Traction Co. has been sold by order of the court. It was purchased by W. B. Given, president of the Conestoga Traction Co., of Lancaster, Pa., for \$25,100. The company will be reorganized by local capitalists including beside Mr. Given, J. H. Fredericks, J. B. Furst and Wilson Kistler. New equipment will be bought and the road extended.

Last September a car belonging to the Camden (N. J.), Gloucester & Woodbury Railway Co. was struck by a train on the Philadelphia & Reading R. R. at a crossing in Gloucester, N. J., and one person was killed. The motorman and conductor of the car were last month acquitted of a charge of manslaughter by a jury in the Criminal Court of Camden and exonerated of all blame.

The Terre Haute (Ind.) Electric Co. is making extensive additions to its power station equipment. It is reported the company intends, upon the completion of the line between Brazil and Terre Haute, to buy its coal of the mines along its route and by hauling it in its own cars, materially reduce the cost of fuel. Three new Cahall boilers of 250 h. p. each have recently been installed at the power house.

The special committee mentioned on page 171 of the "Review" for last month, appointed to investigate the exact condition of the Cleveland City Ry. in order to reach a basis upon which new franchises are to be granted, has nearly finished its labors. Professor Langley, one of the experts, is quoted as saying: "The officials of the company have been extremely pleasant and accommodating to us in every way, and we have not met with any unusual obstacles in our work."

Drastic measures were taken by the Pennsylvania & Northwestern Railroad Co. last month to prevent the new electric road now

building from Punxsutawney, Pa., to Anita, from crossing its tracks at grade near Adrian Mines, Pa. Early one morning before daylight 50 employes of the steam railroad company went to the locality, overpowered the watchman of the street railway company's property and dragged his house away with a locomotive, after which they blew up the roadbed with dynamite.

The Union Traction Co., of Anderson, Ind., reports for the last six months of 1899 as follows: Gross earnings, \$222,895; operating expenses, including taxes, \$112,640; net earnings, \$110,254; other income, \$20,439; total income, \$130,693; interest on bonds, \$109,820; surplus, \$20,873. Of the \$5,000,000 new mortgage bonds recently issued, \$800,000 are reserved to retire underlying bonds; \$3,440,000 have been used to acquire properties and for improvements now under way; and \$760,000 are held for future needs.

MR. A. S. LITTLEFIELD, of Chicago, is now visiting in the East after several weeks in the South.


MR. W. C. RAY, of Louisville, has been appointed superintendent of the Henderson (Ky.) Street Railway Co.

MR. GEORGE M'KINLOCK, president of the Central Electric Co., of Chicago, has just returned from a two months' trip in California.

MR. S. B. M'LENEGAN, for two years past secretary of the Oakland, San Leandro & Haywards Electric Ry., has been chosen superintendent of the company.

MR. W. S. SMITH, superintendent of lighting for the Toledo Traction Co., has resigned to go into business for himself; he is temporarily succeeded by Mr. A. A. Atkinson.

MR. S. H. FINNEY has taken charge of the electrical department of the Manville Covering Co., 173 Randolph St., Chicago. Western representative of the H. W. Johns Manufacturing Co. Mr. Finney will fill the office left vacant by the death of Mr. Herbert A. Reeves.

 Receiver's Sale of Three-Quarters of a Million Dollars worth of Real and Personal Property of the John Stephenson Company (Limited), Bay Way, N. J., Wednesday, April 25th, 1900, 2 p. m. prompt,

BY AUCTION

TO THE HIGHEST BIDDER, WITHOUT RESERVE.

The undersigned, by virtue of an order of the Court of Chancery, of New Jersey, will sell on the above named date, in lots, positively without reserve, on terms to be made known at the sale, the following material: Lumber, Iron (rough stock), Cast Iron, Malleable Iron (parts worked up), Tool Steel, Cast Steel, Bolts and Nuts, Washers, Rivets, Screws, Nails and Brads, Tacks, Springs, Files, Sand Paper Rubber, Belting, Bronze and Brass Trimmings, Finished and Unfinished Electrical Materials, Glass, Paint Materials and Brushes, Miscellaneous Paint Utensils, Miscellaneous Merchandise, Office Furniture, Fixtures, Gold Leaf, Etc., Cars Manufactured and Under Construction.

AND IN ONE PARCEL

All the Real Estate, Buildings, Machinery, Fixtures, Motors, Patterns, Tools, and all personal property except the merchandise mentioned to be sold in lots as above.

The Plant covers an area of about 88 acres; the buildings (7) have floor space of 100,000 square feet. Railroad and tide-water facilities unexcelled; in fact, there is not another such advantageous location to be had in the Bay of New York. Wood-working machinery with individual electric motors, and tools of the latest type. Labor-saving devices are numerous. Sanitary requirements first-class. Artesian Wells, Electric Lighting, Etc., Etc. Everything in first-class working order, ready for the commencement of operations at once. Nothing has been left undone to make these works second to none in the car building business. Permits for the inspection of the works can be had from the Receiver, at Room 709, 95 Liberty Street, New York, where the Inventory of Personal Property, is on file, and may be inspected, and where also copies of the description of the Real Estate may be obtained.

ALBERT A. WILCOX, Receiver.

JOHN G. STEAD, Auctioneer, Romaine Building, Paterson, N. J.

ECHOES FROM THE TRADE

THE FALK CO. expects to begin work on the Third Street line of the Tri-City Ry., Davenport, Ia., about May 15th.

THE WESTERN ELECTRIC CO., of Chicago and New York, is out with a new 32-page catalog of general electrical supplies.

THE COMPRESSED AIR MOTOR CO., of Chicago, has increased its stock from \$1,250,000 to \$2,000,000 for the purpose of enlarging the business and buying certain foreign patents.

THE ELECTRIC LAUNCH CO. has removed its plant from Morris Heights, New York City, to Ave. A and North St. Bayonne City, N. J.

THE R. D. NUTTALL CO. is now located at Fayette St. and Garrison Ave., Pittsburg, Pa., where all communications should be addressed.

THE BERLIN IRON BRIDGE CO., of East Berlin, Conn., has opened an office in the Stephen Girard Bldg., Philadelphia. This new branch will be under the management of Mr. L. H. Brumbaugh.

THE WESTERN ELECTRIC SUPPLY CO., of St. Louis, has issued two new catalogs, one on direct current and the other on alternating current, fan motors and ceiling fans. As in times of peace it is well to prepare for war, so it is a good idea to buy electric fans before hot weather actually arrives. The catalogs will be mailed on application.

THE PECKHAM TRUCK CO., Havemeyer Building, New York, is sending to all its friends with its compliments a very acceptable glass paper weight.

MR. J. G. STOWE, U. S. Consul-General at Cape Town, writes the department that there will be a large field in South Africa for American machinery, especially electrical apparatus, as soon as the war is over.

THE WESTERN ELECTRIC CO., of Chicago, has recently installed for Carson, Pirie, Scott & Co., of that city, a 150-k. w. 125-volt generator. A generator of the same size was also installed for C. F. Gunther, of Chicago.

THE KISINGER-IRON CO., of Cincinnati, O., has on hand orders for about 1,200 tons of castings. This company has also received a contract from the United States Government for engines and dredging machinery to be used on the Ohio River.

THE B. F. STURTEVANT CO., of Boston, has sent us a supplement to its catalog No. 108, which was entitled "Who Uses Mechanical Draft?" The supplement contains the names of over 200 additional plants having Sturtevant apparatus.

MESSRS. THOMPSON, SON & CO., of 107 Liberty St., New York, have a number of inquiries for small steam dummy locomotives. These are used for driving snow plows and they can be quickly and cheaply equipped for this service. They are sold at from \$1,500 to \$2,000 each.



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Editor.

F. S. KENFIELD,
Business Manager.

EASTERN OFFICE, 100 WILLIAM STREET, NEW YORK.
C. B. FAIRCHILD, EASTERN REPRESENTATIVE.

CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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VOL. X.

MAY 15, 1900.

NO. 5

The Iowa assessment board has decided that a steam railway grade on which the ties and rails have not yet been laid is a "railway" to a sufficient extent to be taxed as such. The position is about as consistent as it would be to tax a lot and foundations only, for the full amount of the 10-story building to be erected later.

Judging from the reports coming in from every hand an unusual overhauling is in progress for the summer season. Old rails are being replaced with new and heavier ones, long cars are taking the places of short ones, and everywhere preparations are being made for one of the best seasons in the history of electric traction. We thoroughly believe these expectations are to be realized, and predict that 1900, in spite of the slight setback that may come during the presidential campaign, will be the banner year of the decade.

On another page of this issue is an interesting account of the conversion to electricity of the cable lines of the Denver City Tramway Co., a change tending to emphasize the passing of the cable system of traction. In connection with a brief statement of the method of doing the work Mr. C. K. Durbin, the general superintendent of the company, to whom the present splendid condition of the property is largely due, has given the cost of setting poles and stringing wires, separated into its various items, which makes a valuable table for reference.

Probably every inventor is at times hard pressed for reasons to explain why his device is better than all others for accomplishing a given purpose, and why all the others must inevitably fail. The Brooklyn Eagle recently published an interview with M. Diatto, the distinguished French engineer, who designed the surface contact electric railway installed at Tours last year, in which M. Diatto

is quoted as saying that the conduit system "has never proved practicable, and its great expense and the unhealthy odors which emanate from the stagnant water which naturally collects in the slot, have precluded its general adoption."

One of the most interesting phases of the almost phenomenal increase of electric street railway mileage in this country, has been the corresponding increase in the amount of riding solely for pleasure, or as it might be called, the artificial traffic. Not over two or three years ago it was an open question whether street railway companies could profitably invest money in parks and amusement attractions, whereas today, there is hardly a road in the land that does not own, or at least is interested in a park resort of some kind. In a number of cities, as at Brooklyn, Cleveland, Toronto and others, this feature has developed to such proportions that it is found advantageous to appoint a separate official, known as the outing or excursion manager, to relieve the general manager of the details of caring for and encouraging pleasure riding. This is a point worthy of consideration. The right man giving his entire time to this one department should have no difficulty in increasing the receipts of the road by a sufficient amount to considerably more than pay the extra expenses, including his own salary.

We chronicle elsewhere this month the death of A. S. Hallide, inventor of the cable system. Thirty years ago the residents of San Francisco were forced to daily climb hills too steep for loaded wagons to ascend. Toiling slowly up to his home among the other "cliff dwellers" one hot day he resolved to solve the problem of a transportation system to which 25 per cent grades should be no hindrance. He did solve it, after many weeks of study, and the cable system was the answer. Without it San Francisco could never have been the city it is today, and although another and better method his entire time to this one department should have no difficulty his creation, the honor of a great invention will always attend his name.

He and his invention served well their day and generation, but who would be so venturesome as to assert that in another 30 years our present approved methods will not in turn have given place to something different; something perhaps as unthought of, as undiscovered as the trolley was when the first Clay St. car made its famous trip through Chinatown.

In his paper before the Texas Street Railway Association, Mr. MacGregor calls attention to the inclination of the officials of smaller cities to make comparisons with, and attempt to adjust local conditions to, the measure of large cities. With him we agree as to the unfairness of any such comparison. The large roads in the big cities do a wholesale business, where the small road has a retail trade with an occasional job lot in the shape of a Fourth of July or the County Fair. What may be only a heavy burden to the one is simply impossible to the other.

It seems to us much of this excessive burden of small city roads is due to the natural inclination to imitate, so common to humanity. The village trustee attempts to do as he sees the mayor of the recently incorporated city do; the little mayor apes the ruler of a big city, and the big city in turn follows after the ways of the few great cities. Hence it is, that when a city of say 25,000 to 50,000 undertakes to impose on its street railway the burdens which are borne by companies in the city of 500,000, we have presented simply the familiar example of the family with an income of \$1,200 per year, trying to keep up with the \$12,000 incomes. It simply cannot be done, and can only end in one result.

We believe that the city officials in these smaller places aim too high, for it is as easy to overshoot as to undershoot the mark. These officers make deductions from the big cities, and are ambitious to secure personal credit with their own constituents by applying the same processes at home. Of course the child cannot carry the load of the father, and if it is forced to do so, is either stunted in its growth or prematurely dies under the burden. This tendency to unfair conditions is also favored by the frequent change in office holders. About the time one has been in authority long enough to begin to realize the struggle the local company is making to build up the town, and because of that realization to entertain a fairer appreciation of its importance and needs, he is replaced by his successor. This successor not infrequently starts

right out to make for himself a record at the expense of the road, which, had he understood the facts as he will later, he would not have done.

It would seem then that much may be accomplished by managers in smaller cities by taking the city authorities and even the public into their confidence, to a greater extent than has generally been done, in the hope of appealing to that sense of fairness and justice of which by no means all office holders are devoid. In some cases we feel sure such a course intelligently and consistently followed would have resulted in much good. The street railway, of all home institutions, should deserve and receive the sympathy and good will of the people.

Last month we briefly mentioned in our news notes that an eastern syndicate was endeavoring to arrange for the building of lines to close the existing gaps in electric roads between Boston and New York, and this done would put on through sleeping and dining cars. Whether these plans are put in execution or not the suggestion is of interest, and the scheme will not be condemned as impossible or even as impracticable. Electric roads have been so developed and lent themselves so readily to various adaptations that the public now readily accepts as feasible plans that a few years ago would have been promptly rejected by our best managers.

A through sleeping car service between the points named involves no insuperable difficulties. The distance via the present electric lines, after filling the gaps, is about 260 miles, and while the electric cars by reason of passing through so many cities and towns where the speed must be reduced, cannot be expected to compete with the steam roads in point of time, the distance is not so great but that the trip can easily be made in one night. Leaving one terminal say at 9 p. m. and arriving at the destination at 9 a. m.,—which is as early as a business man cares to make business calls, we have 12 hours in which to make the run, or an average speed of less than 22 miles per hour. Between cities 35 miles an hour is a low estimate speed, and after midnight the car could make better time through cities than during the day. While the sleepers would not be as large or heavy as on steam roads they could be built with large single berths, upper and lower. There can be no question but that berths could be furnished at as low a price as is now charged on the regular sleepers, which is \$1.50. The railroad fare between Boston and New York at present is \$5.00, while on the electric lines, as shown by the trips between the two cities mentioned on another page, the fare is about 1-3 cents per mile, say \$3.50 for the entire distance. This may be taken as the minimum that can reasonably be expected since on the through trips the entire length of each of the several lines was in general traversed for the single fare.

Sleepers could run singly or in trains of two or more, thus adapting the service closely to the demand and reducing to a minimum the number of empty berths hauled. The small number of men required to run the car or train would also permit of departures at intervals of say 30 minutes between 9 p. m. and midnight. A passenger missing his train would not lose his trip.

Aside from difficulties that might possibly be experienced in arranging the schedules of the through cars so that they would not conflict with the regular service, the principal objection that may be urged to the scheme at the present time, is the fact that on most roads, particularly those in small towns, the power houses are not operated between midnight and 5 a. m. A small generating set in charge of one man who could do his own firing or a storage battery ordinarily used for regulating the day load on the generators, would solve this question.

During daylight hours a through parlor car service should prove very popular. Each year there are thousands of tourists traveling between New York and Boston to whom the extra time would make little difference; in most cases the fact that the journey lasted longer would be considered a positive advantage because of the attractive scenery. Because the electric lines run through highways and streets and cars stop whenever desired, every opportunity is afforded for passengers to stopover and visit points of historic interest. For touring parties not wishing to plan for more than a day in advance the electric cars have all the flexibility and convenience of bicycles, without the work.

Another company proposes to build "house cars" which will be chartered by parties desiring to have a few days' outing, in New

York or New England. Street railway literature is full of references to the electric car as the legitimate successor to the stage coach and though the suggestion that it be used for purely pleasure trips as well as for the business of transportation is a novelty, there are many possibilities which we may expect to see realized at an early day.

Whether taxes shall be included with operating expenses is a point on which there has been much discussion by railway accountants. When the committee of the Street Railway Accountants' Association prepared the first draft of its standard system of accounts in 1897, it recommended that taxes, "which might be termed an operating expense, or might not," be classed as a fixed charge, called a deduction from income. This subject had been discussed in the committee and in reaching the decision they did, the members were influenced by the fact that nearly all state boards of railroad commissioners require that taxes be so treated. In its second report submitted the following year, at Boston, the committee stated that its members were unanimously of the opinion that taxes, being incident to the ownership of property and the operation of the road, are an operating expense. This position was well sustained by arguments, and it was also stated that the general though not universal practice in street railway accounting was to charge taxes as an operating expense.

Last year when the Accountants' committee met with the committee of the Convention of Railroad Commissioners the disposition of taxes was one of the points taken up and in view of the classification of accounts prescribed by the Interstate Commerce Commission, the practice on steam roads, and the position taken by the railroad commissioners, the street railway men agreed to again class taxes as a fixed charge and this change was ratified at the Chicago convention of the Accountants' Association.

While, therefore, the recommended practice must be considered as fixed for the present the reasons which led the Accountants' committee to the unanimous conclusions that taxes should be classed as an operating expense still obtain, and are as potent as ever.

Mr. Stuyvesant Fish, president of the Illinois Central, in a letter recently published in one of the railroad papers after presenting the familiar arguments to demonstrate that taxes are an operating expense and should be so classed, points out the injustice done the railroads of the country by the classification of accounts at present used by the Interstate Commerce Commission. He says: "The Act to Regulate Commerce, by which the Interstate Commerce Commission was created, in terms applies to 'common carriers engaged in the transportation of passengers or property' by railway. The common law requires the charges of common carriers to be reasonable. Apart from the value of the service, the reasonableness of those charges can only be determined by deducting from them the cost of rendering the service. Taxes of necessity form part of that cost, and should, therefore, be included in all statements made by the railway companies to the Commission, or by it reported to Congress. This is made the more obvious by the further provision of the statute, which requires that the reports made by the Commission to Congress 'shall contain such information and data collected by the Commission as may be considered of value in the determination of questions connected with the regulation of commerce.'

"As those reports contain the only information which reaches Congress as to the cost, to the railways of the United States, of rendering service as common carriers, it is essential that they show it plainly and in full. The exclusion by the Commission of taxes from their statement of the expenses of operation of the railways of the United States, for the year 1898, resulted in those expenses being understated by \$43,828,224."

With the present outcry against corporations operating under public franchises what will more quickly increase the demand for the imposition of greater burdens, than to understate the cost of operation? In Connecticut the street railways in 1899 paid taxes amounting to 7 per cent of the investment, to 4.9 per cent of the gross earnings, or to 13 per cent of the net earnings—that is, the net earnings as given were in this case nearly 15 per cent greater than the true net earnings of the properties.

We were recently asked a question by a manager, and the longer we studied an answer the more difficult we found the task. As it is a subject well worth the thoughtful consideration of our readers the question is given here as it came to us.

The proposition comes from a manager who is conscientious and progressive and who honestly wants to do the very best by his men that existing conditions will permit. He has been put in charge of a consolidated property in a city where all but one of the several lines have either been in a receiver's hands or belonged there. The purchasers are cutting off unnecessary expense caused by duplication, and spending many thousands of dollars in bringing the rundown properties up to a first-class condition. When they have completed this work of improvement they must patiently wait for the revenue to grow up to a dividend paying point, for the city had been overbuilt by the several competing lines, and the usual result of needless parallels prevails.

With the property which came to this manager through consolidation were a number of men, two or three from each company, who were carried on the pay rolls out of sympathetic and sentimental reasons. So long as the separate roads each had a few the burden was less noticeable; now consolidation has brought them all, some 15 or 20 onto the same pay roll. This brings us back to the troublesome question, and we will do as the manager did, state one individual case, which is fairly illustrative of all the rest.

Smith is a man 48 years of age; he is perfectly honest, sober and industrious, but is physically incompetent for the duties of motor-man, which position he now holds. He started in to work for one of the merged companies the day the road was begun, and was retained out of the construction force and continued as driver of a horsecar. Year after year he faithfully performed his duties, and while his record shows an occasional mishap or shortcoming the total to date is what would be called a good and satisfactory record. Indeed, the fact that he continuously has worked for the same company for a period of 17 years under several managers, is in itself an indication that he was a good man. When horses gave way to motors he still remained and is today handling the controller.

But, as already stated he is no longer physically capable for, nor does the manager feel justified in longer retaining him in this position. The manager is responsible for the safety of the passengers carried in Smith's car and has no right to jeopardize human lives which some day may be sacrificed because the motor-man was not equal to an emergency. And the manager asks, "What shall I do?"

Some one suggests, "Can't he use him as a janitor at the office?" to which the reply is the manager cannot use 20 janitors, and moreover the present incumbent has filled the place satisfactorily for the past eight years and there would be no justice in discharging him simply to help some one else.

As the manager says, if his company was showing a surplus at the end of the year he would feel more inclined to strain a point and create some job even though it would virtually be a pension position, but in this case it is more than the road can do to declare a dividend now, to say nothing of surpluses and pensions.

And so we leave him with his troubles just where we started out.

INTERESTING CASE AT MONTREAL.

The Montreal Street Ry., which has an agreement with the city to pay the latter a percentage of the gross earnings, has, with the development of the system, built suburban lines. The company was sued by the city for its percentage of the gross receipts on the lines outside as well as inside the city, and the case was on April 20th decided in favor of the company.

The court held that while the contract required the company to pay the stipulated percentage upon "the total amount of its gross earnings arising from the whole operation of its 'said railway,'" the term "said railway" was exactly limited by another clause in the agreement which granted the right to operate an electric railway "in the city." Further, it was said that "the outside lines of the company are operated by virtue of franchises which the local municipalities have conceded and for which they exact consideration in one form or another. The city of Montreal can give no title in respect of them, and while no doubt, competent to exact a tribute on their earnings in payment of its own concessions would need to express that right in language of great certainty."

At the argument the court asked counsel what the company's obligations would be if it built a line to St. Johns or to Longueuil, or even to Quebec. The counsel for the city could not, in the interest of consistency, avoid the assertion that according to the true

intendment of the 36th article of the contract a percentage of the earnings of all these lines would be exactable. Marked difficulty was felt in maintaining a like position if a gap of a half mile, or a hundred feet, or even a single rail separated the systems within and without the city.

"These were features of the controversy," said the court, "which deserved serious consideration and required a practical solution. A passenger steps into a car in Montreal. His one fare carries him to any point either in the city or, if he wills, in any contiguous municipality to which the line extends. We may be certain that the extra distance is not traveled for nothing, but it is a plausible argument that this fare, certainly paid and apparently earned within the city limits, should be, to its full extent, subject to percentage. Take, however, the converse of this example. A passenger steps into a car in, say, Westmount, and in manner accustomed, forthwith pays his fare. He may not enter the city at all, or he may, if he chooses, travel over its lines without extra charge. Thus here is compensation of both traffic and argument. The loss to the city is nominal rather than real, for every mile of suburban roads indirectly adds to the revenue on which percentages are payable."

The exact amount to which the city was entitled was ascertained by an easy process of railway arithmetic certified as correct by a firm of accountants and the suit dismissed at the city's cost.

THE CONNECTICUT CONSOLIDATION.

Up to April 15th what is known as the Young syndicate, otherwise the Connecticut Lighting & Power Co., of New York, had secured control of the Bridgeport (Conn.) Traction Co., with 54.8 miles of track; the Central Lighting & Power Co., of New Britain, 18.6 miles of track; the Norwalk Street Railway Co., 7.5 miles; the Shelton Street Railway Co., 3 miles; the Waterbury Traction Co., 15.7 miles; Westport & Saugatuck Street Railway Co., 5.5 miles, and the Torrington & Winchester Street Railway Co., 13 miles. An option had also been taken on the stock of the Winchester Avenue Railroad Co., of New Haven, owned by the New England Street Railway Co., but on April 23d the stockholders refused to sell. Mr. I. A. Kelsey has filed a bill in equity claiming the Winchester Avenue stock, and the matter will have to await the termination of the litigation.

New officers were chosen for the Bridgeport Traction Co. as follows: President, A. M. Young, New York; vice-president and general manager, Randall Morgan, Philadelphia; secretary, H. G. Runkle, Plainfield, N. J.; treasurer, Lewis Lillie, Lillie Bay, Me. J. E. Sewell, superintendent of the Waterbury Traction Co., has been appointed superintendent of the Bridgeport, Shelton, Milford and Westport roads. E. L. Burnstett has been appointed auditor.

NO "JIM CROW" CARS IN NORFOLK.

Statements have appeared in the daily press to the effect that separate cars for negroes would be placed in operation by the Norfolk (Va.) Railway & Light Co. Upon inquiry, however, we find this report is misleading, as there is no intention of making a close class distinction in that city. Mr. H. C. Whitehead, secretary and assistant treasurer of the company, explains the situation as follows:

"On the Lambert's Point division of our line there is a fashionable country club, very generally frequented by the society people of the city. There is also the coaling station of the Norfolk & Terminal Ry. not very far from it, and on the same line. The presence of the workmen from this latter point, with their soiled clothing, in the cars occupied by the members of the club has been a source of much annoyance and inconvenience, and to obviate this we have put on trail cars on Saturday and Sunday afternoons only, in order that these two classes of passengers might naturally drift apart, and it has developed they do. While those trail cars, therefore, are intended primarily for the negro workmen, they are not put on for the purpose of excluding any class of passengers from any of the cars we are operating, and hence can hardly be classed as separate cars for negroes, since, as a matter of fact, in the city they are occupied by white persons as well."

The Canadian Electrical Association will hold its annual convention in Ottawa June 27th, 28th and 29th.

The System of the Boston Elevated Railway Co.

Department of Transportation—Snow Features—Moving of Buildings—Lost Articles—Departments of Civil Engineering and Maintenance of Way—Department of Employment—Bureau of Audit—Miscellaneous Departments.

BY C. B. FAIRCHILD.

PART III.

DEPARTMENT OF TRANSPORTATION.

The duties of the superintendent of this department, which is now in charge of Mr. J. E. Rugg, are outlined in the regulations as follows:

"The superintendent of transportation shall have general charge of the movement of surface cars, plowing and leveling of snow, and of all officials and employes engaged in car service, upon the street, and in the car houses and subway. He shall keep a vigilant outlook over the passenger traffic, shall arrange the time tables, investigate complaints, receive and care for lost articles, provide for chartered cars and cars for all special occasions, shall see that all accidents are investigated, and all discipline suitably administered. All appointments to positions above the rank of starter, inspector or foreman, and all discharges above the rank of switchman or car cleaner shall be submitted to the vice-president for approval before becoming effective; all changes in car routes, new routes, and important changes in time tables shall be submitted to the vice-president for approval before taking effect. Discipline of all car service, car house and street employes shall be administered through the several division superintendents. The superintendent of transportation shall hold a meeting of division superintendents for advice and consultation at least as often as once a fortnight. He shall arrange that his office shall be constantly open and attended, and shall keep such account, perform such other duties and make such reports as may from time to time be required."

The system of surface lines is divided into nine divisions, and each division is under the immediate supervision of a division superintendent, who is responsible "for the operation of cars, car houses, transfer stations, stables, etc., and the care and maintenance of poles and wires in prescribed districts, and for the care and maintenance of tracks in his territory. In case of the central division, however, the superintendent is relieved from the construction and repair of tracks." Each division superintendent is assisted by a chief inspector and by such other inspectors, starters, foremen and officials as may from time to time be authorized or required.

There is also a division track master in each operating division. Their duties will be outlined in a subsequent paragraph.

The regulations prescribe the limits of each division and give the name of the streets on which the tracks of every division are located.

It is the custom of the superintendent of this department to spend the morning hours till 11 o'clock in visiting and inspecting the different car houses or work in one or more of the divisions, and for this service he is provided with a horse and carriage, or rather a carriage and two horses, the horses being driven on alternate days. After 11 o'clock, for the rest of the day he is usually to be found in his office, where he inspects the daily reports of the different departments, attends to matters of discipline and studies the various reports to ascertain where improvements or a saving can be made. He has a corps of clerks to summarize and classify the different reports, and present the returns in a simple manner on suitable blanks. Once in two weeks, as the regulations require, he holds evening meetings with the division superintendents. At these meetings the division superintendents present reports, and sometimes prepare papers as requested on subjects of interest, and these are freely discussed, each one being expected to express his opinion on the propositions presented. At these meetings the superintendent of transportation takes the opportunity to instruct his assistants and explain the object and scope of particular orders and methods. By this practice of meeting with his assistants, he learns the mental characteristics of each one, and through them the attitude of the employes toward the company and towards their superior officers and associates. This feature of semi-monthly meetings is regarded by all concerned as a very important one, looking to the successful operation of the road. It seems to be the policy of the management, not merely to make the system as good

as others, but a great deal better, and to have every man imbued with the idea that all are aiming for the best.

In addition to the semi-monthly meetings, with the division superintendents, inspection tours are made at irregular intervals and without notice. The vice-president usually originates these trips, and when he is ready he orders, through the superintendent of transportation, a special car to be in waiting at a certain place and all the division superintendents are ordered on short notice to report at the same place at a certain hour. The party then boards the car in waiting and the vice-president indicates the destination. The trip is usually made to one or more of the car houses or power stations without notice to the foreman, and a thorough inspection is made, after which each division superintendent is expected to report at the next meeting any adverse criticism or commendation on the condition in which the building, rolling stock, tools and supplies is found. They are also to report on the condition of the special car in which the trip was made. By this means every division superintendent has an opportunity to see how each of the others conducts his department, and has an opportunity to learn what he can that will be of service in conducting his own department. These inspection tours have the tendency to spur the superintendent of each division to keep everything up to a high standard at all times, as he never knows when his turn to be inspected will come.

In addition to the meetings mentioned, each division superintendent is required to hold a meeting every two weeks with his inspectors, foremen and starters, which meetings are held on alternate weeks from those held by the superintendent of the department. At these meetings each division superintendent takes the opportunity to instruct his assistants and criticize their work, and advises with them, as does the superintendent of transportation with his assistants. The character of these instructions is indicated by the following report, which is copied from the minutes of the secretary of the meeting. These reports are made by the secretary and copies forwarded to the superintendents of the transportation department.

DIVISION FIVE.

Superintendent's Office.

South Boston, Mass., Jan. 29, 1900.

The eighth meeting of the superintendent, foremen, inspectors and starters was held this evening.

Meeting opened at 8 o'clock p. m. by the superintendent in the chair.

Minutes of last meeting were read by Inspector Damon.

Present—Supt. G. R. Tripp, Foremen Brewster, Clerk, O. M. Wells, Inspectors Dickey, Daman, Norton, Starters Clough, Hutchins and Donaldson.

The superintendent made the following remarks:

While in a great many things the matters that we shall talk about are perhaps but a repetition of what we have spoken about at previous meetings, still with few exceptions the conditions we are called upon to confront in the railroad business are practically the same. It is the same old story over again, but it is a story that we have got to have told us, and we in turn have to keep talking it to the men; and if this order of things was not carried out we should all get slack, therefore I say, for the good of the service, that it becomes necessary that we should all be critical, and keep talking up the rules of the road.

There are new men coming in all the time, and they must have the rules instilled into them, and the old men are apt to forget if you don't keep talking to them.

I am sorry to say that in the matter of collisions we have not much to our credit this month, and it certainly does look strange to the management, that we should have more than are being had anywhere else. It would seem as though from the action taken in these cases, that the men would be more careful, and try and

guard against them. I don't want you to relax your vigilance in this respect one mite, and if possible increase it.

If you see the motormen getting too close to the car ahead, jump on and tell them to keep back, and if it is not possible for you to get on at that time, by reason of its occurring between stops, to your being engaged in something else, why bear it in mind, and make it a point to see them later on, and caution them about it. That will let them know that you are watching them, and that you intend to see what is going on, and I think that this one thing alone, if rightly attended to, will go a long way toward stopping these collisions.

It would seem that when a collision has occurred, that the action taken in this office is all that could be expected. With very few exceptions the men have been discharged, and this should act as a preventive against collisions, but to my mind the stopping of collisions has in a great measure to be done on the streets, i. e. where the greater part of the work has got to be done, and it rests with you, street inspectors, whether the great number of car collisions which we are now having, are practically stopped or not.

Regarding the giving out of transfers at the corner of Broadway and Dorchester Ave. It seems to me that the starter should stand nearer the corner, so as to be able to notice passengers that get off the cars coming down Broadway. I am inclined to think that where you now stand it gives a great opportunity for people to get checks that are not entitled to them, and we don't want them to get in the way of beating checks, for if we do there will be no stopping them, and I would advise that you stand so as to have an eye on the cars that go down Broadway, and go via the South Station.

I notice that the cars are not getting the dusting out before starting on their inward trips that they should. While the conductors go over them after a fashion, they are not at all thorough. Their dusting strikes the middle of the sill, and they leave about three or four inches on each side that is not touched at all. See if there cannot be an improvement in this, and keep things up, so that we cannot be criticised as being slack.

I put out a notice last night, cautioning motormen in regard to running their cars at a slow rate of speed going down all grades, particular attention to be paid to Mt. Washington Hill.

I notice in a great many cases that motormen are taking the hill too fast, and there is liable to be a bad accident come out of it if it is not stopped. We cannot afford to take any chances with men running too fast down these grades, and I wish you would give the matter the closest attention.

While for the last few days the car house men have been very busy in beating the cushions, this has resulted in more or less neglect in keeping the rest of the car clean. Now that we are through with the cushions, we shall hope to see the cars cleaner. Too much attention cannot be paid to the keeping of cars clean, for they remain under the eyes of everybody, and there is a great deal of comment for, or against us, by the public at large, caused by the condition of our cars. Let us aim to have them in such shape that the criticism will be in our favor.

While we have had no snow as yet, still we are liable to get a large storm at any time. When we do get one I want you all to be on the alert, and if there don't seem to be plows enough out, or if the cars are being delayed on account of snow, get right to the telephone and let us know what the conditions are, and if more plows are needed don't hesitate to say so. This applies to the starters as well as the men on the street; let us all feel that in a snowstorm we all have got something at stake, and that is the keeping of the tracks clear of snow, so that we shall not be blocked up.

It don't make any difference what a man's position on the road is, or however humble it may be, if he has the welfare of the road at heart that man is going to succeed. What this road wants is loyal men, and a man that is not loyal to his superintendent and to the best interests of the road, cannot find fault if he don't have the confidence of the superintendent, and is not pushed ahead. If a man is loyal and does the business the best that he can and makes mistakes, the feeling of the management toward that man is more disposed to be liberal than with a man that you feel is working right against you.

I don't want you to understand by this that mistakes or blunders are to be encouraged or overlooked, and you want to do all you can to guard against them, because a mistake at some times is apt to cost this company a great deal of money. While it is best not to get so excited as to lose your head, still there are times when

you must think quickly, and be right, too, and I think it is a pretty good plan to suppose some cases that are liable to come up, think what it would be best to do if they should come up. If you do this and the trouble arises, you have made up your mind before hand what you should do, and can get right to work with a clear idea of what is required of you.

One more thing I want to call your attention to, and what has been spoken about at previous meetings, is the importance of having the conductors and motormen understand that they must keep the door closed.

I notice that the motorman sometimes will sit down inside and leave the door open, waiting for his time to be up to start. The heaters will be turned on, but when the car starts it is as cold as a barn, and would have to run half way to Boston before it would get warmed up. Now this is not right, and we don't want to do business that way.

Also the practice of conductors standing in the doors talking to the motorman going up P St. has a pretty strong tendency to cause a cold and uncomfortable car and also to cause the passengers to make remarks regarding the condition of the same. And so I might go on and enumerate all of these things that are coming up all the time. Matters that we can't be too careful about chasing the men upon.

We are having more or less trouble at the present time on account of conductors striking their bells too quick when passengers are getting on and off the car. There should be no excuse accepted for accidents of this kind. Conductors should not strike the bell until they know for sure that their passengers are safely on or off the car.

Even if a car does get back late, and it is due to the conductor being slow on the bell, such a conductor is far more valuable to this company than a conductor who to be thought a good fellow with his motorman, and quick on the bell, has struck the bell before some one of his passengers was safely on or off his car, and in consequence has a bad accident. This has cost the company a lot of money, and it wants the practice of giving the bell too quick discouraged. Keep at the conductors all the time, and try and get instilled into them that it is much better to prevent an accident, and save a great deal of money for this company, than it is to have an accident and then say that you are sorry. Sorrow is all right in its way, but it don't save money for the company. If you will just bear these suggestions in mind and act accordingly I think there will be good results from them.

Mr. Tripp then called for remarks on any of the subjects he had spoken of. He called upon Mr. Dickey for remarks. Mr. Dickey spoke of his endeavor to prevent car collisions by speaking to all motormen whom he had seen following the preceding car too closely, and he also spoke of the manner of their starting from the car house in a bunch.

Starter Clough, when asked about it, said there were times when several started at once, according to the tables, for instance at 6:30 a. m. there were four to go, and his habit had been to let the first one get up to Third St. before starting the next, and so on, to let each have a little headway, but he thought the most of the trouble was caused by some of the motormen using up two minutes to reach Fourth St. while others will run up there in less than a minute.

The amount of ashes at Dorchester St. Station was spoken of by Inspectors Norton and Dickey, and Mr. Tripp told Mr. Brewster to have the teamster to go there tomorrow and remove them. The subject of free transfers was spoken of and Mr. Donaldson, starter at Dorchester St. Station, said he thought the number given out there seemed to be on the increase at present; that about the only decrease was at morning or night; but through the middle of the day it was the same as before the change in the system at Dorchester Ave. was established.

The increase he referred to had been since the new system at Dorchester Ave. had been established, which at the first caused a great shrinkage in the number given out at Dorchester St. Station. Mr. Hutchins of the Dorchester Ave. Station, said the number given out there was constantly increasing.

Mr. Norton suggested that the sand man should carry in his wagon a set of jumping irons and a rope, so as to be able to help put a car on the track that he found off, and it would be a great saving of time over what it would if he had to drive to one of the stations to get them. It was thought to be a good idea, and Mr. Tripp instructed Mr. Brewster to make requisition for two sets of

sons are readily made, so that one foreman can be pitted against another, and as each one is furnished with a duplicate report, is able to compare his work with that of others.

In making the rounds of some of the car houses in company with the superintendent of transportation, it was noted that the offices of the division superintendent were provided with electric lamps and electric heaters and that the toilet rooms were furnished with first-class plumbing. Included in the office equipments are record boards for posting the names of conductors and motormen with their runs and also the names and time for the swing crews. In a blotter provided on a table conductors record their runs together with the number of passengers on both the out and in trips. A book of all published orders is provided, to which conductors and motormen have ready access. Each division superintendent is allowed a sufficient number of clerks for making up records and keeping the accounts of the employes. The conductors make their returns in canvas bags which they deposit in a hopper in the top of a safe at the receiver's office. When a bag is deposited, the receiver operates a trap which allows the bag to fall within the safe and the receiver makes a record of the number of the conductor making the deposit. Two money wagons are provided and the attendants, with these, strip the safe once a day when they drive to the central office and deliver the receipts to the treasurer. One station, however, sends its receipts in by messenger. For the division superintendent's office there is a messenger who is sent regularly to the general office for letters and orders. Lockers are provided in the rooms set apart for trainmen and these usually have ventilated doors or doors with wire screens to provide for ventilation. The

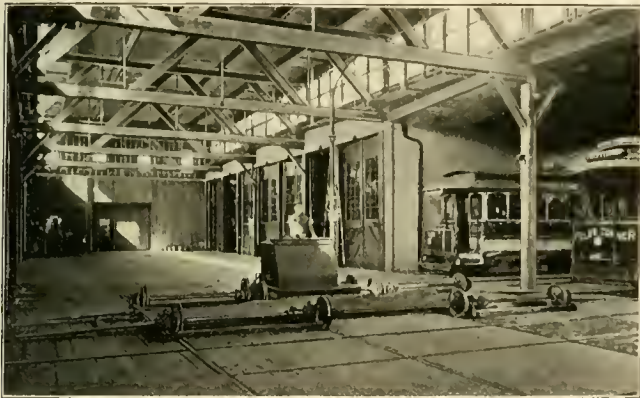


FIG. 51—TAUNTON TRANSFER TABLE.

practice of providing lockers for car employes is an old one, as the present department superintendent originated it on one of the Boston roads 24 years ago.

At the different starters' offices are tower clocks which are wound, regulated and kept in repair by an employe specially designated for the purpose. At all the car houses there are sand dryers. There are no sand boxes on the cars, but sand is carried in metal pails by each motorman and is kept on the platform, the sand being applied by means of a hand scoop as required. Each motorman is held responsible for the sand pail and takes it off at the end of his run with the rest of his kit of tools.

Most of the electric transfer tables at the different car houses are made by the Taunton Locomotive Manufacturing Co. The Boston Elevated formerly made its own transfer tables, but now buys them from the Taunton company. Fig. 51 shows one of the tables for double-truck cars; it is driven by an F-30 motor. At each end of the table there are wedge shape tracks, about 4 ft. long, which are held up from the rails by springs when the table is in motion, but when a car is run off or on, they are pushed down by the weight of the wheels to form a gentle incline for the wheels to pass from the floor level to the level of the transfer car. These tables have roller bearings for the journals and also track brakes. They carry a stand with a group of electric lamps.

Armatures that need repairs are packed in boxes having cross bars to hold them in position and in these they are shipped to and from the main repair shop. At each car house are extra armatures so that cars are not delayed while waiting for repairs. At each of the houses, the stock room is partitioned off for the storing of

supplies. The stock rooms have bins, cupboards and shelving for the proper sorting and storing of supplies. The supplies are received once a week on requisition, from the department of stores. Supplies are dealt out to the men in the houses on orders signed by the division superintendent; the foreman of each house is responsible for the stock and condition of the store room. Great care is taken to keep the stock rooms at all the houses neat and clean. The floors are oiled, and a strip of matting is usually spread all around the edge of the floor in front of the bins.

In the pit repair rooms are wheel dismantling devices; for operating these a section of the track is made removable, and the cradle consisting of heavy plank is operated by ropes or chains from overhead lifts. By this means the wheels and axles with the motors can be lowered to the bottom of the pit when the wheels are run out and new ones substituted.

There is a blacksmith shop with one forge for doing light work at each car house. In the repair department of each car house, it is the practice to cover the floors of the house and pits with a liberal sprinkling of sifted sand. This is designed to absorb the oil that may drip from motors and journals while the cars are over the pit, and prevent the men from tracking oil into the cars and about the building. The sweepings from cars while in the house are caught in baskets at the steps and not thrown out on the floor. The floors of the house and pit are swept only once a week, when a new lot of sand is sown over the floor by hand. Iron pans are provided in which the workmen can place their wrenches and tools to prevent them coming in contact with the sand on the floor. Extreme neatness is noted in every department about the car houses.

For motor connections on the motors of the W. P. type, cables with coverings of asbestos in place of soft rubber are used. By shifting the neutral point of the brushes on motors of the W. P. type about 3-10 in., sparking has been prevented and the life of the motor brushes which was formerly only about two days, has been lengthened to from 10 to 14 days, and the life of the commutators has also been prolonged.

SNOW FEATURES.

As the street railway company is required by city ordinance to remove or care for all the snow that is removed from those streets in the business district on which the cars run, the handling of snow becomes a very important factor with this system. The snow work is systematized and the particular duties of each division superintendent and those of his assistants are carefully outlined and printed in pamphlet form. The first two pages of the book on snow work contains general directions to the division superintendent. This is followed by an index giving the location of all the snow plows and this in turn by a snow plow route by divisions. The routes are all numbered and the names of the streets through which each machine is assigned to work is given, with the number of miles for a round trip.

The number of men required at each piece of special work is also given with the location of the work, also hill work when sanding is to be done, the number of men to sweep at certain points, and the location of teams that can be had for carting snow. The general directions are as follows:

"You are herewith supplied with a complete schedule of snow work for the coming winter, together with separate copies of work in the respective divisions, and you are expected to see to it that all employes connected with this work are provided with a copy each of division snow plow routes, so that they may be fully informed as to the work they have to do. A copy of routes for each division should also be posted in each lobby.

"All labor specially hired for any storm is to be paid as heretofore, on special snow pay rolls, at the close of each day by a special snow paymaster, to be designated by division superintendent, who will also see that he is provided with the necessary funds. The utmost care is necessary in the identification to the paymaster of all persons engaged in snow work, and whenever possible and consistent with the number of men to be paid, individual names should be made use of upon the pay roll.

"Full directions as to this and the issue of snow-teaming tickets, and accounting for hired teams, can be obtained from the auditor. The utmost vigilance will be exercised by superintendents to watch for snow storms and get their forces promptly at work at the earliest moment necessary.

"Arrangements must be made whereby, from all parts of the division, inspectors and other men on the street will communicate

with the superintendent's office by telephone or by messenger if wires fail, all important events during heavy storms, and the few days succeeding as often as once an hour. During the same period, this information must be telephoned to the office of the superintendent of transportation hourly. It is absolutely essential that the fullest information as to condition of snow, cars, and snow work on the divisions should be regularly and systematically communicated to the general office during snow storms and no excuse whatever will be accepted for failure to do this. All bills contracted for feeding men, hiring of horses and teams, etc., must be promptly procured and verified as correct by the superintendent and forwarded to the general office. Care should be taken in regard to all snow work to practice the utmost economy consistent with efficiency, and superintendents are especially notified that electric lines must be kept clean if they are to be kept running. In



FIG. 52—SNOW SLED.

heavy storms, the number of cars run must be reduced to provide for additional power required for both the cars and the electric plows. Prompt use of levelers following plowing will insure the greatest economy in teaming."

The company has snow carting sleds of its own make to the number of 500; one of these is illustrated in Fig. 52. Teams are engaged beforehand and contracts made so that in case of a snow storm the division superintendent knows on what parties to call for teams. A large list of men who will agree to respond to the company's call for snow work is also kept by the superintendents, and they also have an arrangement with the different charitable associations of the city to send all the men available. Through these associations, any number of men desired can usually be enlisted for fighting the snow, and when there is any shortage the company has only to send to the Italian quarter on the east side of the city to get all the men required. A list is also furnished giving the different gangs and the names of the foremen who are to supervise any special gang, and the number of men in each, also names of sub-foremen and the number of men each is expected to handle. The location of all places for dumping snow is also given, and this is usually one of the most annoying features of the work, as such places are scarce. The names of sub-foremen in charge of the

slight his duty. Two crews are assigned to each plow, and all are carefully instructed as to their duties.

A careful record of all snow work is kept, so that after each storm, the division superintendents report, on suitable blanks, the entire cost of storm. During one storm, that of Jan. 1, 1900, 485 extra teams were employed and 1,453 extra men, and the total cost of this storm was about \$16,000, and this for a fall of about 8 in. of snow. It costs the company from \$16,000 to \$20,000 to take care of from 8 to 10 in. of snow. When the weather is threatening, the snow crews and other extra men are required to remain at their respective stations all night to be ready in case of an emergency. These men are paid 30 cents an hour for their extra time, regardless of whether they are called out for work.

The layout for snow work as indicated above, is in keeping with the foresight manifest in the conduct of all of the departments. It is held that trouble is best prevented before it happens, for this reason great attention is paid to little things, for instance, conductors and inspectors are required to report when any car is off the track and condition of the track, and for this purpose blanks are provided, and the items on this blank on which information is required are as follows:

- Kind and number of cars,
- Kind and make of truck,
- Locality of derailment on straight track, curve, switch or frog.
- Kind of rail in track, Time of derailment, Lines delayed, Duration of delay, Conductor's number, Motorman's number, Cause of derailment.

The division superintendents report to headquarters on a similar blank.

If a fuse on a car blows, the officials want to know it, and the cause, and conductors are required to report it. The officials seek to know everything that happens or is likely to happen before the public knows of it, so that cars will not be put out to advertise the seeming inefficiency of the officials or the employees.

The system of discipline exercised over the employees, while it is strict, is not so rigid as to kill, but is flexible and uniform. The aim is to get good men and to keep them as long as possible in the employ of the company, the theory being that the longer a man serves the company, the more valuable he becomes.

MOVING OF BUILDINGS.

A city ordinance provides that the city authorities will not give permission to any person to move a building on the line of the street railway tracks without first getting the consent of the street

FORM 516A
BOSTON ELEVATED RAILWAY CO.
BUREAU OF SURFACE LINES DEPARTMENT OF TRANSPORTATION.
APPLICATION FOR LEAVE OF ABSENCE

Motorman	Badge No.
Line	.....
To be off duty	days, commencing
	1
Will return to work	1
Last time off duty was	1

FIG. 54.

Boston Elevated Railway Company.
BUREAU OF SURFACE LINES—DEPARTMENT OF TRANSPORTATION.
Superintendent's Office. Division

CLASSIFICATION OF ACCIDENTS OCCURRING IN MONTH OF 190

DATE	MOTORMEN					CONDUCTORS					MISCELLANEOUS					TOTAL
	BY CARS COLLIDING	BY CAR AND TEAM COLLIDING	BY CAR LEAVING TRACKS	BY CAR PASSING CAR	BY TEAMING CAR WITHOUT SIGNAL	UNCLASSIFIED	BY FALLING OFF OF PLATFORM	BY STARTING CAR TOO QUICK	UNCLASSIFIED	BY DEFECTIVE CAR OR TRACKS	BY DOOR SEATS, W BRAKE	BY HORSE TAKING FRONT	BY ASSAULT	BY CAR OR FEELER STRIKING PERSON	BY PASSENGERS OR RUNNING BOARD		UNCLASSIFIED
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
TOTAL																

FIG. 53.

dumps and the number of men under each are also given. As before stated, the company operates 188 electric snow plows besides levelers. Tickets are given to the men on snow work and these are punched by the foreman of each gang twice in the forenoon and twice in the afternoon, so that no one has an opportunity to

railway company. When a building is to be moved, the owner or applicant first makes his request to the superintendent of transportation on a blank provided by the company, in which he states that he desires to move a building from a certain locality to another via certain streets. He gives the dimensions of the building and on the same blank agrees to the following conditions:

"In consideration of permission being granted me by your company, to cross its tracks with said building, via above named route, I hereby agree to move said building at such a time of day as may be agreed upon between Division Superintendent _____ and myself. I further agree in case of detention or interruption of any of the cars or lines of your company, to bear the full amount of expense incurred by your company caused by such detention or interruption, also to pay all expenses for labor and material in case it becomes necessary to cut or remove any of the wire, track, or other property belonging to your company, or used by it in the operation of its cars. And I also agree to use the utmost dispatch in removing said building from its position, whereby it in-

terferes with or interrupts in any way the cars or lines of your company."

Following this, the superintendent of transportation on a suitable blank refers the matter to the division superintendent interested with the facts in the case, and requests an investigation and an estimate of what it will cost the company. The questions are: With what lines will such moving interfere? To what approximate expense will the company be put if such permission is granted? Do you recommend that such permission be given, and if so, upon what day and at what hour of the day will it be the least inconvenience you to have such building moved?

Form 164

Boston Elevated Railway Company.

Summary of Number of CAR CREWS used in Division No. in Month of

DATE	NUMBER IN SERVICE		Crews on Regular Cars	Crews on Regular Extras	Crews on Swing Extras	Crews on A. M. Trippers	Crews on P. M. Trippers	TOTAL Crews Used	SPARE FOR SUBSTITUTES		SUBSTITUTES USED		Number of Men Suspended						SICK	
	Condr's	Motors							Gen. Office		Ina Dept		Fire Dept		SICK					
									Cond.	M.M.	Cond.	M.M.	Cond.	M.M.	Cond.	M.M.	Cond.	M.M.		
1																				
2																				

FIG. 55.

The division superintendent having made his report, the superintendent of transportation decides whether the request shall be granted and if it is, the applicant is notified on a suitable blank and at the same time the superintendent of transportation, on a blank form, advises the auditor to that effect, and states the amount the applicant has deposited with the treasurer to cover the estimated cost to the company. After the building has been moved, and the wires restored, the auditor makes out a bill against the amount deposited, and when paid, if the cost is found to be less than the amount deposited, the balance is refunded to the applicant.

Some of the blanks used in the transportation department are shown herewith. Fig. 53 gives the headings of the division super-

intendent of time tables, whose duty it is to prepare, alter or revise the schedules for cars on each division. After being prepared, these schedules are submitted for approval to the superintendent of transportation and the vice-president, and when approved are issued on large sheets, being duplicated in sufficient numbers for posting in the lobbies of all the car houses. These reproductions are on plain paper, the sheets being usually 16 x 11 in. For the preparation of these sheets the matter is written by the typewriter on wax paper and from this duplicate copies are made on a rotary neostyle copy-press. A number of these duplicating machines or presses are used in some of the other departments as well.

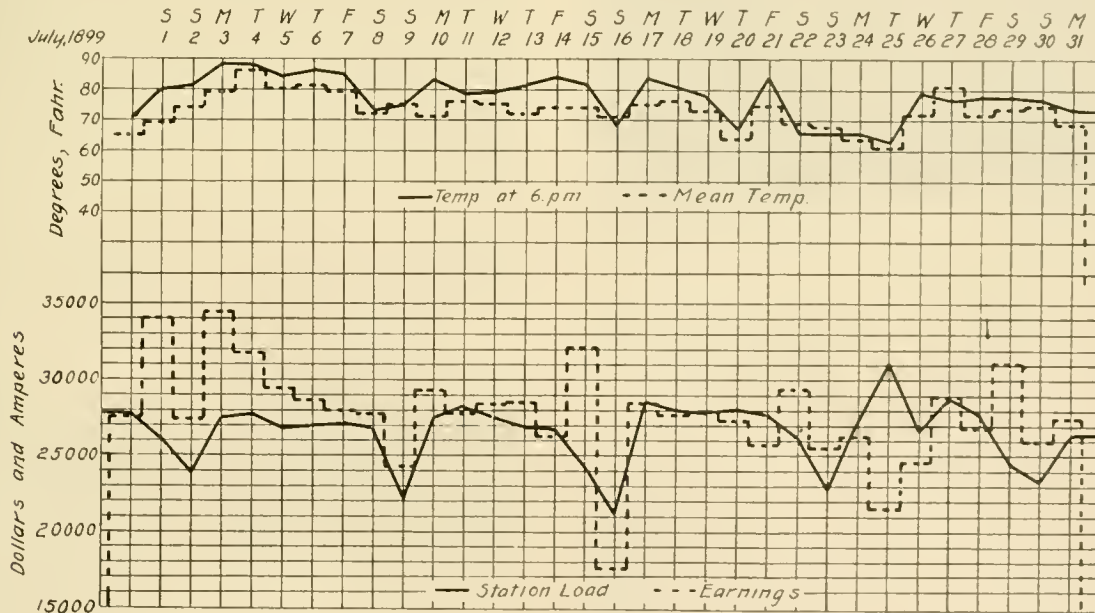


FIG. 56—A FEW DIAGRAMS FROM THE RECORD BOOK.

intendent's report of accidents; the totals from the division reports are transferred to a smaller blank with similar headings, which gives the summary of accidents for the whole system.

Fig. 54 shows an application for leave of absence; the original measures 3 1/4 x 7 1/4 in.

Fig. 55 is the upper part of the form on which division superintendents report the service of trainmen.

Besides the blanks and reports that show the results in the different departments, the vice-president has charts plotted for his own inspection, which present graphically the records of the different departments. The book of cross section paper in which these charts are plotted has pages about 17 1/2 x 13 in. printed in green with 10 lines to the millimeter, every tenth line heavy.

LOST ARTICLES.

Conductors send postal cards to headquarters describing any article found, besides making a report on suitable blanks. The receivers send in daily lists of articles with description. There is very little of value turned in that is not called for. Umbrellas are the principal items turned in to the lost article department, but few of these are of value; if they are, they are usually called for.

The directors of the company take a special interest in the Metropolitan Mutual Aid Association, organized among the men, and authorize the payment of all the expenses incurred for the operation of the society, the amount for some years being as much as \$2,300. All the money contributed by the men goes to the benefit funds. The membership numbers about 1,700, and the benefits are \$1,000

at death and \$5 per week for a term not exceeding 13 weeks for such as are off duty from sickness. The members are also entitled to free medical advice and treatment. The company bears all the expense of a ball for the men in winter and in summer gives them all an excursion. There is great harmony between the directors and the members of the association.

In the summer of 1899 the Boston Elevated Mutual Aid Association was formed for the purpose of caring for those employes of the road who may be incapacitated for work on account of sickness. It pays no death benefit, but pays \$7 a week for 14 weeks in case of sickness. The president of the road is one of its officers, and its expenses are paid by the road. The men pay 10 cents a week and a board of trustees chosen directly from among them award the benefits and decide all disputed claims. This association also provides for immediate identification and care in case of injury. The membership has steadily increased from the beginning until now it numbers about 2,500.

Mr. J. E. Rugg, the superintendent of the transportation department, has been engaged in the street railway business for 37 years, having first served as a conductor in 1863 on the Chelsea & Boston road, now known as the Lynn & Boston.

DEPARTMENT OF CIVIL ENGINEERING AND OF MAINTENANCE OF WAY.

These departments are so closely allied in relation to the track work that they will be treated under one head. The first mentioned is under the direction of Mr. Arthur L. Plimpton, civil engineer, and the latter is in charge of Mr. Richard Hapgood, with the title of superintendent of tracks.

The duties of the civil engineer as outlined in the printed regulations are as follows: "He shall have charge of the engineering,

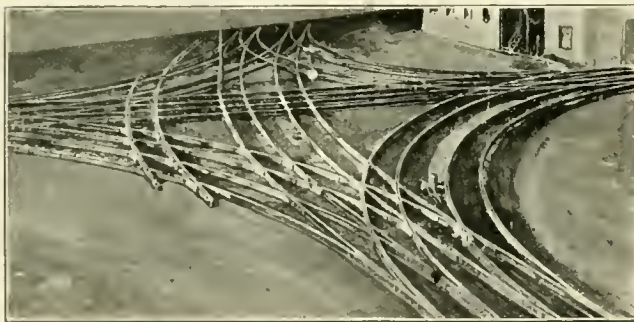


FIG. 57—SPECIAL WORK FOR DEWEY SQ.

plans and specifications for all matters connected with tracks of surface lines, shall prepare estimates, keep such records and make such reports as may from time to time be required. He shall also prepare such plans, specifications and estimates for buildings as may be required, and in general conduct all matters of civil engineering, connected with surface lines."

The duties of the superintendent of tracks are outlined as follows: "He shall have general charge of the repair, maintenance, inspection and construction of tracks and paving and the removal of snow from the streets. Division superintendents will be accountable to the vice-president, represented by the superintendent of tracks, for the inspection and care of tracks and paving in their several divisions, and will carry on such work and make such reports as he may direct or require. All appointments and discharges of division track masters and foremen in his department and all wages and salaries paid shall be submitted to the vice-president for approval before being effective. He shall perform only such work other than ordinary maintenance as may be authorized and shall keep such account and make such reports as may from time to time be required."

The department of civil engineering in the Boston Elevated System is of much greater importance and requires ability of a higher order in a city like Boston than any other city of its size in the country. This is because of the narrow and crooked streets and the necessity of designing special work to suit the very peculiar conditions that exist. The amount of work can be appreciated when it is stated that there are in the entire system over 600 pieces of special work.

The layout at Dewey Sq., opposite the new terminal station, is a particularly complicated one, including tracks running in all possible directions at a street corner and in addition a track of the Union Freight R. R., which crosses six of the street railway tracks. Fig. 57 is from a photograph of this crossing as assembled in the

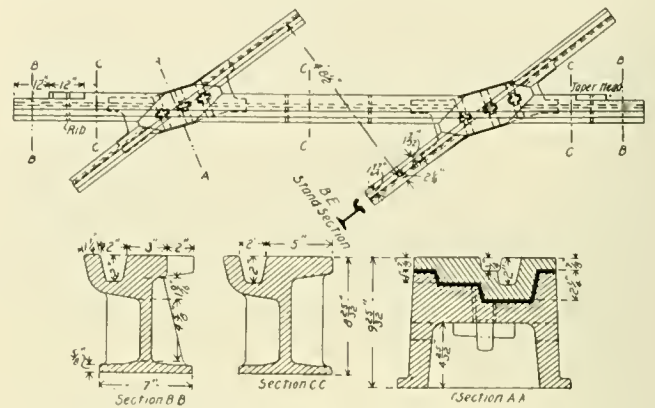


FIG. 58—CROSSING WITH CAST STEEL RAILS.

yards of the makers, Wharton & Co., before shipment. The freight track appears at the left in the illustration; the treads of these rails are 5 in. wide and through the crossing are of a guard section having a groove 2 1/4 in. wide by 2 in. deep. The Boston Elevated rails have a groove 1 1/4 in. wide and outside arms fitted to admit of the use of the company's standard joint fastenings. All outside arms are at least 4 ft. long; the sharp angles in the frogs are fitted so as to give a length of 4 in. to pave against. All curves are joined with the tangents by transition curves. The rails are all 10 in. deep with Wharton manganese steel centers.

The Boston Elevated Ry. also has considerable special work built by the Lorain Steel Co.

Fig. 58 illustrates a crossing in which cast steel rails are used. The crossing frogs have manganese steel centers which are held in place by keys, as shown in the section on A-A, so that they can be replaced when necessary. This is at Causeway and Charlestown Sts. and the Bridge, and was built by Wm. Wharton, jr., & Co.

Fig. 59 is the standard switch tongue bolt. The bolt has a T-shaped head and after being inserted in the bed casting is turned through 90° in which position the long arms of T prevent the bolt lifting. The shank of the bolt is square and so locked by the switch tongue that it cannot be pulled from the bed. The bolt is tightened from above, the cap screwing down over it.

The standard surface roadbed is shown in section in Fig. 60.

Fig. 61 shows the Churchill rail joint which is extensively used on the system and is giving satisfaction. The joint illustrated is

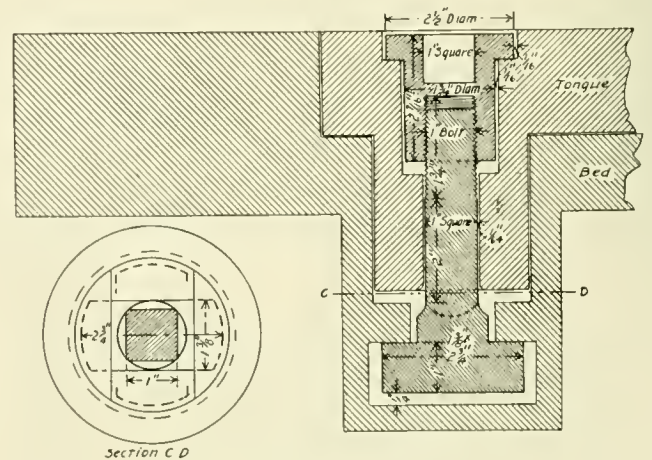


FIG. 59—SWITCH TONGUE BOLT.

for a 9-in. girder rail; the two side plates and the bottom plate are shown reduced to a scale one-half that of the end elevation. These joints are made by the Diamond State Steel Co., of Wilmington, Del.

Fig. 62 shows the joint designed by the civil engineering depart-

ment. This differs from most fish plate construction in that the top flanges of the plates extend beyond the edge of the rail head. For the inside plate oval holes about 1 5/32 by 31/32 are punched so as to fit tightly the oval neck of a sample standard 7/8-in. mild steel bolt. Circular holes in the outside plate are drilled to 1 1/16 in. diameter, except the bond holes, which are oval as shown. The centers of all holes are to be located exactly as shown in the drawing and the edges left without burrs.

In connection with the fish plates, the company is using a cold rolled steel bolt, on which the threads have been rolled into shape instead of being cut in the ordinary manner. It is claimed that these bolts are much stronger than those made by the ordinary process, a 7/8-in. bolt being equal in strength to a 1-in. bolt of the old style, and that they can be turned up so tight that the

hold under all conditions, the former light rods having given out under the heavy teaming traffic.

About 35 miles of track of 65-lb rail section was electrically welded at the joints about five years ago. All of this track was removed last year and renewed with a heavier rail. About 8,000 cast welded joints were put in last season by the Falk process, the company having bought a cupola and accessories for making cast welded joints.

The officials are not as well satisfied with asphalt paving as with that of granite blocks. The standard block for granite paving is 12 x 8 x 4 in. No border along the rails is used with asphalt paving, although it is the opinion of the civil engineer that a toothing of granite blocks or brick would be preferable. About 1 1/2 miles of brick paving has been laid as an experiment, but has not yet

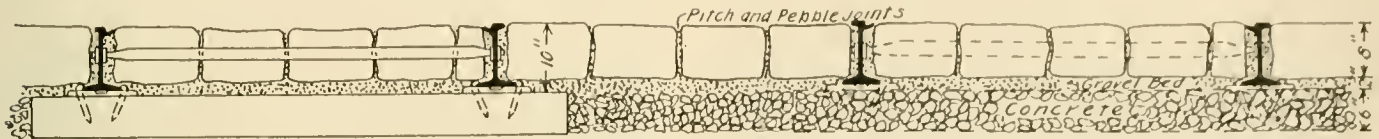


FIG. 60 STANDARD SURFACE ROADBED.

threads form a nut lock, so that they are not liable to work loose. The bolts are purchased from Sternbergh, of Reading, Pa.

The standard rail for the Boston Elevated Railway System is a 9-in. 95-lb. girder, rolled in 60-ft. lengths. On streets paved with asphalt a full grooved rail is used, and where the paving is of granite blocks and in other localities, a half groove section. A rail of harder material than formerly is now used, and the life of rails on Washington St., where the traffic is the heaviest, is about 6 years.

On some paved streets concrete is bedded between and over the ties and around the ends, and beneath the rail, thus thoroughly bonding the track to the street. Ties are placed 30 in. c. to c. On the reservations, where the soil and sod are above the ties, pine ties treated to a preparation of woodline, after the manner of the Pennsylvania R. R. practice, are used. In the subway, chestnut and hard pine ties are preferred. The dimensions of ties are usually 6 1/2 ft. long by 5 1/2 in. thick, with a 6-in. face. The ties generally last as long as the rail. The company is putting up an apparatus for treating ties with woodline.

A cast tie plate 1 in. thick is used, and is cast with three holes for the spikes; this thickness gives the requisite depth for the pav-

been down long enough to prove its advantage, as compared with granite. It is found that with the new rail construction the cost of maintaining tracks is not half as much as it was five years ago.

Hand drills are used for drilling the rails for bonding and among the other track tools are rail saws, made by the Q & C Co., of Chicago.

DEPARTMENT OF EMPLOYMENT.

The office of this department is located at 82 Water St., about two blocks from the company's general offices, and is in charge of Mr. A. W. Senter, superintendent, whose duties are thus outlined in the regulations: "He shall hire all employes for car service, shall instruct them, or cause them to be properly instructed in their duties and certify them when qualified to the several divisions. He shall carry on the work in his department in conformity to such regulations as may be established, and shall keep such record and make such reports as may be required."

The superintendent of this department and his clerks are required to give their entire time to hiring men and keeping their records and great pains is taken to secure only suitable men. The steps followed in the selection of men are about as follows:

The company has issued an open letter which outlines the requirements and duties of the employes and this being quite generally known, prevents undesirable men from making application. The requirements are that both conductors and motormen shall be not less than 21 nor more than 45 years of age. The eyesight and hearing must be perfect, and height not less than 5 ft. 4 in. for conductors and 5 ft. 6 in. for motormen. Applicants must be perfect as to their hands, not having lost any fingers or thumbs. In the case of conductors, it is required that they possess a common school educa-

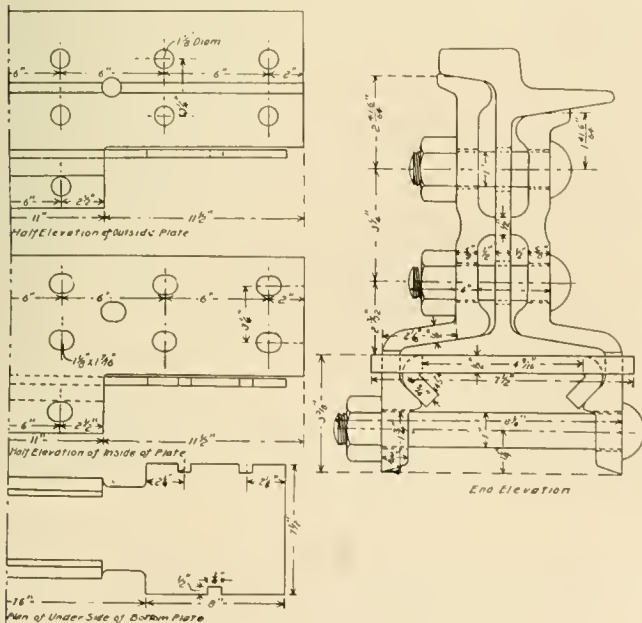


FIG. 61—CHURCHILL RAIL JOINT.

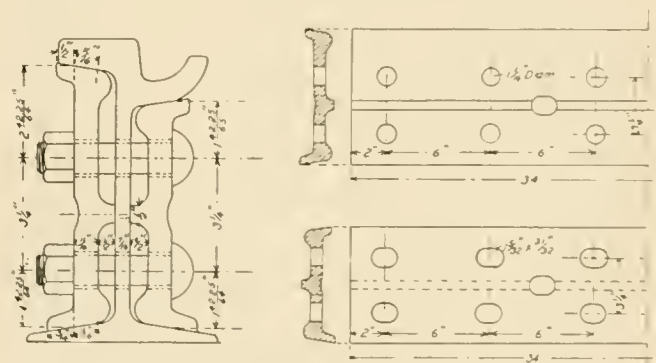


FIG. 62—STANDARD B. E. JOINT.

ing. Brace plates are used when necessary on special work and curves. Tie rods are spaced 5 ft. apart and are usually heavy, weighing 20 lb. each, the cross section being 2 1/2 x 2 1/2 in., and so upset at the ends as to give a full inch in diameter for the thread. The weight of tie rods has been gradually increased from 9 lb. in weight, used eight years ago, to the present size; they are now found to

tion, and they are required to furnish a bond with two real estate owners as sureties, each in the amount of \$300. Motormen must be able to read and write the English language, but no medical examination is required. Applicants appear in person and the superintendent of this department sizes them up as to general appearance, cleanliness and deportment. If they make a favorable impression in

manner and address and appear to have an honest purpose in applying for the position, they are allowed to register for further examination. The records show, however, that only about 13 per cent of the applicants receive appointment. On being tested for eyesight and hearing, and names of references taken, the applicant is given a blank which he is required to fill in, sign and swear to. This application, which is shown reduced in Fig. 63, contains the representations of the applicant as to various matters deemed pertinent by the superintendent. The references given in the application are then written to or visited and if satisfactory replies are received,

Next the pupil is put on the car and taken by the chief inspector to a side street, where he is put through a severe drill. He is tried on emergency signals, on reversing and backing cars and must demonstrate his ability to handle a car without abusing the apparatus and without an undue waste of power. This instruction is given no faster than the pupil is able to grasp it and care is exercised not to confuse him with a jumble of ideas. After being thus instructed in the division, he is sent back to the employment department office for examination upon the rules, on running and handling of cars, and the proper way to use the rheostat, controller and brake; he is also examined about how to cut out motors and how to make repairs. Then, upon a dummy car platform provided in the office, he is required to demonstrate the points upon which he is supposed to have been instructed. Some of the open cars are operated by the old half circle rheostat and handle. This explains why the men are instructed in handling this type of controller. Should the applicant be unable to pass this oral examination, he is sometimes given a second trial, but is rejected if he fails in this second trial. If, however, he passes a satisfactory examination, he is given employment on 60 days' probation and during that time he carries a letter of advice, shown reduced in Fig. 64, which gives his name, number, date of appointment, date of examination, and when his probation expires, and on this the instructors are required to note his conduct and their estimate of his ability to perform the duties required of him. At the end of 60 days if the reports are favorable, and the division superintendent considers him a suitable person to be employed, he forwards a recommendation for permanent appointment to the superintendent of transportation, who, if he approves the recommendation, forwards it to the department of employment, where it is filed with the man's examination papers. While on probation or on the extra list, they receive regular pay, but no pay while breaking in. While on probation, the applicant is required to wear a regulation cap and badge, but is not required to purchase a uniform till his time of probation has expired. The men are allowed to buy their uniforms where they like, provided that they conform to a certain style as given in the regulations for clothing and printed and illustrated in the book of rules.

Boston Elevated Railway Co.

APPLICATION FOR EMPLOYMENT.

BOSTON. 189

SUPERINTENDENT EMPLOYMENT DEPARTMENT

Dear Sir:— I hereby make application for a position as _____
in the service of the Company, with the full understanding that in the event of my securing employment I am to abide by such
rules and regulations governing its employees as the management may from time to time establish.

If employed I promise to loyally and faithfully serve the Company, and to do all in my power to further its interests
To conduct myself honestly, soberly, and with proper obedience and respect to its officials, and courtesy to passengers and the
public.

Age _____ Where born? _____
Married or single? _____ General condition of health _____

Employed the past five years as follows: _____ Reasons for leaving: _____

Previously employed by Railroad and Railway Companies as follows _____

Have you ever been convicted of a Misdemeanor or Felony? _____

Section of road preferred _____

Are you now using intoxicating liquors? _____

(Full name of applicant) _____
(Residence) _____
(P. O. Address) _____

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF SUFFOLK.
Boston. 189

Then personally appeared the above named _____
and made oath that the foregoing is true to the best of his knowledge and belief.

Justice of the Peace.

FIG. 63.

he is accepted as an applicant and put on the waiting list. It will be noted that the applicant has to give a satisfactory account of his business life at least five years previous.

When a vacancy occurs a man on the waiting list is notified by mail when he can report for instruction and breaking in. On reporting, he is furnished with a badge and is assigned to a division for instruction; at the same time he is given a book of rules which he is expected to study carefully with a view of passing an examination on the subject. Conductors and motormen are provided with another book which gives the running time and the routes of each particular division. The routes are numbered and terminals named, and all the intermediate streets are given with the running time from start to finish and the running time between different points with the total minutes up to certain points, both for the in and out trips.

If the applicant is a candidate for the position of motorman, he is placed in the hands of a competent motorman in regular car service, and is allowed to ride around with him and observe how to handle the brake and controlling mechanism and to become familiar with the bell signals; he is then allowed, under the direction of his instructor, to handle the car himself. He remains with his instructor about nine days, and if he shows himself apt in handling the car, he runs a trip or two on each route in the division, and each man who has him in charge has to vouch for his efficiency. He is then taken by the chief inspector of the division to the "pit room" where he is shown under a car and the working of the brakes explained. Next he is instructed how to cut out motors, put in fuses and make such slight repairs as may be made on the street when there is no chance of delaying the traffic. Care is taken not to teach the motormen too much about repairs, as they are liable to block the street if they attempt it, the rule being that they should have the car pushed or towed home if it is disabled.

In the case of conductors, they are instructed in their duties about as follows: If the applicant is unfamiliar with the city, at least one day is given to teaching him how to give the signal bells, and he is not allowed to collect fare until he is thoroughly proficient in the use of signals. If he succeeds in bell ringing to the satisfaction of his instructor, he is allowed to collect fares on the second day. The method of doing his work is then explained to him and he is closely watched as to the manner in which he performs his duty. If he makes an error in registering, or in making change, selling tickets or in the receipt or issue of checks and transfers, he is corrected as to his failures. He is instructed to make his first collection as soon as possible after leaving the starting point and taught to be prompt in the collection of fares from passengers who board the cars at intermediate points. He is also instructed to call the destination of the car when necessary and the principal places along the

BOSTON ELEVATED RAILWAY COMPANY.
BUREAU OF SURFACE LINES.
NOTICE TO INSPECTORS, FOREMEN AND STARTERS.

Conductor No. _____
Motorman No. _____

Appointed _____ 189 _____
Turned in _____ 189 _____
Probation expires _____ 189 _____

You will make it your duty to post yourself as to the work this man is down for each night, and carefully observe his performance of the same, also his general conduct, particularly his habits, reporting his qualifications, etc., for a permanent appointment before expiration of probationary period.

(Signature) _____

FIG. 64.

route and to announce the streets in a clear and distinct voice. At the close of the day he is instructed as to how to make his returns and to use a day card for each separate run with the cash and checks properly credited to the route upon which they were taken. He is then instructed as to how the deposit is returned in the safe and signs his deposit slip before leaving the station. As time goes on, he is instructed in time tables, and how to fill out accident reports and such other blanks as he may be required to carry, and is also instructed in regard to certain rules with which he must show himself familiar. In this way he gradually acquires a thorough knowledge of his duties.

Instructors are notified on suitable sheets that before they turn in a pupil they must be sure he understands the use of the daily lists, the time tables, and the principal duties on which they are to report are summarized as follows: Method of collecting fares, selling and receiving checks, announcing destination of car, calling streets, making up day cards, making up trip sheets, accident reports, rules and regulations, the use of the daily lists, and the use of time tables.

Instructors are cautioned not to turn in incompetent men as it reflects on their own ability. The period of instruction for conductors is about a week, when they are sent back to the employment department where they are required to pass a written examination upon the rules, and this is supplemented by oral questions, relating to the enforcement of rules and such other points as may occur to the superintendent of the department. If he passes a satisfactory examination, the applicant is appointed in the same manner as the motorman. This rigid system of selection results as a rule in securing competent, intelligent and urbane employes.

Not many applicants are found who have had experience on other roads. They are accepted, however, if they show a good record with the roads where previously employed. In conducting the affairs of the department of employment, the library card system is used, and the cards of men who have been discharged are all retained and kept on file for future reference. By this system of selecting and training employes no man can be put to work upon the request of the president, directors or any officers of the company, and only those who can comply with the requirements are selected.

By this system of selecting employes, the superintendents and other officers are relieved from all annoyances from would-be applicants and from the duty of examination and passing upon the qualification of the men.

The book of rules and regulations mentioned, which is supplied to conductors and motormen, has been very carefully prepared and is thoroughly indexed; no penalties are attached to particular offences. In the back of the book space is given to presenting such extracts from the Boston Police Manual as refer to the licensing and conduct of street railway employes. The book also contains the revised regulations of the Board of Aldermen, relating to street railways and also the public statutes of Massachusetts in regard to railway crossings, passing cars, the requirements of the Board of Railroad Commissioners, with penalties for infringement. There are also given the regulations of the Railroad Commissioners relating to the heating of street railway cars, and a general police order which reads as follows: "Complaints having been made of annoyances to passengers on street railway cars by intoxicated and disorderly persons, the police force is hereby instructed to respond to all calls for assistance from conductors and others in such cars to take such action in each case as in the judgment of the officer may be necessary for the safety and comfort of passengers."

The preface to the book of rules contains instructions and cautions as follows:

"For any violation of these rules, neglect of duty, or action adverse to the company's interest, an employe will, in the discretion of his superintendent, be suspended or discharged.

"Every employe whose duties are in any way prescribed in this book, is required to have a copy of it constantly in his possession when on duty and to make himself perfectly acquainted with the whole of it. Employes must strive carefully to perfect the discipline and increase the efficiency of the service. They must report any misconduct or negligence which may come to their knowledge, detrimental to the interests of the company.

"Employes must bear in mind that they are engaged in a public service, in which they are constantly called upon to exercise great patience, forbearance and self control. Politeness and courtesy continually practiced by employes will prevent controversy and complaint, and greatly benefit the service. In addition to these rules, general orders will be issued as occasion may require and posted in the station order book which all employes must examine each day. A general order, whether in conflict with these rules or not, which may from time to time be given by proper authority, will be fully observed so long as it may remain in force.

"If in doubt as to the meaning of any rule or order, application must be made at once to the proper authority for explanation. Ignorance will not be accepted as an excuse for neglect or omission of duty. In all matters, whether covered by these rules or not, em-

ployes are expected to use good judgment and discretion. In case of doubt, take the safe course.

"Every employe must promptly obey all instructions received from his superiors and is required to look after and be responsible for his own safety and to exercise the utmost caution to avoid injury to the public.

"Special attention of all employes is called to the provisions of the 'Public Statutes of Massachusetts,' the 'Regulations of the Board of Aldermen,' and the 'Rules of the Police Commissioners of the City of Boston,' which last are printed in full at the end of this book."

While penalties are not usually assigned to specific infringement of rules, it is the practice of the superintendent of transportation to discharge motormen whenever they are reported as having had a collision with another car the second time, no matter how slight the damage.

BUREAU OF AUDIT.

This department is not listed among the departments in charge of the vice-president as given elsewhere, but is conducted under the supervision of Mr. H. L. Wilson who is responsible directly to the president and board of directors. The offices of this department occupy the entire fourth floor of the department building and are elaborately furnished with all the necessary desks, cabinets, cases, and safes for the care and handling of the records. The clerical force consists of 34 clerks, all but three of whom are men. Three women stenographers and typewriters are employed. In the conduct of the business, the library card system prevails and so systematic is the organization that the work of the department is now conducted with only one additional clerk to the number formerly employed by the West End company before the lines were leased to the present company, although the business of the department has increased nearly 50 per cent. For readily shifting the heavy books, some of the shelves in the large safe are provided with iron rollers so that the books can be easily slid in or out of place. Some idea of the detail work which this department is required to handle can be formed when it is stated that last year the department paid 12,846 vouchers. The company furnishes blanks on which all bills are made, so that the vouchers are all uniform and can be filed in uniform packages. The pay rolls amount to from \$75,000 to \$110,000 per week. By a state law, the company is required to pay the employes weekly. Every man is required to sign his name on the pay rolls as a receipt for his money and these rolls are all bound and kept on file. The number of different report blanks which are prepared and furnished by this department and from which returns are tabulated is over 400. On an average, over 3,000 records relating to the operation of the lines are received at the auditor's department daily.

A very elaborate and complete method of accounting is required on the system of the Boston Elevated Railway Co., for the reason that all the property used in connection with the surface lines has been leased from the West End company. One feature of the records that is of special interest is the inventory record of real estate and all property that the West End company turned over to the Elevated company. These inventory ledgers comprise five large volumes and the method employed is unique and interesting. The first volume is that of the real estate and gives a record of all power houses, car houses, shops and tenement houses belonging to the company, and in connection with each item, there is first a written description on carefully prepared typewritten sheets, and the detail description includes each floor of the buildings. Next follows a ground plan in colors after the manner of keeping real estate records and shows the dimensions of the lots and the buildings and the plan of each floor. Next follows a photograph of the building.

Volume 2 is a record of the track construction, electric line equipment, power station equipment and subway equipment. This is carefully indexed and shows the kind of rail that is used on every street in each of the cities and towns through which the lines run, giving the length in feet, description, and the kind and condition of pavement; there is also a sectional drawing of every kind of rail on the road that existed when the company took possession of the lines. Following this is a description of the different types, and also each piece of special work with a drawing showing the general type of special work, and also the location of each piece, by whom made, when put in, type of rail and the number of feet. There are also separate illustrations, of all girder rail special work, all T-rail

special work, and all the special work of tram rail. The inventory of line equipment gives for every street on the system, the size and kind of trolley poles, these being alphabetically arranged by streets, cities and towns. There is also a sketch of the poles in which the dimensions and weight are given. The switch boxes, insulating material, a record of single and double trolley wire, single brackets, double brackets, and span wire, and all the different sizes of feed and return wires and type of wire are also given. A grand summary, showing everything in tabulated form by cities, and towns follows. There is also a statement of underground conduits and cables giving location, length of trench, length of conduit, average number of ducts, and number of feet of ducts, number of connections and manholes, also number of feet of each size of feeder cable and underground returns. This is followed by the submarine, bridge cables, together with the switches and the number of feet and size of wire on bridges. The same volume also contains a description and illustration of all the power station equipment.

Volume 3 contains an inventory of cars, motors, trucks, controllers, and car equipment and also the miscellaneous vehicles. The number of every car is given; when built, by whom, style of car, and a photograph of one of every lot of cars. Then follows a description and drawings of all the different types of trucks, also a description of all the motors, together with controllers, all spare parts, armature spools, etc. The vehicles of all kinds, including coal cars, sprinklers, sleighs, snow plows, etc., are described and illustrated.

Volume 4 is a record and description of the machinery and tools in all the manufacturing and repair departments, together with the furniture and fixtures of the buildings, also a record of horses and harnesses, and in connection with the horses, the register number and age as well as the description are given. The miscellaneous department includes all office furniture, and all tools and machinery of the entire system with location.

Volume 5 describes the material and supplies on hand.

A card is provided for every vehicle showing where it is to be found and all the information about it. The power station expenses are kept on cards, with a record of the coal and oil, there being a card for a record of 12 months, and the different years are so arranged that comparisons are readily made. The card record shows the power consumed for operating the car for lamps and for heaters. A card is provided for the transfer tables, one for the stationary motors and one for the armature record. This armature record shows when the armature was received with all repairs that have been made to it with their cost, number of the car on which it has been run, and cause of removal in each case. The motor records are also kept on cards, give the car number, the date put under the car, the date on which removed and cause of removal. By this record, the relative economy of the different type of motors is readily found. By the system of reports and accounting used, the auditing department is able to know the cost of any particular piece of work, and can tell the different repair departments what they can do under certain conditions. Twice a month, a report of the receipts per car-mile is made up.

In the auditing department is a ticket chopping machine driven by an electric motor, which is designed to cut up into fine pieces all checks and transfer tickets. This machine is provided with a hopper into which the tickets are thrown and the small pieces are delivered into a large willow basket, and then as scrap they are sold to paper dealers.

DEPARTMENT OF WIRES AND CONDUITS.

Mr. Charles H. Hile is the superintendent of this department and the regulations prescribe his duties as follows: "He shall have general charge of the inspection, care, maintenance and construction of all poles, trolley wires, feeder wires, conduits, cables and return wires (except track wiring) and of the testing of wires, cables, switch boxes, etc.

"Division superintendents will be accountable to the vice-president represented by the superintendent of wires, for the inspection and care of wires, performed by the emergency crews in their divisions and will carry on such work and make such report as he may direct or require. He shall perform only such work of new construction as may be authorized and shall keep such accounts and make such reports as may from time to time be required."

The office of the superintendent of this department is located in a large wooden building near the central power station and here is stored a large quantity of feed wires and other supplies for the con-

duct of the department. Wagons and drays are provided for the shifting and handling of the material and a suitable clerical force is provided for keeping the accounts. A very complete set of testing instruments is also provided and is part of the equipment of this department. The frequency and method of tests of feeders and electrical machinery have already been described.

DEPARTMENT OF INSPECTION.

The superintendent of this department is Mr. Clarence E. Learned. This department receives more attention than is usually given to work of this kind by street railway companies. The method of keeping the record of the men and the record of the open and secret inspection is kept by a code system which is very complete but which must be seen to be understood. The work of the department is considered highly essential and results in a high class service.

DEPARTMENT OF BUILDINGS.

The regulations prescribe that the superintendent of this department shall have charge of the inspection, repairs, maintenance and construction of buildings, and shall report hereon to the vice-president as may be required. The present incumbent is Mr. Marrett I. Paine with the title of superintendent of buildings.

PURCHASING AGENT.

All buying is done by the purchasing agent, Mr. Henry F. Woods, upon proper requisitions, duly approved. No official or employe of any department in the bureau of surface lines is authorized to make any purchase or to contract any debt or incur any obligation, other than for the employment of labor as may be authorized in the regular transactions of the business of the different departments, except when specially authorized by the vice-president or in case of emergency, as referred to in the case of snow work. All debts contracted in emergency are required to be promptly reported to the vice-president with the correct bill duly approved. All heads of departments are cautioned to exercise foresight in making requisitions for stores and materials so that ample time may be given for the consideration of the requisition and purchase of the material.

In connection with the department of motor power and machinery, should have been mentioned the drafting department, which is under the supervision of Mr. Howard P. Quick, with the title of chief mechanical draftsman. This department is located on the second floor of the machine shop building and is provided with all the appliances and furniture usually found in departments of this kind. Besides the draftsmen, an expert photographer is employed who makes photographs of all cars, machinery buildings, etc., that may be required. In this department originate all the designs for cars, trucks and special cars, as well as all the machinery for power station equipment. Formerly the department was responsible for the design of buildings, but this work has now been assigned to the civil engineering department.

There is also in this department, an inspector of motor car repairs, Mr. William S. Collins. The office of the inspector is in the repair shop, where he is to be found every morning until 9 o'clock, when he drives on his rounds to the different car houses, which are all visited once in 10 or 12 days. Besides the repairs to motors, the inspector of this department looks after the condition of the pit rooms, and is also responsible for the cleanliness of all the car houses and the method of storing and caring for the supplies that are delivered to the different car houses.

In closing this article on the Boston Elevated Ry., the writer wishes to express his appreciation for the favors and courtesies shown him by the officials, the superintendents and the foremen of the different departments.

EMPLOYEES' CLUB AT BIRMINGHAM, ALA.

The Electric Club, recently organized among the employes of the Birmingham (Ala.) Railway & Electric Co. for temporary campaign purposes, has decided to make the organization permanent and add social, literary and benefit features. The officers of the company have given the men their hearty support and it was determined that the president, general manager and treasurer of the company shall be ex-officio president, vice-president and treasurer, respectively, of the Electric Club. Under this plan the officers of the club are: President, A. M. Shook; vice-president, J. B. McClary; treasurer, Edward Warner.

THE ELECTRIC RAILWAY FROM PALERMO TO MONREALE.

The Continental Electric Co., of Nuremberg, Germany, has recently completed an electric railway between Palermo, the capital of Sicily, and Monreale, a town of 19,000 population, and on a portion of the line has installed a very interesting counterweight system. Formerly what we may call "rapid transit" between Palermo and Monreale ended at Rocca, a small suburb about three miles from Palermo, situated at the end of "the Chaussec" which runs in a straight line to the foot of the mountain on which Monreale lies. From Rocca the highway ascends a steep, winding grade. The highway was not available for the electric railway and a direct route was chosen which involved a rise of 433 ft. in 3,600 ft. Below this grade is one of 8 per cent for 3,600 ft., and at the upper end a grade of 6 per cent for 2,600 ft.,

Instead of using a rack rail for surmounting this grade, a counterbalanced cable system wherein electric motors on the car provide the traction power, was designed, which, we believe, is quite

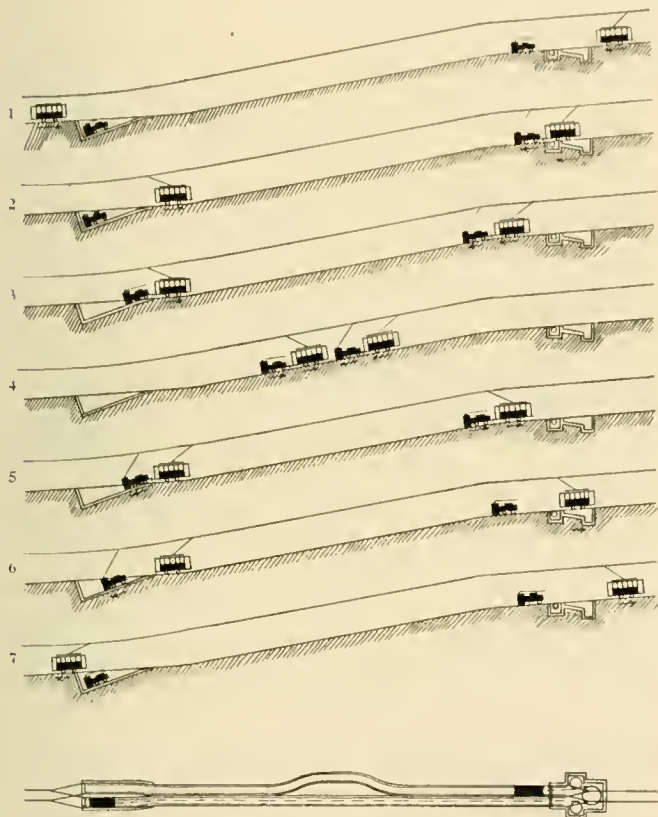


FIG. 1—DIAGRAM OF OPERATION.

a novelty for electric roads in Europe, though in this country there are several examples of such installations, as for instance, the Bronsdon counter weight systems used in St. Paul and in Providence, and the Mt. Tom electric cable railway near Holyoke, Mass.

The passenger cars are of 1 meter (39.37 in.) gage and on the steep grade a double track with turnout is laid; these two tracks have one rail in common, making only three rails except at the turnout where the middle rail branches, as shown in the plan view, Fig. 1. The object of making a three-rail track instead of a two-rail was to avoid switches and simplify the arrangement of the cable. Between the rails of each of the two tracks is laid a track of 58 cm. (22.8 in.) gage, on which the counterbalance locomotives or "brake cars" run. The two brake cars, one on each narrow track, are connected by a wire cable which passes over a sheave at the upper end of the grade, and are thus balanced one against the other; they get the name "brake cars" from the fact that they are equipped with automatic tooth-brakes, as well as with electric motors.

The difficulty of constructing switches to permit the passenger cars to pass the brake cars at the foot of the grade, led to the introduction of a most unique feature, that of running the brake car into a pit and letting the passenger car pass over it. The operation will be understood from Fig. 1, which shows the cars in

seven position. In 1 the up-bound car has arrived at Rocca from Palermo and the down-bound car at Monreale is ready to descend; the lower brake car is in the pit. At 2 the up car has crossed the pit and stopped; the down car is coupled to its brake car and the trolley pole of the latter is adjusted. At 3 the down car has proceeded far enough to draw the other brake car from its pit when it is coupled to the up car. At 4 the two trams meet at the turnout. At 5 the cars are uncoupled from their respective



FIG. 2—PIT AT ROCCA.

brake cars. At 6 the lower brake car is entering its pit. At 7 the down car has crossed the pit on its way to Palermo.

It will be noted that by this ingenious arrangement the passenger cars are kept always on the upper side of the brake cars while on the grade and the danger from a failure of the coupling eliminated.

The weight of the passenger car is about 10 tons and that of the brake car 7½ tons.

Fig. 2 shows the car crossing the pit at Rocca, the lower end of the cable section. Fig. 3 is a view of the road crossing the valley.



FIG. 3 CROSSING THE VALLEY.

The advantages claimed for this system by the builder are: ability to ascend steep grades; minimum loss of time in connecting to cable; safety; simplicity of operation; narrow gage may be used; speed may be maintained on the grade; freight vans may be carried.

Just as a car on the Cincinnati, Newport & Covington road was crossing the line between Ohio and Kentucky, one day last month, two of the passengers—a young colored couple, were united in marriage by a colored preacher. Nobody knows in which state the ceremony was performed.

ENGINEERING IN CHINA.

An article that will not fail to be of interest to anyone who has ever considered China as a possible field for engineering labors, or for the introduction of American material, appears in the April issue of Cassier's Magazine. The author is Mr. G. James Morrison, who has been prominently engaged in railroad construction work in the Orient for a number of years, and is therefore qualified to speak with authority on the conditions under which engineering enterprises must be carried out among the Chinese,—a people, who while boasting of a civilization thousands of years old, honestly believe the common welfare of the nation demands that nothing be done to change the habits or customs of its citizens. Mr. Morrison first briefly reviews the often described mining, agriculture and commercial resources of this land, whose undeveloped riches are almost beyond conception, but then abruptly departs from the opinion usually maintained by writers on China, who hold that the best way to remedy the abuses and evil conditions they all recognize as existing is to approach the government itself, point out the abuses and suggest remedies. The author thinks that success in nullifying the evils that must be overcome before this vast territory can be opened to the improvements of modern civilization, particularly in the line of building railroads and tramways, is most likely to attend the efforts of those who are prepared to take China as it is, be thankful for the most meagre concessions at first, and gradually overcome the prejudices of the oriental mind without appearing to do so. It will be slow uphill work but Mr. Morrison believes the results will justify the labor.

In conclusion he says: "All who wish to succeed in China must be self-reliant,—they must trust as little as possible to government assistance, they must be prepared to accept the country as it is, and also its government, which, with all its defects, consists principally of men whose honest and patriotic belief is that European civilization is unsuitable to their empire; whose habits can be altered only by slow degrees; and whose modes of action result in what to European eyes is obstructiveness of the most determined type. While China will for years to come provide a field for engineers and engineering enterprise, it is neither going to be opened up nor broken up with the speed that many people seem to expect."

STREET RAILWAYS OF RHODE ISLAND.

The following data concerning the street railways of Rhode Island are taken from the annual report of the Railroad Commissioner, Mr. E. L. Freeman, which covers the year 1899. The reports submitted by the companies are for the year ending June 30, 1899.

There are 13 street railway companies organized in the state, one more than in the preceding year, of which 10 are in operation. These 10 have 183 miles of road in the state with 213 miles of (single) track, and own 580 motor and 152 other cars.

The capital stock aggregates \$10,982,000, an increase of \$70,000 over the preceding year. The funded debt is \$1,015,200, an increase of \$203,000; the floating indebtedness is \$718,335, an increase of \$218,315. The total of property and assets, as reported, is \$13,296,331, which is over \$580,000 in excess of capital stock and indebtedness.

During the year ending June 30, 1899, the total receipts were \$2,266,172, an increase of \$237,479 for the year; total expenditures, including interest and taxes, were \$1,428,888, an increase of \$211,502. The whole number of passengers carried was 44,603,401, an increase of 4,623,401 for the year. The number of employes is 1,320, which is 104 more than in 1898.

There were 49 accidents reported to the commissioner as occurring in connection with the street railways, in which 4 persons were killed and 84 more or less injured. Of those killed, 2 were crossing the tracks in front of cars; 1 was a woman lying beside the track; 1 was an employe, killed in collision of cars. Of the 84 injured, 42 were passengers; by collision of cars, 16; by cars jumping tracks, 10; by getting on or off cars, 11; knocked from running board by tree or car, 4; by breaking of car platform, 1. Of the other 42 injured, 20 were by collision of cars with teams; 12 were persons who were crossing tracks in front of cars; 3 by collision of cars and bicycles; 7 were employes, of whom 4 were injured by collision of cars, 2 by cars jumping tracks, 1 by falling from car.

Seven of the street railway corporations paid dividends as follows:

- Union Railroad Co., Providence, 8 per cent.
- Pawtucket Street Railway Co., 8 per cent.
- Newport Street Railway Co., 7 per cent on \$30,000 preferred.
- Providence Cable Tramway Co., 6 per cent.
- Interstate Consolidated Street Railway Co., 6 per cent.
- Pawcatuck Valley Street Railway Co., 2½ per cent.
- Newport & Fall River Street Railway Co., 3 per cent.

Tables 4 and 6 give data for the various railways of the state. It should be noted that the total expenses include taxes and interest.

TABLE NO. 4.—Showing Names of Corporations Capital Stock paid in, Funded Debt, Floating Debt, Total Indebtedness Total Receipts, Expenditures, and Net Earnings for the year ending June 30, 1899.

NAME OF CORPORATION	Capital Stock paid in	Funded Debt	Floating Debt	Total Indebtedness	Receipts	Expenses	Net Earnings
Union Railroad Co., Providence	\$8,200,000 00	\$25,000 00	\$189,651 75	\$214,651 75	\$1,712,818 87	\$2,78,975 48	\$78,848 99
Pawtucket Street Railway Co.	500,000 00	20,000 00	20,000 13	40,000 13	142,850 73	93,258 10	48,992 63
Woonsocket Street Railway Co.	140,000 00	155,000 00	162,804 68	317,804 68	67,962 43	66,575 69	—4,992 94
Newport Street Railway Co.	107,000 00	80,000 00	18,217 24	98,217 24	53,007 15	16,801 92	6,000 88
Providence Cable Tramway Co.	300,000 00	240 00	240 00	480 00	18,000 00	18,000 00	18,000 00
Interstate Con. Street Railway Co.	380,000 00	150,000 00	127,818 10	277,818 10	146,119 42	117,823 48	28,295 94
Pawcatuck Valley Street Railway Co.	75,000 00	100,000 00	11,500 00	111,500 00	17,328 13	14,413 45	8,112 70
Pawtucket Valley Electric Street Railway Co.	400,000 00	185,500 00	156,103 27	341,603 27	42,933 92	41,833 47	1,100 45
Newport and Fall River Street Railway Co.	250,000 00	240,000 00	89,002 30	329,002 30	70,835 73	65,037 18	5,798 55
*Sea View Railroad Co.	60,000 00	0 00	0 00	0 00	3,605 27	2,865 40	820 87
†Cumberland Street Railway Co.	70,000 00	70,000 00	0 00	70,000 00	0 00	0 00	0 00
‡The Block Island Electric Light and Transportation Co.	0 00	0 00	0 00	0 00	0 00	0 00	0 00
Total	\$10,982,000 00	\$1,015,200 00	\$718,335 10	\$1,733,535 10	\$2,266,172 89	\$1,428,888 63	\$836,284 14

* Road partly built, and commenced operating on July 1, 1896. † Road built, but not operated. ‡ No return made.

TABLE NO. 6.—Showing Date of Organization, Miles Road, Number of Motor and other Cars, with Total Number of Passengers Carried for the year ending June 30, 1899, and Increase or Decrease over previous year.

NAME OF CORPORATION	Date of Organization	Miles Road in R. I.	Miles Single track in R. I.	Number Motor Cars	Number other Cars	Number of Passengers Carried	Increase over last Year
Union Railroad Co., Providence	February 2, 1865	85.816	112.539	395	78	83,997,224	2,182,456
Pawtucket Street Railway Co.	July 16, 1885	17.887	19.969	46	5	2,847,927	168,638
Woonsocket Street Railway Co.	June 4, 1886	17.12	17.25	21	10	1,143,844	81,946
Newport Street Railway Co.	July 30, 1888	4.01	4.17	15	4	963,027	168,035
*Providence Cable Tramway Co.	Incorporated, 1884 Road built, 1886 Opened Jan. 1, 1890	2.927	3.293	82	28	0	0
Interstate Consolidated Street Railway Co.	May 1, 1891	4.750	4.973	25	17	3,900,964	228,840
Pawcatuck Valley Street Railway Co.	May 25, 1893	6	6	7	0	332,547	31,240
Pawtucket Valley Electric Street Railway Co.	July 23, 1893	10.748	11.158	9	2	858,553	297,964
Newport and Fall River Street Railway Co.	January, 1894	14.79	15.48	26	4	1,403,655	434,568
†Sea View Railroad Co.	July 28, 1897	12.00	12.00	6	4	72,905	78,905
†Cumberland Street Railway Co.	March 11, 1898	7.91	7.00	0	0	0	0
‡The Block Island Electric Light and Transportation Co.	0	0	0	0	0	0	0
Total		183.038	213.827	580	152	44,603,006	4,623,401

* Operated by Union Railroad Co. † Part of road built, but not started till July 1, 1896. ‡ Road built, but not operated. § No return made.

Nearly all the street railways of the state have accepted the provisions of Chapter 580 of the Public Laws (St. Ry. Rev., Mar., 1899, p. 198) by which they pay an annual tax of 1 per cent of the gross earnings and an amount equal to all dividends in excess of 8 per cent, in lieu of all other state taxes. (By this act the burdens imposed on the roads by cities and towns may not be increased without the consent of both parties.)

The Union Railroad Co., of Providence, added 7.745 miles of track to its system, and enlarged its car house and power station capacity.

The Rhode Island Suburban Street Railway Co. was organized during the year and acquired by purchase the property of the Cumberland Street Railway Co., 7 miles; that of the Pawtucket Valley Electric Street Railway Co., 11 miles; the Oakland Beach branch of the New York, New Haven & Hartford, 10 miles, and the Barrington, Warren & Bristol road. This company has built a sub-station at Riverview and will take current from the Union Railroad Co., transmitting on by the three-phase system.

The total mileage of the Union Railroad Co., the Pawtucket Street Railway Co. and the Rhode Island Suburban Railway Co., all of which are controlled by the United Traction & Electric Co., is 173.12 miles.

The Holland & Lake Michigan Electric Railway Co. resumed operation over the Saugatuck branch on April 11th, the first time cars have been run since the destruction of all the company's rolling stock by fire on January 10th last.

New York twins born the day ground was broken for the rapid transit tunnel were named respectively William Rapid Transit and Robert Rapid Transit Behrend, after Mayor Robert A. Van Wyck and Chief Engineer William B. Parsons.

MEETING OF THE SOUTHWESTERN ASSOCIATION.

The second annual convention of the Southwestern Gas, Electric & Street Railway Association was held at Waco, Tex., on April 12th to 14th, the meetings being at the Business Men's Club. The first session was called to order by the president, Mr. T. D. Miller, of Dallas, at 10 a. m. Thursday April 12th. Capt. M. B. Davis was introduced and made an address of welcome; he was followed by the mayor, Mr. C. C. McCulloch, who greeted the association in behalf of the city. President Miller made a brief response and then, after the roll call and other routine business, made his annual address. He said in part:

"The past year has been noted for its great activity in industrial enterprises, with the natural rise in prices of supplies. Those who have lived up to the old precept, 'in time of peace prepare for war,' and taken advantage of the low prices to make extensions and improvements, find they are able to show a large profit on the investment in the amount saved in the expenditure over what the same would have cost had it been deferred a year or more. Competition has in numerous cases been tempered by consolidation or the courts. The anti-trust law has been declared constitutional, but no case has been reported where it has affected any of our industries, for the simple reason, that, forsooth, none of us are in a trust.

"A popular cry in municipal affairs today is municipal ownership of public or semi-public utilities, which include gas works, central-station electric plants and street railway lines. There has been considerable educational work done on this subject the past year, and it is to be hoped it will continue. An unfounded and erroneous idea is prevalent in the public mind as to the earnings of such institutions. There have been cases where city authorities have been unable to get the consent of the public for the purchase of such utilities, and still laboring under the delusion that the profits of the business were enormous. They have attempted to and have imposed heavy burdens in the shape of a privilege tax or income tax or bonus for the occupancy and use of the streets. The injustice of such course must be apparent to all, for such levy or impost must be paid by the patrons of the enterprise, which payment accrues to the benefit of all at the expense of a few. It is argued that our business is in its nature exclusive, and that it is impracticable to have competition in the sale of gas, electric lights and transportation of passengers. This statement is, in a measure, true, but the impracticability is not physical, but financial, as some of you here can testify from more or less lurid experience. If our profits are sufficient to enable us to give large bonuses to the government for a privilege to do business, would it not be more logical for us to give that amount to our customers in the shape of lower prices? An adjustment of this nature would, I believe, meet with approval from all interests involved, could the subject be treated in a perfectly impartial way.

"Everyone is inquiring for the cause of the failure of the Austin dam. Was it defective construction or faulty design, or error in judgment as to the sustaining power of natural material, or its ability to withstand the effects of the water under the new conditions? That there has been an error committed is beyond doubt, and it is to be hoped that a thorough and impartial investigation will develop the cause of the calamity and that the responsibility may be fixed where it belongs. This is due to the men who were in any way connected with the promotion, design, execution or management of this work. The failure of this dam is of interest to the engineer from a technical standpoint; to the gas man because it was in direct competition with a gas plant for light and power; to the electric light and street railway man because of the extremely low rate made in Austin by this plant for current for both light and power, for its moral effect reaches far beyond the confines of Travis County; to the political economist because it is a municipal enterprise, and perhaps of a magnitude far greater, for the size of the city, than has ever been attempted before in this country. The question has been asked, Has the plant paid? Has it earned sufficient revenue to warrant the million-and-a-half investment?

"Electrolysis or electro-chemical deterioration of underground metallic construction is a thing that gravely concerns the gas man and the street railway man. How to avoid damage to the mains from stray ground currents does engage the attention of the gas man, and how to avoid damages through the courts for damages accrued to gas, water and telephone mains should engage the attention of the electrician. The electrical associations have discussed this subject, the gas associations have done the same and the street rail-

way associations have given it consideration. It occurs to me that our association is in a particularly fortunate position to consider it.

"The relation of corporations to the public should engage our constant attention. It is a live subject, and one that has but recently been prominently brought before the public through attempted legislation of a special session of the state Legislature. In this connection let me call your attention to the fact that there is practically no criminal proceeding available for the protection of our business against the surreptitious user of gas or electric current. Under the criminal code the value of the thing stolen must be proven to obtain a conviction. The thief who steals gas or electric current does not use a meter and would hardly testify as a prosecuting witness and himself the defendant, so that it is impossible to convict for such theft, though the criminal be apprehended red-handed in the act. Of course, civil action can be resorted to, but such action against 'one who was slick enough to rob the gas or electric company' could hardly be expected to result in financial gain. I therefore recommend that a committee be appointed to prepare a bill covering this defect, which bill they will have introduced at the next session of the Legislature."

The papers presented included the following:

"Electrolysis," by E. H. Jenkins, San Antonio.

"Meters and Incandescent Lamps," by W. S. Rathell, Waco.

"Operation of Electric Lighting Plants from a Business Standpoint," by A. E. Judge, Tyler.

"Use and Care of Electric Meters," by E. D. Kelly, Waxahachie.

"Sale of Gas and Electricity for Light and Power," by J. R. Cullinane, Denison.

"The Cause and Remedy of Poor Incandescent Lighting," by H. L. Monroe, Dallas.

"The Attitude of Municipal Corporations to the Public," by John G. Boyd, Terrell.

"Operation and Maintenance of Street Railways," by H. F. MacGregor.

Abstracts of the papers of most interest to street railway men are given below:

Officers for the following year were chosen as follows: President, J. F. Strickland, Waxahachie; vice-president, C. F. Yeager, Laredo; E. H. Jenkins, San Antonio, and J. R. Cullinane, Denison. These gentlemen and H. F. MacGregor, T. D. Miller and W. S. Rathell were chosen directors. The next meeting will be at Houston.

OPERATION AND MAINTENANCE OF STREET RAILWAYS.

By H. F. MacGregor, Vice-President and General Manager of the Houston Electric Street Railway Co.

This subject affords scope enough to write a book, but consideration for my hearers and my own inclination will limit this paper to a few observations growing out of my experience which I feel may be useful to others, or that may invite discussion with some comments and criticisms on current conditions. Elaborate, technical or statistical information will be eliminated. This paper will be found dry enough without endeavoring to emphasize the condition.

Technical and statistical matter is available in better form than my knowledge or my records would furnish. Those who make such matters a special study furnish instructions and tables of value as a basis to work from. The usefulness of information of this character depends on the ability of a railway manager to correctly determine to what extent it applies to the conditions under which his lines are operated. My feeling is that these matters can be worked up by the technical papers from unquestioned authorities with greater benefit to the business, than they can be furnished by the average street railway man whose opportunities are limited; and that the sessions of the associations can be more profitably devoted to single topic papers, and discussions of them, experience meetings, and the question box, where the timid man gets in his work. It is this exchange of ideas from practical experience that makes the trips to the Southwestern and the American associations attractive to me, and beneficial to the interests I represent.

The last decade has witnessed revolution and annihilation; the night-mare of the succession being about the only reminder of the motive power of the past. Invention has crowded invention. The electrical apparatus of yesterday is a back number today. The standard of today, if we dare yet to talk of standards is likely to be obsolete tomorrow. The procession has moved rapidly, and but

few of us have had properties financially able to keep pace with it. Our experience like our machinery is obsolete; it was expensive but is perhaps worth all its cost and whether willing victims or forced, there was no choice; we could not stand still. Investors in street railways and other electrical plants have contributed large sums to the march of events, and those that come after us will consider it money well spent, and those that went through the transition find themselves cautious and self-reliant, two essentials today in the successful management of electrical properties. There was something to warm the cockles in the heart in the motive power of old, that is lacking in the modern method. Perhaps this is explained by the fact that "blood is thicker than water," for looking backward is there a street railway man who cannot picture that he was at one time or another a brother to the sire of the lamented but not forgotten mule that shared our burdens?

I should have profited by the knowledge of the habit of our neighbor across the border, and said in answer to the suggestion of your committee "Manana," for "tomorrow" I am hoping for several standards in the construction, operation and maintenance of street railways adapted to all classes and conditions. Systematic and thorough work in this direction is what I believe is needed most by railway interests, commencing with franchises, proper municipal demands, standards for material and equipment for cities of different classes. Everything now is based on what is accomplished in larger cities; municipal exactions are the same. The public mind is educated by object lessons from cities glutted with traffic where the problem is how to handle business and not how to create it; where the horn of plenty exists, and is not an iridescent dream.

At the meeting of the American Association I ventured to remark that the trend of the discussion was toward conditions existing in but few cities, and inapplicable to the wants of most of the members and suggested a division that would profit the smaller interests. I see from the published program that at the next convention, in Kansas City, we are to have a paper on construction, operation and maintenance of roads that operate 20 cars or less; this is a step in the right direction.

The improvements demanded by the public and the spoliation by the courts, municipalities and legislatures menace the very existence of street railways in cities under 50,000 inhabitants, or cripple them so they are unable to maintain the public service as they desire or should do. This should be remedied by the proper education of the public, and no one can better do this than the street railway people and allied interests working out with mathematical precision the results that can be obtained under given conditions. I believe we now have had sufficient experience to do this, and it is only a matter of compiling the facts and getting them properly before the people. The facts would be an aid to the successful development of improved city and suburban transportation facilities, and a convincing answer to the craze for municipal ownership and socialism.

In the operation of street railways I recommend the belt system as being more profitable, covering more territory for the same operating expense and affording greater protection against accidents over a double track system, and having fewer delays and annoyances over a switch system.

In cities of the class of Houston we average a car for about every 2,500 inhabitants. In smaller cities it would vary from this number to one for every 5,000 people. With us the travel amounts to one fare daily for less than 20 per cent of the population. The operation of these cars should have close attention and every possible effort should be made to encourage and increase travel. Attractions on lines operated on a business basis are desirable, but free shows are not beneficial; those of a class that should be encouraged cannot be afforded free on a 5-cent fare and it is preferable to give people full value for their money in attractions, concerts, etc., at popular prices, say 10 cents admission and 10 cents for reserved seats. Where the attraction is inexpensive in character the admission might include a coupon for refreshments at the privilege stands.

We operate our cars by the usual methods, and have no patent process better than others. Eternal vigilance is the price of success and if not success of the privilege of living.

Our headway varies from 5 to 30 minutes on different lines. On short lines it is desirable to have short headway. Formerly our outside limit was a 20 minute service, but we find half hour cars earn about the same money on light traffic lines; and that a 15-minute service increases the travel but slightly and only to a small percentage of the increased expense of another car. Patrons on long headway lines time themselves until it becomes a habit and the domestic

arrangements at home are systematized accordingly. Twenty dollars per day per car is required for the operation and maintenance of a proper standard of excellence and the profit must come from earnings above that.

For the economical maintenance of a line it should be constructed well in the beginning. The rail should be 60 lb. or heavier, the heavier the better; the base of the rail should be not less than 5 in. in width to prevent cutting into ties; the joints should be cast-welded. We have a cast-welding machine and it is undoubtedly the thing in paved streets as there is no weak point left in the track and no movement at the joints; bonds are unnecessary and by reason of the saving in the bonds the cost is approximately the same and the result is practically a perfect track. In unpaved streets we are cast-welding also and without trouble. Thus far the stretches have not exceeded a half mile. Until we have tried a long stretch of straight track I am not prepared to give my unqualified endorsement of cast-welding in unpaved streets in light soil. My impression is that expansion joints left at quarter mile intervals will prevent possible trouble.

We have generally used cypress ties; 12 years is about the limit of life, and under some circumstances not that long. We have recently used also creosoted pine ties, estimated to last 20 years. Tracks should be well ballasted, and carefully looked after. We use No. 0 trolley wire, and have red and white cedar poles and recently put up some creosoted pine poles; some of the white cedar poles erected 10 years ago have been replaced; the major portion are good for several years yet. The red cedar poles last longer, but are not as attractive in appearance, and the sap wood decays and makes the pole more difficult to climb.

The maintenance of the equipment and the station repairs constitute a heavy tax on the earnings. It is necessary to have quite an extensive repair plant and a very large sum of money can be thrown away or saved in the handling of these departments. The fuel question requires close attention and to know when one is getting the best results is difficult to determine.

The handling of claims and lawsuits requires rare judgment, a street railway man who handles small properties soon gets to be a jack of all trades; on larger systems special ability is found in separate departments. The greatest problem to be found in the operation and maintenance of street railways among the members of the Southwestern Association is how to make both ends meet. Everything is subordinated to this vital proposition. It dwarfs our recommendation, clips the wings of our ambition and destroys our reputations as managers. The inexorable conditions for which we are not responsible and that are beyond our control are ever present. We are, however, kept out of the clutches of the devil if there is anything in the saying that the devil finds something for idle hands to do. As the happy son of Erin, who was watchman for the Galveston Street R. R., remarked to a man who said he was looking for a steady job, "You have come to the right place; we work here nights, days and Sundays." Like the poor our troubles are always with us. These we get to endure as a matter of course, and keep cheerful looking at the bright side, for there are many pleasant features that compensate for the exactions in other directions.

ELECTROLYSIS.

By E. H. Jenkins, President San Antonio Gas & Electric Co. and San Antonio Traction Co.

There is now scarcely any doubt that electrolysis has existed in a mild form for several years before the introduction of trolley cars, as before that time the telephone and telegraph companies used the earth for the return circuit and the "vagrant" electricity from these systems used the water and gas pipes. That there was damage from this cause, fully accounts for the destruction of small service pipes in the past where the soil did not contain any substance, as far as could be ascertained, that would produce corrosion.

It is well established that only a small difference of potential, not exceeding one-hundredth of a volt, will under favorable conditions produce electrolytic action though it may take considerable time for the effect to become apparent.

The first electric railways undertook to return the current to the generators by the rails but made only poor attempts to electrically connect the rails at joints. Experience showed the bad effects of poor bonding and better provisions have been made for taking care of the return currents and the author believes that little or no dam-

age is possible from systems having rails of ample capacity properly bonded with copper bonds.

There is a difference of opinion among electrical engineers on this point. Mr. Hubert S. Wynkoop states that it is impossible, because of financial considerations, to provide a track return so satisfactory that considerable electricity will not seek a path through pipes, cable covers, etc., for to confine the current to the rails would require their resistance to be infinitely small compared to the earth; an improved track return is and must always be, a palliative and not a cure.

Mr. I. H. Farnham, of the New England Telephone Co., of Boston, was the first to investigate electrolysis and his experiments, conducted in 1893, led to the first attempt to improve conditions by reversing the polarity of the station dynamo and placing the positive pole to the trolley wire; this was succeeded by improved bonding.

In 1894 a committee of the Western Gas Association, through its chairman, Mr. George Treadway Thompson, made a report on electrolysis and considered various remedies suggested by gas and water companies. These included covering the gas and water pipes with non-conducting paints, or slipping drain pipes over the iron pipes, cementing them at the joints and ends. At Los Angeles some of the pipes were laid in conduits filled with sawdust; pitch kept in place by boxing of convenient form has also been tried. These methods of protecting the pipes are too expensive for general adoption and no partial installation would wholly cure the trouble. If the current enters the pipe and leaves it near the same point, a jacket of tiling or non-conducting paint would prove a true protection, but if the current enters the system at a remote point the local covering would merely force it to find a new outlet and transfer the difficulty to another point. At Cambridge, Mass., the practice of protecting pipes by attaching copper wires and plates to them was tried, and abandoned because of the rapid destruction of the copper plates.

Prof. Elihu Thompson has suggested the use of secondary generators, driven by the railway current, the current from which should be utilized to reduce the potential of the pipes and cables to that of the surrounding earth and rails.

The plan included means for making the operation of the secondary generators automatic, but it has never been put in operation.

The system adopted by large roads in Boston, Brooklyn, Cleveland and elsewhere is to provide insulated track feeders designed to carry the entire current and connected to the rails at intervals of 400 or 500 ft.; the rails carry the current only between feeder junctions.

The recommendations of Mr. T. J. McTighe are for heavy bonds so placed as to be protected against corrosion and convenient for inspection; the liberal use of heavy cross bonds, and the installation of an underground trunk return from power house to track and there connected to each rail.

Mr. A. A. Knudson, writing in the American Electrician for March states that he has found the resistance of the joints of water and gas pipes and Edison tubes increases with age because of the galvanic action between the pipes and the lead of the joints. The effect of this resistance is to cause electrical currents flowing in the pipes to leave the positive end of the pipe and flow to the next pipe through the surrounding soil or in case of water pipes through the contained water; this results in electrolytic pitting of the pipe or reduces it to graphite. For this reason any return which involves conducting railway current through pipes is not a cure of the trouble. As an absolute remedy the only thing in sight is the metallic circuit, the double overhead or underground wires.

In San Antonio the recently laid track has 74-lb., 60-ft. rails with Morris bonds under the fish plates and No. 0000 bonds around the plates. A return cable from the track to the power house is also provided and the gas pipes near the power station have been connected to the generator.

In conclusion Mr. Jenkins says: "I feel satisfied that in cities of say 100,000 inhabitants and less, if rails of the electric railway system are properly bonded, and the gas and water pipes have suitable return wire connections to the power house, there is little or no danger from electrolysis. In larger cities with more complicated systems of pipes electrical surveys should be made and when the facts are known suitable return conductors can be placed."

Wages on the Calumet Electric Ry. have been increased from 17½ cents to 20 cents per hour, taking effect May 1st.

SCHOOL FOR MOTORMEN AT BALTIMORE.

The United Railways & Electric Co., of Baltimore, Md., has established a training school for motormen where the new men are instructed and drilled in their duties before being "broken in" on the cars by old motormen. The illustration shows the interior of the school room; at the right and left will be noted the controller and brake equipments, which include all types in use on the system; at the front end is the instructor's desk and in the center of the room is a large table on which are always to be found the current street railway papers.

About 100 applications for employment as motormen are received each week. All applicants must present two letters of recommendation; one from their last employer, if any, and one from a well-known and reliable person who is willing to indorse them.

The applicant must weigh 160 lb. and must be at least 5 ft. 8 in. tall. He must not be under 25 years of age and not over 40 years. He must be sober and willing to perform his duties. He must furnish the company a bond of \$50.

All applications are made to the employment agency of the company, and after a number of suitable men have been selected, according to all requirements, the general manager, Mr. W. A. House, has the men come to his office where he explains in a general way the policy of the company towards its employees, and the motives



INTERIOR OF INSTRUCTION ROOM, BALTIMORE.

guiding it in selecting men. Good, trustworthy men who are seeking permanent and not temporary employment are wanted; such men are encouraged in their work and the company tries to keep them. Men over 25 years old are preferred because at that age most men have responsibilities to hold them to a fixed purpose and prevent them from shifting about. A man over 40 is harder to teach than when younger and Mr. House believes that he is often guided by a disposition similar to that preceding his 25th birthday.

The school is in charge of an instructor of motormen, Mr. J. K. Morgan, who is under the immediate supervision of Mr. S. W. Huff, master mechanic. Mr. Morgan gives the new men three days' drill in the manipulation of controllers and brakes, and instructs them as to the fuse boxes, switches, etc. The hours of instruction are 8 to 11:30 a. m. and 1 to 5:30 p. m.

The men are next put on cars with experienced and reliable motormen. Here they are under the eye of the inspector of motormen, Mr. E. N. Howell. At the end of seven days on the cars the inspector can usually tell whether the candidate will make a satisfactory motorman and passes on his case; in some instances more time is given.

This careful training makes accidents of infrequent occurrence. When accidents do happen, unless they are very serious, the men are not suspended at once but are given a hearing early the following morning so that if not at fault they can catch regular runs and lose no time. The investigating board consists of the general manager, the superintendent of transportation, the division superintendent, and the assistant claim agent.

500-VOLT CURRENT ALLEGED TO HAVE CAUSED DEATH.

About a year ago suit was commenced against the San Antonio (Tex.) Street Railway Co. because of the death of a man 60 years of age, who was standing on a pile of cinders which he had wetted down and was raking with an iron handled hoe. A trolley wire was suspended over the cinder pile and it was alleged that in raking the cinders the hoe handle came in contact with the wire, giving the deceased an electric shock which caused his death. This happened on a hot day in August, the thermometer being 95 degrees in the shade. The man fell and in a few moments expired; both hands clutched the handle of the hoe but there were no marks or burns on the hands or any other part of the body.

The witnesses for the plaintiff stated that they heard a sound as if the hoe came in contact with the trolley wire but did not see it touch the wire.

On the first trial the jury disagreed and on a second trial found for the defendant company. The plaintiffs carried the case to the court of Civil Appeals where it is now pending.

CLUB ROOMS AT CLEVELAND.

By the courtesy of Mr. R. M. Douglass we have been favored with copies of a number of photographs taken by the Cleveland Electric Railway Co. for exhibition at the Paris Exposition. The three engravings herewith are reproduced from interior views of the employes' club rooms as established at the various car houses. The company has had the matter of providing such rooms under consideration for a year, but it was only in December and January last that the plans were carried out.



Holmden Ave.

Miles Ave.

Lake Ave.

EMPLOYES' ROOMS AT THE CAR HOUSES OF THE CLEVELAND ELECTRIC RY.

As noted from the illustrations the games include bowling, pool, cards, chess and checkers. Punching bags and boxing gloves are also provided. In addition there is reading matter, and the city library has established a branch at each club room so that the men and their families can avail themselves of library privileges without inconvenience.

The company furnishes these amusements free to the employes and only asks the men to look after them, which is done by a committee of their number. A slight charge is made for games, a cent a cue for pool and a small charge for bowling; from this income they pay a man to look after the room, stand at the foot of the bowling alley, etc.; the income provides for this and leaves a surplus for the men, with which they can buy additional sources of amusements or create a fund for any purpose they may desire, possibly for a sick benefit.

Construction work has commenced on the extension to the Forest Park and Clayton branch of the St. Louis Transit Co.

The Birmingham (Ala.) Railway & Electric Co. will build a 100 x 140-ft. extension to its Highland Ave. car house, as its five barns now in use have become inadequate to accommodate all of its rolling stock. The new building will be of iron and will contain eight tracks.

SOME CONDITIONS AFFECTING THE MAINTENANCE OF CARS AND THEIR EQUIPMENTS.

(From the Electrical Review, London.)

If an English engineer were called to estimate the probable running costs of the various divisions of a potential electric traction scheme, he could, without much difficulty, and with good chances of accuracy, foretell the amount with which to debit the power station; for making allowances for the considerably increased load factor, the decreased charge for switchboard attendants, and a few other betterments, his experience in the lighting school will guide him in estimating the cost of power at the switchboard. He can, moreover, pick up nuggets of information on this point from the gold mine of American and Continental statistics.

For similar reasons he will not be far out in estimating the cost of maintenance, depreciation, and "inefficiency factor" of the electrical construction beyond the board, including feeders, with their boxes, switches, manholes, etc., poles, and overhead wires, electrical and supporting.

He may, by good fortune, attain a fair approximation when dealing with the track, with its special work, bonding, and diverse ballasting—macadam, setts, or wood—but when he comes to the running cost of cars, he is face to face with a fearsome octopus, whose tentacles are hidden, towards which he advances cheerfully, grasping a sword forged from the mean of countless statistics.

If the engineer was born under a particularly lucky star, he may have struck a line which, in this matter of cars, will verify his estimate. With this line we have nothing to do, the object of the article being to indicate, however vaguely, some of the difficulties with

which the question bristles, and which make the estimation so much a matter of chance.

The size of the outfit does not affect us particularly.

Expenses due to repairs and renewals should be merely nominal during the first six months. Everything is new, presumably in the pink of condition, and the contractors are, no doubt, hovering around, coaxing, and doctoring. It is after this critical period that the x's, the unknowns, the special characteristics of the men-in-charge of the line, of the cars and their equipments, begin to unfold themselves.

Let us attempt to marshal some of the unknowables:—First, and most thickly veiled, comes the personal factor. However lusty a babe is electric lighting, electric traction is certainly yet "in its infancy" in Great Britain, and large type would be needed to fill a sheet of scribbling paper with the names of those who know a tram-car from a traction engine—speaking more or less figuratively. It is necessary, therefore, to imagine the possibility of the resident engineer being a man sound in lighting, but with an elemental acquaintance with the vices and surprises of a traction job. He may have been on some line where the conditions were ideal—and monotonous (for who would give anything for that job where the engineer could talk about "the even tenor of his way?") The man most likely to succeed is he who has been in charge of a system where breakdowns of every possible description—not due neces-

sarily to bad management—come thick as leaves in—well, in autumn).

This man has an unlimited capacity for learning, but unfortunately for our estimator—a very small percentage of these surprises occur during the probation period of the undertaking, when the contractor's representative is at hand to advise; and so it happens, that instead of being able to strangle faults before birth they are allowed to develop fully, and only then is the preventive noted for use in future. In fact, the resident engineer has to learn by experience, which is likely to be a pretty penny out of the promoters' pockets.

Probably a more important place under the heading "Personal," should be assigned to the motorman—that most unspeakable product of devolution—for one must persist in counting him as belonging to a distinct genus, a race apart.

Who shall say beforehand what this uniformed wonder will do, or how he will do it; and who, when he considers what the motorman should know, would for a moment imagine that he could do it? In sooth, he should know all things, even as he knows the taste of beer. The contractors probably saw him through a period of skilled training; he is riddled with instructions as to what he should do under any circumstances; he has instruction books thrust upon him (sometimes with the adjuration that he read them as often as his Bible!); he has every chance to learn, and yet . . .

Is there a particularly bad point entering a loop, then shall your motorman go through on the last notch—poor wheels, poor car—what reeks he of broken flanges, of the terrible lurch on the lead, which twists the frame and strains horribly the car body; what cares he for the comfort of the passengers? All he cares about is to get a loop ahead of another of his kind. The damage to the car is not apparent at the time, so he will not suffer.

Is there a flooded place on the line? How fine to think that he can slosh through six inches of water, at the "making up" speed, without wetting his feet (oh! you wretched motors, arresters, and resistances). What a glorious device is the "emergency!" How it saves one's right arm to use that little handle to pull up for a passenger. If the passenger jumps on before the car has stopped, so much the better! Off goes the emergency, and nobody hears the ruinous arc inside. Look at the creature! He is climbing a hill when the current goes off—circuit-breaker out at the station. On goes the brake, and round goes the controller handle to the first notch, or maybe it remains where it was on the notch where the fields are shunted, the position which his "instructions" say "must on no account be used when climbing a grade;" then, when current again comes on, you see we start without loss of time, unless the station breaker opens at less than 200 amperes.

Look at him again. Something has caused his circuit-breaker to open time after time. What more natural than to hold the handle of that breaker until the depot is reached, or perchance till the main fuse blows, in which case he is hopelessly stranded, because he has quite forgotten what he should do under the circumstances.

(How I love to see him step off a car to find what ails it when the lights go out, and it happens to be "grounded.")

All these things do not lengthen the life of the motor equipments. The motorman can damage a car in so many ways, and he uses his power.

Let us get away from the personal factor with all speed. After the engineer has learned that a car will not run an infinite number of miles without being overhauled—knowledge sometimes obtained at considerable cost—he institutes a regular system by which every car is run into the repair shed, either after traveling a certain number of miles, or some fixed period of time. After a little while he finds to his disgust that his orderly system works out better on paper than in practice, for cars apparently are not keeping the rules at all, but are just dropping into the repair shed when they like, not when he wishes. Armatures or field coils failing, brush-holder yokes burning up, controllers niggling, arresters short-circuiting, trolley connections continually earthing to poles, (oh! those delightful double-deckers) poles doubling up, axles breaking, wheels cracking, and flanges chipping off, trucks sprung out of square, and, finally, cars being dragged in with platforms wrecked, dashes and vestibules unrecognizable, controllers in smithereens, and broken glass everywhere. Most of these things happen occasionally on lines working under the best conditions, but it is doubtful if any engineer, with foresight of the brick-wall order, would allow for every one of these calamities happening continually on any one line. Yet these exaggerated evils are found on some—probably a very few—lines.

To show how such a concourse of disasters could come about, it

will be well to indicate the possible condition existing in one line. On the opening day everything runs smoothly; all things appear in order and well done. The track runs through a mining and manufacturing district, serving a dense and dirty population. In a few months some portions of the road begin to sink, owing to disturbed workings caving in. It subsides most quickly under the track, and all heavy traffic prefers the middle of the soft track to the softer macadam road sides. Joints open and sink, the track gets out of gage, nasty kinks and curves are given to the rails. These things play havoc with wheels, axles, and springs. Setts rise and break low hung gear, such as life-guard and gear case.

The road is very hilly, and the grade severe. Often, under ordinary conditions, the motors are running overloaded for 15 minutes continuously, and when a motorman has adjusted the brakes so that they bind on the wheels, this overload is considerably increased. If the ninth notch (κ ; controllers are assumed) has not been removed it is probably used on this grade.

On a road which is hardly ever level, brakes may be on for half the round trip, which means that brake shoes require very frequent renewal, and much attention. On such a road 20 running cars will keep two men employed on little else than brakes. Moreover, on a greasy rail a bad driver will put a flat on a wheel in a remarkably short time, and being a bad driver, he will make it worse every time he slows up; consequently, the pair of wheels and their axle have to be taken out to allow the flats to be ground or turned out.

The locality is famous for its rain; all the low places on the track are flooded during wet weather, and much water finds its way into the motors. Certain types of arresters and resistances, unless well protected, are not at all fitted for a damp climate, and it is easy to surmise that the electrical equipment suffers much under the foregoing conditions. During the greater part of the winter dense white fogs prevail, and after most fogs, a car or two are found in the sheds, more or less damaged as the result of a collision, generally with heavy carts, the drivers of which are afflicted with incurable deafness; the heavier and slower the cart, the deafer is the driver.

In the summer the whole track is covered with a fine metallic dust, which finds its way into every part of the truck and car. Bearings run hot and melt out, thereby allowing the armatures to rub against pole faces. The life of every wearing part is lessened; and, until the bottoms of controllers are boxed in, the ravages of the dust increases the wages sheet considerably. Nor is it good for motors when the car runs over a rail insulated with dust every few yards with full current going on and off in jerks.

Snow is a "beautiful white devil" to the tramway man. In a manufacturing district its whiteness does not stay long, but it remains a devil throughout, and much salt mixed therewith is trying to things electrical.

Perhaps it is plain now to those who did not know before, that for some indefinite period after opening of a new system it is practically impossible to tell how much of the revenue is to be eaten up by "car equipments."

It is apparent that this article is a mere indication. Too little is seen in the technical papers of the experiences of traction men, and if this article should be the means of suggesting subjects on which others will expound, it will have served its purpose; and the writer may not have to subscribe so heavily to American traction organs.

REGULATING BATTERY OF THE PEEKSKILL (N. Y.) TRACTION CO.

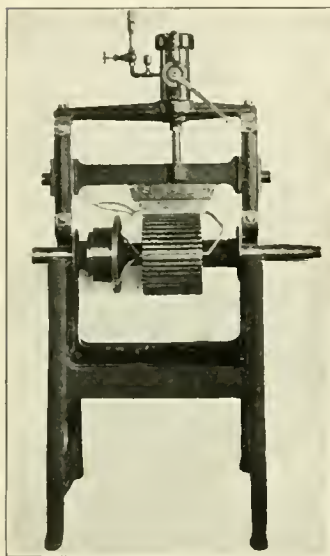
The Peekskill (N. Y.) Traction Co. operates a 5 mile road and on one line is a continuous grade varying from 1 to 8 per cent. Only three or four cars are required to care for the traffic and the small number of cars and the steep grades make the current demand extremely variable. Power is furnished by the Peekskill Lighting Co. which installed a storage battery to regulate the load on the railway generators. This battery consists of 262 type F-9 cells of chloride accumulators made by the Electric Storage Battery Co., of Philadelphia; each cell has nine plates approximately 10½ in. square, with space in the jars for adding four other plates and thus increasing the capacity 50 per cent. On full charge this battery has a capacity of 40 amperes for 7 hours and can discharge at the rate of 160 amperes for short periods; for regulating it is often called on for momentary loads of 250 amperes.

The line load fluctuates from 15 to 250 amperes, which is taken by the battery, the generator load being nearly constant at from 75 to 85 amperes.

MECHANICAL DEPARTMENT

PNEUMATIC PRESS FOR ARMATURE COILS.

The saving of five hours' work is effected in putting armature coils in the core slots of an armature, and connecting up the leads, by the use of a press, illustrated herewith, which is employed in the armature repair department of the Chicago City Railway Co. The press was designed by Mr. C. E. Moore, formerly master mechanic of the road, and Mr. Bryant, then foreman of the department, and was made in the shops.



PRESS FOR ARMATURE COILS.

The device consists of a cast iron frame having a punch or follower which works up and down in guides, and is actuated by compressed air expanded in a vertical cylinder, placed on top of the frame, having a piston which is connected with the movable punchhead. The direction and force of the motion are controlled by a valve having a long handle placed in convenient reach of the operator.

The follower or head carries in its lower face a narrow removable plate, which is just the length of the slot, and of a width sufficient to just fill the slot. The armature is placed in the bearings provided for it as shown, the side openings being sufficiently wide to receive the shaft. When in place the armature can be easily revolved.

The coils which have been previously wound, taped and formed, are placed one at a time in position, one side just above the slot, when the air is admitted to the cylinder, and one side of the coil is pressed firmly, and without shock or jar into position.

As soon as the first half of each coil has been pressed into its slot, the armature is turned the other way, and the second half of each coil is in succession, pressed quickly into its place. The time required for putting all the coils into an armature of a No. 12 A Westinghouse motor, and connecting the leads, is only one and a half hours.

The controlling valve is so arranged that it gives a very delicate movement, when required, to the follower or punch. The blade of the punch is removable, and can be changed to correspond with the different length of armatures.

NEW CAR HOUSE OF CLEVELAND CITY RY.

The Cleveland City Ry. has recently completed a new car house at its Rocky River terminus, about 8½ miles from the public square in Cleveland; this point is the terminus of the tracks owned by the Lorain & Cleveland, its cars running into Cleveland over the city tracks. The car house is of brick and steel construction, 108 x 340 ft., and is divided into three sections by fire walls. The roofs are carried on steel trusses. Each section has a skylight, made of metal bars and wire glass, which extends the entire length of the building, and in addition the exterior walls have windows.

The repair shop and waiting room occupy a building which is parallel with the car house, but far enough away to permit of a track to run between. This building is of similar construction, and is 37 x 197 ft.

The general arrangement of buildings and tracks is apparent from Fig. 1. Fig. 2 shows sections and an elevation of the car house, and Fig. 3 a cross-section of the shop.

The entrance doors to the car house are a combination of sliding and folding doors, so that when opened they leave the entire width of the building clear, a space of about 34 ft., thus doing away with



EXTERIOR OF CAR HOUSE AND SHOP.

door posts between the tracks. The trolley wires are placed in notches cut in a plank across the doorway, as may be seen from the half-tone engraving, so that they do not interfere with opening and closing the doors.

In the pit construction in both the car house and machine shop the tracks are supported on steel posts, giving lightness and free-

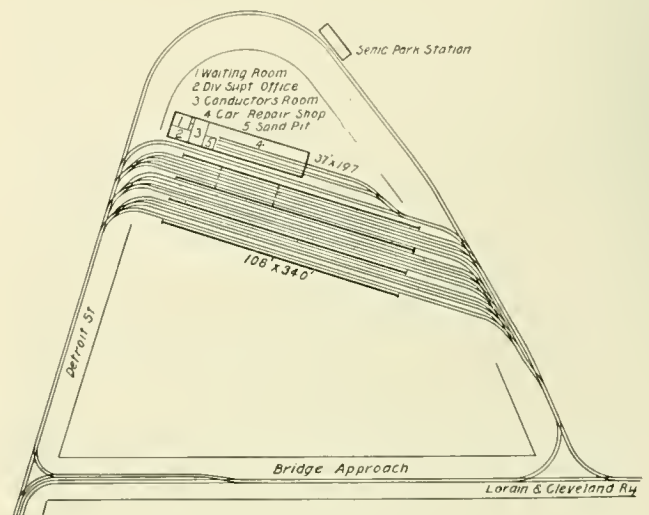


FIG. 1.

dom of action in the underneath work. Heavy beam rails are used so that the posts are 15 ft. apart in the machine shop and 7 ft. 6 in. apart in the car house.

At the front end of the shop building is a commodious waiting

room for passengers with accompanying toilet rooms, also general offices, employes' rooms, including billiard room and reading room for the employes, these latter being located over the waiting room and offices, thus utilizing the upper or attic portion of that part of the building.

The rear portion of this building contains the machine shop, boiler room, sand room, etc.

The offices, waiting rooms, etc., are done in Southern pine in

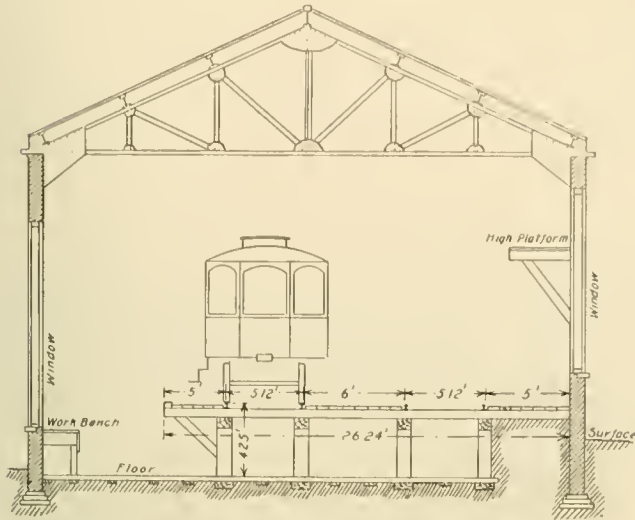


FIG. 3—CROSS SECTION OF SHOP.

natural finish, and the walls and ceiling tinted in colors. The roof boards of car house and machine shop are of narrow matched planks 3 in. thick, dressed on the under side and resting on the steel construction, the steel work and roof boarding being tinted in col-

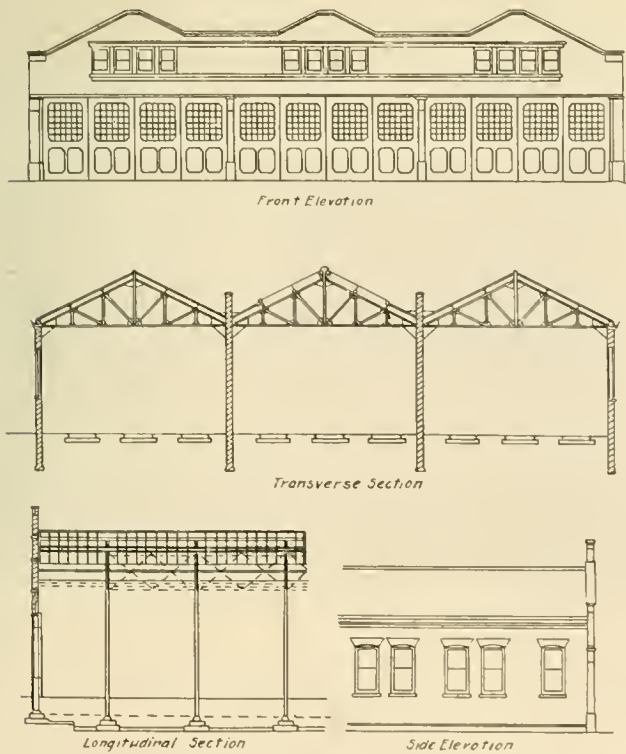
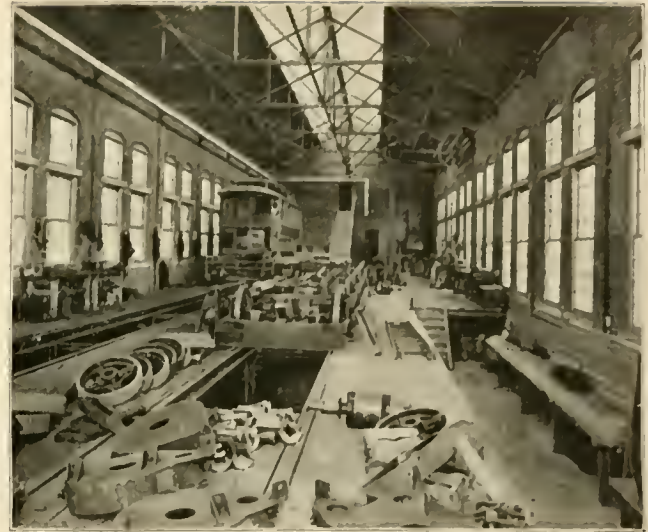


FIG. 2.

ors. The walls are also to be tinted, giving the whole a pleasant and cheerful appearance.

As shown in Fig. 3 the floor of the machine shop is 4 ft. 3 in. below the track level. The pits are all provided with steam heating coils.

The architect of the buildings was J. N. Richardson; the brick construction was done by C. H. Fath & Son, the iron work by the



INTERIOR OF MACHINE SHOP.

National Iron & Wire Co., the roofing and carpenter work by W. S. Thompson, and the special track work, of which there was considerable, by the Cleveland Frog & Crossing Co.

We are indebted to Messrs. J. B. Hanna, secretary, and John Ehrhardt, assistant secretary, of the Cleveland City Ry. for the drawings and data.

SOME DETROIT IDEAS.

General Manager DuPont, of the Detroit Citizens company, has been studying the car heating question and arrived at the following conclusion. His theory is that with a stove heater in the center of the car two currents of air are set in motion, readily understood from the diagram. That circle next the rear door is frequently reinforced with fresh air from outside whenever the door is opened; but the circulation forward remains practically unchanged, and though moving, steadily becomes more and more impure. In this connection it should be remembered that these

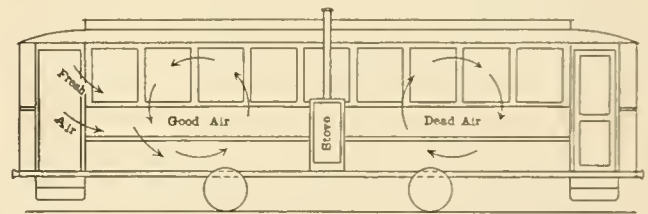


FIG. 1.

cars all loop at terminals and the front door is not used by passengers.

To remedy this defect in ventilation, Mr. DuPont last winter put in service some 25 cars heated by a system of his own. The heater is placed on the front platform, where it not only serves

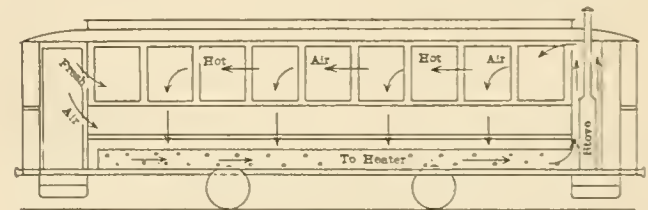


FIG. 2.

to keep the front vestibule comfortable for the motorman, but removes the coal and ash nuisance from the body of the car. The smoke pipe is carried straight up through the hood. Surrounding the heater is a sheet iron jacket opening into the car at the hood, and drawing its supply of air to be heated from pipes placed beneath and extending the entire length of the side seats. These

pipes are perforated to admit the air, and a sufficient amount of fresh air is secured through the holes in the pipes at the entrance end of the car, when the door opens. At the same time the circulation is rapidly kept up and the entire car heated in a uniform manner. The deck ventilators are seldom opened in cold weather. The second diagram shows the plan, and the movement of the air currents in the car, under this arrangement.

Twenty-five cars were built in the company's shops last summer for winter service, in which steel of No. 10 gage was used for the panels instead of wood. The idea was not only to secure a more durable panel with greater bracing strength to the car, but also immunity from the holes punched so easily through wood panels when buggy shafts and wagon poles collide with the car. It is found the iron panel, when struck by a wagon pole, suffers only a slight dent where the wood panel would have been punctured. As might be expected, there is more reverberation from the iron than the wood panel, but this has been corrected by the use of a deadener. The steel plates used for the side and vestibule panels are of various dimensions from 8 x 18 in. to 18 x 54 in.

Another new feature which was found on the Detroit cars last winter, and which has become extremely popular with both the public and conductors, is the pipe rail on the rear platform. The new winter cars which went into service last fall have vestibules at the front end and accelerator platforms on the rear, all cars turning on loop at terminals. As passengers are not allowed on the front platform, the smokers were driven to the rear, and with the usual outside riders used to crowd the platform until it was exceedingly difficult and often unpleasant for passengers to enter and leave the

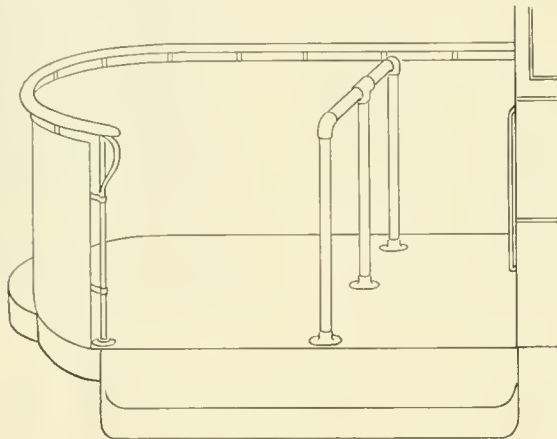


FIG. 3.

car. To remedy this, Mr. DuPont devised a dividing rail, as shown in the sketch. It is made of 1½-in. gas pipe screwed to the platform floor with three legs. This leaves just room between the rail and the car body for a passenger to pass in or out. The conductor also makes his position between the rail and body of the car, but passengers are not allowed to remain there. This leaves ample standing space between the rail and dash for the smokers and standing passengers, who in turn are not subjected to being crowded by those getting on and off. The improvement is inexpensive, but effective.

A NEW BEARING METAL.

The bearings in most common use are compounds of copper, tin and lead in varying properties, there being in general, however, about 80 parts of copper and 10 each of tin and lead. From numerous tests of bearing metals, made principally by the Pennsylvania R. R., it was concluded that an increase in the proportion of lead used would result in decreased friction and wear; also metals having more than 15 per cent lead and less than 8 per cent tin were inferior because of segregation, but it was believed that a homogeneous metal having a larger proportion of lead would give better results.

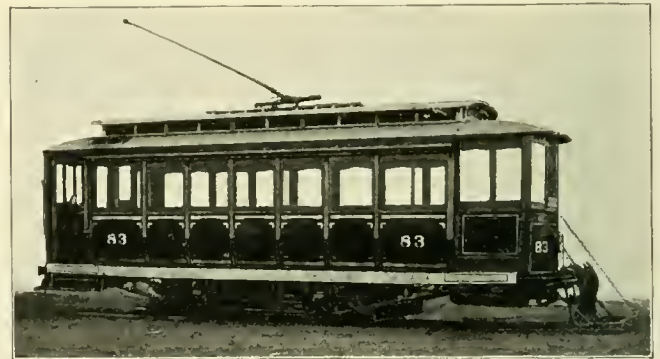
The Ajax Metal Co. has recently developed a patented process for preventing segregation and making bearings with relatively large percentages of lead. The new metals have been given the

name of "Ajax Plastic Bronze" and tests in an Olsen friction machine show the following results:

	Friction, Lbs.	Wear, Grains in 1,000,000 rev.
Phosphor bronze	16.5	10.5
Ajax standard engine bearings.....	18.5	7.2
Ajax 31 per cent lead.....	18.0	6.7
Ajax 40 per cent lead.....	16.0	3.0
Ajax 47 per cent lead.....	13.5	1.65

CONVERTIBLE CARS.

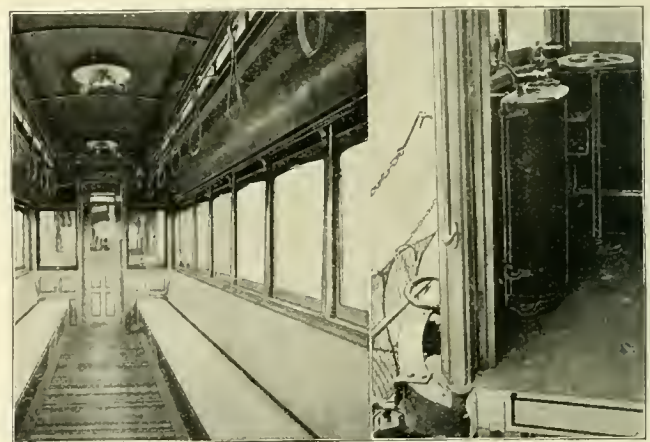
By the courtesy of Mr. S. F. Hazelrigg, general manager of the Atlantic Coast Electric Ry., of Asbury Park, N. J., we are enabled to reproduce the accompanying illustrations showing one of the company's open cars as converted for winter service. The open



OPEN CAR FITTED FOR WINTER SERVICE.

car is enclosed by means of steel panels and sash with glass inserted in the curtain slots of the seat posts; longitudinal seats are placed inside. The vestibules are also part of the conversion.

The company has several of these converted cars, some of which have been in operation for two years. When changed from summer



INTERIOR OF CAR.

VESTIBULE.

to winter cars, or vice versa, no repainting is necessary; it takes two men about one day to make the conversion. For summer use the cross seats and running boards are replaced.

The Atlantic Coast Co. has a large surplus of open rolling stock and has found this an economical method of providing the closed cars needed for winter service; this scheme will doubtless appeal to other managers similarly situated.

The Butte (Mont.) Consolidated Railway Co. is building at Columbia Gardens four greenhouses, each 40 x 20 ft. for the care and propagation of its fine collection of plants, now numbering 8,000 specimens.

NEW CAR BARNS AT READING AND CHESTER, PA.

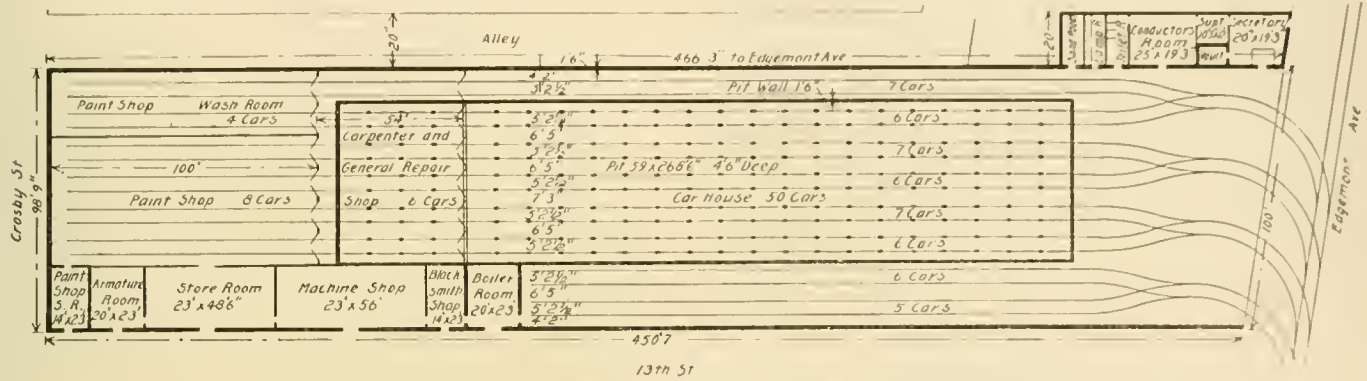
The United Power & Transportation Co., of Philadelphia, owning various electric lighting and street railway properties in Trenton, N. J., Wilmington, Del., and Eastern Pennsylvania, is building two new car barns, one at Chester, Pa., and one at Reading, Pa., to meet the increasing requirements of the important lines centering in those cities.

Through the kindness of Mr. E. L. Fuller, assistant to the president, we are permitted to reproduce herewith the plans for both of these buildings. Fig. 1 shows the barn at Chester, which is to be used as a combination paint and repair shop and storage house, and is designed for the operation and maintenance of 50 double truck cars, 42 ft. over all. The building which will be 100 x 450 ft. ap-

one utilized as a small paint shop and waste room having space for four cars, and the main paint shop with room for eight cars. Entrance from both of these to the repair shop is secured through swinging doors. The paint stock room, armature repairing room, store room, machine and blacksmith shop are conveniently located along the 13th St. side as shown. On a plot of ground adjoining the car barn property on Edgemont Ave., a building has been erected for office purposes, toilet room, etc.

The Reading barn is 105 ft. wide by 480 ft. deep with capacity for 84 double truck 42 ft. cars, and is to be used as an operating barn only, for making light repairs and for storing cars. Four of the tracks will be fitted for a distance of 343 ft. 6 in. in the same manner as in the Chester house.

In both of these car houses the entrance curves are of 35 ft. radius and where the entrance tracks fork the reverse curves are of 75 ft.



CAR HOUSE OF UNITED POWER & TRANSPORTATION CO., AT CHESTER, PA.

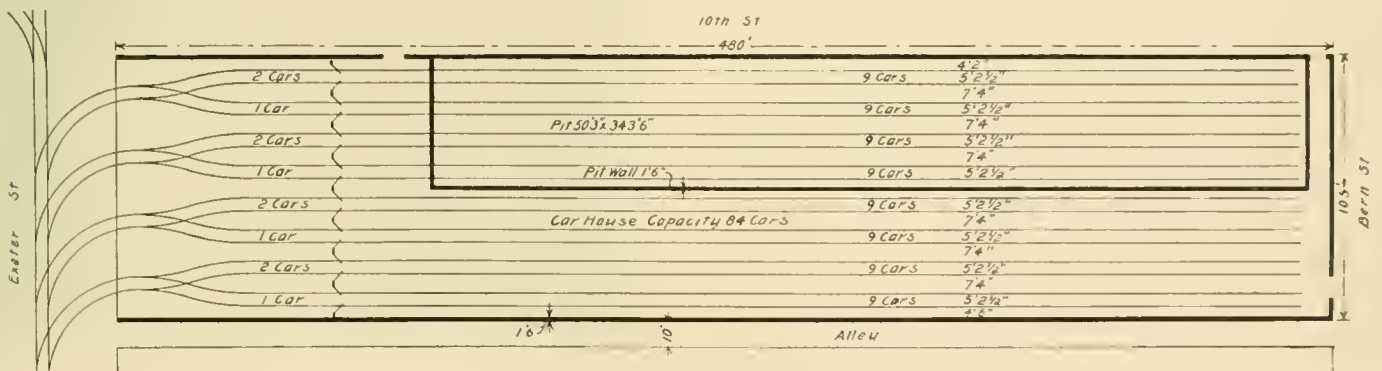
proximately, with walls 18 ft. high will be erected with one row of posts down the center supporting the roof and dividing the interior into two 50-ft. spans. Starting from a short distance from the special work at the front of the house and running back to a point near the center of the machine shop all the ground occupied by the second, third, fourth, fifth and sixth tracks counting from the 20-ft. alley indicated on the plan, will be excavated to a depth of 4 ft. 6 in. to provide for car pits and the floor and tracks will be supported on square iron posts, 170 in number, placed immediately under the track line. On top of the posts will be placed stringers and on these stringers the rails. By this construction the workmen can start from any point under the car house proper, the carpenter or general repair shop, and pass in any direction under all of the five tracks. The various jacks, hoists and tools may also be readily transferred

radius; the arcs from the tangent to the frog are 15' 43' in the Chester car house and 16' 20' in the other.

The United Power & Transportation Co. has recently purchased 40 new open cars with 15 benches to be mounted on Brill 27 G trucks, with Westinghouse No. 49 quadruple motor equipment. The general offices of the company are in the Bullitt Bldg., Philadelphia.

BEATING AN ANTI-TRUST LAW.

About April 1st of last year the capital stock of the San Antonio Gas Co., the Mutual Electric Light Co., the San Antonio Edison Co. and the San Antonio Street Railway Co. was all purchased by one syndicate and as two of these companies had formerly been



CAR HOUSE OF UNITED POWER & TRANSPORTATION CO., AT READING, PA.

from one track to another without carrying them to the surface. The pits are to be well lighted and the pit floors and side walls cemented.

Accommodations for 32 cars at one time will be secured in the main room of the building on the five pitted tracks with space for 18 additional cars on the three tracks at the side, which will be utilized for temporary storage purposes.

Immediately back of the main room and connected with it by swinging doors at each track is the carpenter and general repair shops, 54 ft. long with capacity for six cars. As before mentioned the pits under the tracks in this room open into the pits in the large room. At the rear of the building are two rooms each 100 ft. long,

competitors in the electric light and power business it was claimed that this sale created a consolidation of the several corporations in violation of the anti-trust statutes of Texas passed in 1880 and 1895.

The state by its attorney-general sued the several corporations, asking for their dissolution, the forfeiture of their charters and the appointment of receivers. The state won in the District Court and this decision was affirmed by the Court of Civil Appeal; where the defendants had carried it. The companies then applied to the Supreme Court for a writ of error which was refused. Thereupon all the corporations submitted to a similar decree in the trial court and on Mar. 5, 1900, receivers for their several estates were appointed. The stockholders petitioned that all the properties be at once sold

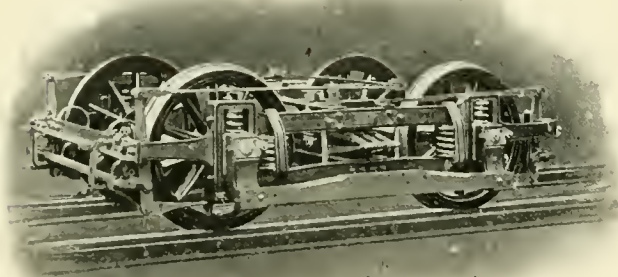
and there being no creditors to intervene the property of the four companies was on April 3d sold to W. F. Douthirt, trustee for the stockholders, and the sale confirmed by the court.

Two new companies were then organized, the San Antonio Gas & Electric Co. and the San Antonio Traction Co.; Mr. Douthirt assigned to the former all the property of the two lighting companies and to the latter the property of the two street railways. The new companies are now pursuing the even tenor of their respective ways at peace with the state.

The officers of the San Antonio Gas & Electric Co. are: President, E. H. Jenkins; vice-president, W. F. Douthirt; secretary and treasurer, V. N. Gurney. The officers of the San Antonio Traction Co. are: President, E. H. Jenkins; vice-president, W. F. Douthirt; secretary and treasurer, J. J. King.

BRILL TRUCK FOR THE PARIS EXPOSITION.

The truck shown in the accompanying engraving was built for the Orleans Railroad Co., of France, for use in its Paris terminal tunnel. It was built by the J. G. Brill Co. and will form a part of the Brill exhibit at the Paris Exposition. The frame is a solid forging but so nicely finished that it has the appearance of a smooth casting rather than a forging, the Brill shops being fitted up in a complete manner for such work. The general features of the truck are the same as those of the Brill No. 27. The spring links are carried over the wheel piece giving a long link and a particularly easy side motion. The wheels are 42 in. in diameter, cast centers and steel tires, and spaced 6 ft. 6 in. between centers.



BRILL TRUCK FOR PARIS.

The arrangement of the brakes will be seen from the illustration; the rods are all carried outside the wheels in order to leave more space for the motors. The gage is 4 ft. 8½ in. The journals are 4¼ in. in diameter, M. C. B. standard. Were it not that the car body which is mounted on a pair of these trucks is designed to carry 44 passengers, the trucks might be designated as electric locomotives as each is equipped with two 150-h. p. motors, giving 600 h. p. for the car. The weight of the truck alone is 11,880 lb.

The beam fastened to the journal boxes is for carrying the shoe for contact with the third rail.

ELEVATED RAILWAY FOR PARA, BRAZIL.

A recent consular report states that the city of Para, Brazil, is to have an elevated road. Dr. Francisco Bolonha, an enterprising Brazilian who visits the United States quite frequently, is working to obtain a franchise from the municipality, which, it is thought, will be granted. The road is very much needed, as the service given by the present horse-car line is very poor. Any company interested in this business could purchase the present franchise, and, with proper management, it would be profitable. It is understood that the present company would sell the railway and electric lighting plant for from 8,000,000 to 10,000,000 milries, Brazilian money (\$1,200,000 to \$1,500,000 gold). The concession is for a term of 50 years.

The North Jersey Street Railway Co. of Newark, N. J., carries about 980 policemen and 400 firemen free every day.

CINCINNATI, NEWPORT & COVINGTON.

A condensed statement of the operation of the Cincinnati, Newport & Covington Ry., Covington, Ky., for the first quarter of the current year, which we have received from Pres. J. C. Ernst, shows a remarkable increase in the net profits as compared with the corresponding period in 1899. For the first quarter of 1900 the gross receipts were \$168,983; operating expenses, \$66,625; tolls, taxes, damages, etc., \$36,944; net profits, \$65,414. For the first quarter of 1899, the gross receipts were \$147,935 and the net profits only \$36,323. Of this increase of \$29,091 in net profits, \$11,359 was in the month of March.

The ratio of expenses to earnings for the quarter was .5292, including tolls, and .3943 excluding tolls, as against .6083 and .4661 for the first quarter of 1899.

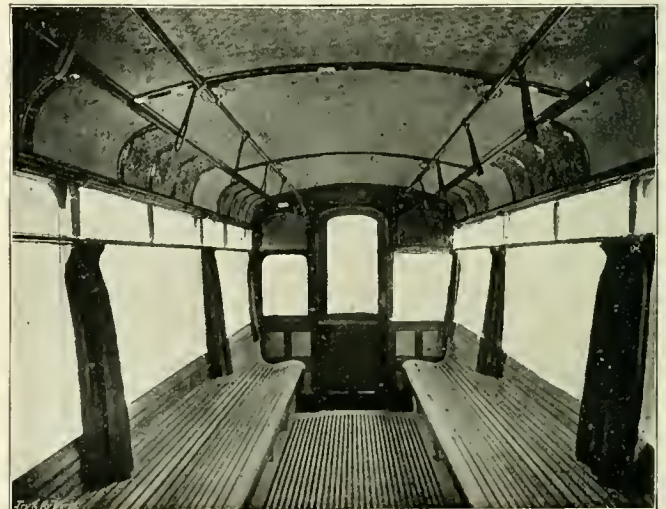
FREIGHT ON CITY STREETS.

Mr. Charles Truax, of Chicago, who was chairman of the Fall Festival committee last year, is a warm advocate of the handling of freight by electric street railways and says concerning it: "Any shipper can see the advantages of being able to load his goods on cars that are switched into his shipping room. He does not have to send a dray a mile or two with a few small packages. They are put on a car with freight from other houses and the company operating the lines will soon learn how to manage so that their cars are made up to save time in reaching the depots. In many places the alleys favor this system perfectly."

Mr. Truax, who is now in Europe, said before leaving that he intended to study the subject of urban freight transportation abroad and have a definite plan to submit on his return.

NOVEL ARRANGEMENT OF CURTAINS.

We reproduce an interior view of one of the Edinburgh cable cars as illustrated in our English contemporary, the Tramway and Railway World. Particular attention is directed to the curtains which slide longitudinally on rods. This arrangement is new to us, but we do not think that it has the same advantages as our system of ver-



INTERIOR OF EDINBURGH CAR.

tically moving curtains or shades. With the curtains shown one can not shut out the sun without also shutting out all view; in windy weather the curtains will be blown about, and we should think that they would gather dust and hold dust, unless given constant attention.

The Central Railway Co., of Peoria, Ill., recently equipped its cars with G. E. 52 motors and to avoid the expense of buying new controllers, those of the K2 type formerly used were rebuilt by the company's electrician, Mr. A. T. Leach. The change was made by putting in K10 cylinders and rewiring the controllers.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ONCE STARTING CAR TOO QUICKLY DOES NOT SHOW UNFITNESS OF CONDUCTOR.

Gordon v. West End Street Railway Co. (Mass.), 55 N. E. Rep. 999. Jan. 5, 1900.

A single act of starting an electric car too quickly, without more, the supreme judicial court of Massachusetts holds, as a matter of common sense and on authority, will not warrant any general inference as to the competency of the conductor so as to support an action under a statute authorizing a recovery of damages for injuries sustained through the unfitness of an employee.

NO GREATER DEGREE OF CARE REQUIRED OF WOMAN THAN OF MAN.

Asbury v. Charlotte Electric Railway, Light & Power Co. (N. C.), 34 S. E. Rep. 654. Dec. 22, 1899.

There is no greater degree of care required to be exercised by a woman, as in alighting from a street car, the supreme court of North Carolina holds, than by a man, she being bound by the rule of "the prudent man," that is to say, bound to exercise ordinary care, or such care as an ordinarily prudent man, placed in like or similar circumstances, would exercise.

THE KIND OF POWER USED DOES NOT MAKE A STREET RAILWAY.

Hoboken Railroad, Warehouse & Steamship Connecting Co. v. State Board of Assessors (N. J.), 44 Atl. Rep. 960. Nov. 13, 1899.

The fact that the same power is used, and the same method of applying it is adopted, as prevails on the various street railway systems of the state, the supreme court of New Jersey holds, has no bearing on the question of the character of railroad property, or of the use to which it is put, even where part of the road is constructed through the streets of a city, particularly so when any railroad is authorized by statute to use any kind of motive power best adapted to its purpose.

NO DAMAGES FOR AUTHORIZED REMOVAL OF TRACK BY MUNICIPALITY.

Stewart v. Village of Ashtabula (U. S. C. C.), 98 Fed. Rep. 516. Dec. 23, 1899.

No damages can be recovered from a municipality for the removal from its streets of a street railway track, where it is done carefully, so as to damage the owner as little as possible. Judge Taft, of the United States circuit court, holds, when the ordinance under which the track was laid provided that the municipality might remove same if the council concluded that the conditions had not been complied with, and should any adjudication of forfeiture be necessary, which he does not pass upon, he holds that one after the removal would be sufficient.

NOT REGULAR DUTY OF CONDUCTOR TO ASSIST WOMEN AND CHILDREN TO ALIGHT.

Selby v. Detroit Railway (Mich.), 81 N. W. Rep. 106. Dec. 12, 1899.

The supreme court of Michigan here holds objectionable an instruction which may have been understood by the jury as meaning that the conductor on a street car was not only bound to give women and children an opportunity to alight with safety, but must assist them in so doing.

TAKING UP TRACKS NOT SUFFICIENT TO SHOW FORFEITURE OF FRANCHISE.

Sawyer v. City of Chicago (Ill.), 55 N. E. Rep. 645. Dec. 18, 1899.

A street railway company having constructed its tracks and operated cars thereon for several years under a city ordinance which it accepted that gave it a twenty years' franchise and imposed upon

it the duty to keep in good repair 16 feet in width of the street, the supreme court of Illinois holds that the fact that the tracks were taken up when a sewer was built, and had not been relaid, was not sufficient to show either a forfeiture of the franchise or a release from the obligation, and that the entire cost of grading and paving the street could not be assessed to the abutting owners.

PULLING DOWN POLE ON PEDESTRIAN.

Bamford v. Pittsburg & Birmingham Traction Co. (Pa.), 44 Atl. Rep. 1068. Dec. 30, 1899.

It is not enough, according to the supreme court of Pennsylvania, that a pedestrian shows that he was injured by the fall of a trolley pole. The burden is on him to prove negligence, or such a state of facts as fairly warrant an inference of negligence. But the last condition it holds was met by evidence tending to show that a loop of wire that had once been serviceable was permitted to hang down at such a point that when a trolley left the trolley wire near a span wire, the wheel caught in the loop, which held the wheel against the span wire, and thus pulled down a trolley pole upon a pedestrian.

NOT BOUND TO ANTICIPATE ATTEMPTS TO ALIGHT FROM MOVING CARS.

Stener v. Metropolitan Street Railway Co. (N. Y.), 61 N. Y. Supp. 1059. Jan. 5, 1900.

While conductors and drivers of street railway cars are bound to use diligence in looking after the safety of their passengers, the appellate division, first department, of the supreme court of New York holds that they have no reason to anticipate that passengers will attempt to alight from moving cars. Besides which, it further holds that if parties attempt to alight from a car, having given no information or indication to the persons in charge of their intention so to do, there is no negligence upon the part of the driver of the car in increasing its speed to the rate at which it can ordinarily proceed with safety.

INFERENCE THAT MAY BE DRAWN FROM COLLISION WITH REAR WHEEL OF TRUCK.

Meyer v. Brooklyn, Queens County & Suburban Railroad Co. (N. Y.), 62 N. Y. Supp. 33. Jan. 9, 1900.

From the fact that, though the plaintiff was driving at a slow walk, with a loaded vehicle,—a truck or business wagon loaded with woodenware,—the horse and the greater part of the vehicle had passed beyond the track at the time of the collision, the appellate division, second department, of the supreme court of New York holds that a jury might well find that when the head of the horse was either on the track, or so near it as to indicate the intention of the plaintiff to cross, the car must have been at such a distance away that, had it been properly managed, the collision would have been avoided.

NO WARNING REQUIRED FOR BOYS PLAYING ON SIDEWALK.

Graham v. Consolidated Traction Co. (N. J.), 44 Atl. Rep. 964. Nov. 13, 1899.

The supreme court of New Jersey says that there is no statutory duty imposed upon street railway companies in respect to giving audible signals of the approach of their cars, such as is imposed by law upon railroad companies. The duty of street railway companies in this regard arises out of their use of public highways in which the public have a right of passage. Since they are permitted to use cars running upon rails, from which they cannot deviate, and since this construction forbids their turning out to make way for the passage of other vehicles or passengers, a duty to give reasonable warning of the moving car may arise. Such a duty may reasonably require audible signals. But, the court holds, no signal nor warning is appropriate or required as to boys playing on the

sidewalk and giving no indication that they intend to cross the track. It is enough if the motorman makes every effort to arrest the motion of the car when they rush from the sidewalk and run directly in front of the car.

EVIDENCE OF SUBSEQUENT ARREST AND ACQUIT- TAL INADMISSIBLE IN ACTION FOR EJECTION.

Vadney v. Albany Railway (N. Y.), 62 N. Y. Supp. 140. Jan. 8, 1900.

In an action brought to recover damages for wrongful ejection from a street car by the conductor, where the defendant claimed that the plaintiff was guilty of such disorderly conduct as to justify the act of the conductor, and the plaintiff contended, on the other hand, that he was not guilty of disorderly conduct, but that the ejection was wrongful, the appellate division, third department, of the supreme court of New York holds that evidence that some days after the ejection the plaintiff had been arrested on complaint of the conductor, charged with disorderly conduct on the occasion under inquiry, and had been tried and acquitted, was immaterial and should have been excluded.

POLE OF DISABLED CAR THAT IS PUSHED SHOULD BE TIED DOWN.

Schenkel v. Pittsburg & Birmingham Traction Co. (Pa.), 44 Atl. Rep. 1072. Dec. 30, 1899.

A disabled trolley car was being pushed by another car behind it, and at a point where the street railway crossed another at right angles the trolley pole of the disabled car jumped its own wire, struck and broke the wire of the cross line, and thus caused the accident by which the plaintiff in this case was injured. There was also testimony that the proper course, under such circumstances, was to tie down the trolley pole of the disabled car, and that in this case the conductor was told by the conductor of the rear and operating car to do so, but he refused or neglected to tie it down. Such being the case, the supreme court of Pennsylvania holds that it was clearly one for the jury, and it affirms a judgment for damages against the company.

PERSON CARRIED BY DESTINATION AND BROUGHT BACK STILL A PASSENGER.

Rosenberg v. Third Avenue Railroad Co. (N. Y.), 61 N. Y. Supp. 1052. Jan. 9, 1900.

The appellate division, second department, of the supreme court of New York holds here that if the plaintiff was carried by his point of destination through the fault of the conductor, and he was thereafter permitted to remain upon the car on its return trip until he reached his point of destination, he must be regarded as occupying the relation of a passenger to the company, even though he paid but one fare. The company, when it received him as a passenger, it says, undertook to deliver him at his point of destination upon its line, so that, if he relied upon the conductor to inform him when such point was reached, and the conductor negligently omitted so to do, but carried him by, and thereafter he was permitted to remain upon the car until it again reached such point, the court does not think that it can be asserted that his relation as a passenger had changed.

MORTGAGEES' SECURITY SUBJECT TO OBLIGATION TO PAVE BETWEEN TRACKS.

Cambria Iron Co. v. Union Trust Co. (Ind.), 55 N. E. Rep. 745. Dec. 12, 1899.

The supreme court of Indiana says in this case, wherein was involved the construction of the franchise of a street railway company with reference to the latter's duty of paving between its tracks, that the following propositions of law have been by it declared settled in that state, viz.: (a) That a charter granted by a city and accepted by a railway company, constitutes a contract between the city and company; (b) that such a charter must be strictly construed against the company; (c) that such company has no doubtful rights under such charter; (d) that where there are doubts they must be construed against the grantee and in favor of the city.

In the light of these rules of construction, the court holds that the charter ordinance in question, which conferred the right to occupy the streets and manifested an intention to relieve the public so far as possible from any inconvenience in their use or increased burden in their repair and maintenance, in providing that the street should be paved between the rails made such paving by the company a condition to its enjoyment of the franchise.

Moreover, the court holds that the obligation to pave between its tracks when and as the street was improved being of the essence of the company's being, when mortgagees accepted their security they were bound to take the property as they found it, and bound to know that the rights they acquired in the property were subject to the burdens already imposed upon it.

FRANCHISE CONSTRUED AS TO GRADING REQUIRED.

People v. Detroit, Ypsilanti & Ann Arbor Railway Co. (Mich.), 81 N. W. Rep. 336. Dec. 21, 1899.

A street railway franchise provided that the track should be laid so as to obstruct as little as possible the free passage of vehicles along the highway; that so long as the highway should remain unpaved the tracks should be laid on the north side thereof; and that that portion of the road lying adjacent to the south rail of the track should be properly dressed to the track, so as to provide for the easy crossing of the same by vehicles. This was a country road, and the supreme court of Michigan holds that all that could be required was that where the railway was within the 16-foot driveway the company should continue the grading of the highway upon its track, but where it was wholly without such driveway it should continue to the south rail of the track.

LIABILITY TO PASSENGER INJURED IN COLLISION WITH FIRE DEPARTMENT WAGON.

Olsen v. Citizens' Railway Co. (Mo.), 54 S. W. Rep. 470. Nov. 28, 1899.

As a street car was proceeding on its way, an engine of the city fire department crossed the street at a crossing in front of it. The engine was followed by a hook and ladder wagon, which was being driven very rapidly, as is usual with such wagons going to a fire. The motorman did not stop the car, but when he saw the wagon approaching he undertook to avoid a collision by running his car at full speed across the intersection of the streets ahead of the wagon. A passenger on the car was injured by the resulting collision, and, in affirming a judgment in the passenger's favor, the supreme court of Missouri, division No. 2 holds that, under the facts developed on the trial, it was clearly a case for the jury to determine whether the motorman was negligent.

If the motorman heard the gong or the shouts of the people warning him of the approach of the fire department's wagon, the court goes on to say, the most ordinary care would have dictated to him to approach the crossing with his car well in hand. He must have known that it was the duty of the driver of the hook and ladder company to act with the utmost promptness, and regardless of a considerable degree of danger to himself, and that the hook and ladder wagon had the right of way. The custom of giving these fire engines and hook and ladder wagons the right of way grows out of necessity, in which all good citizens acquiesce.

The duty which the defendant street railway company owed to the plaintiff, who was its passenger, the court holds, was to use every effort that a very prudent person would have exercised under the circumstances to have averted injury from the plaintiff. This duty was not restricted solely to the motorman. It devolved upon the conductor, also. If the conductor heard, as the plaintiff heard, the fire gong and shouts, it was his duty to co-operate with the motorman in avoiding the collision.

Particularly does the court hold that there was nothing novel in, but the duty of the defendant and its servants and employes was correctly stated by an instruction given the jury that the defendant, by its servants in charge of its cars, in one of which the plaintiff was a passenger, was bound, in law, to exercise a high degree of care to watch and listen for any approaching vehicle at the street crossing, also, to use such care to avoid collision with any such vehicle, and, if the defendant's servants in charge of the said cars failed, even in a slight degree, to use such care, and thereby directly

contributed to cause the plaintiff's injury, then the defendant was liable, although the jury should find from the evidence that the employes of the city fire department also failed to exercise ordinary care, and thereby contributed to cause said collision.

The contention that the negligence of the defendant could only be predicated on the failure of the motorman to exercise the high degree of care, the court dismisses with the statement that such a rule would make a mere dummy of the conductor, and that it finds nothing in law or reason to exempt the defendant from responsibility for all its servants in charge of its cars. Likewise, in pronouncing without merit the objection that by the view taken in the trial court the defendant would be required to have skillful employes, it says that the law exacts that a company using appliances which will naturally prove very dangerous if not handled skillfully shall have competent servants in charge thereof.

Nor does the court consider that there was any error in permitting witnesses to state how far the gong on the wagon was heard, and could be heard, as in this way only could the plaintiff demonstrate to the jury that the motorman, by the exercise of ordinary care, could also have heard the gong.

The plaintiff being absolutely free from negligence, on her part, and the collision having occurred and injured her, the court holds that a prima facie case was made. The burden, it holds, was cast upon the defendant, after the proof of the collision, to show that it was the sole fault of the hook and ladder company. It was essential for it to show, not only that the driver of that wagon was negligent, but that its own negligence in no way contributed to the collision, it being for the latter only that the plaintiff here sought to hold it responsible.

SHOULD STOP CAR AND TAKE BOY INSIDE OR PUT HIM OFF.

Levin v. Second Avenue Traction Co. (Pa.), 45 Atl. Rep. 134. Dec. 30, 1899.

In this case, a child 5 years of age, got upon the step of the platform of a car, and while there, after the car had started, was seen by the motorman, who knocked on the window, and then kicked on the lower end of the closed side—the side next to the child—when the latter jumped off and fell. This was all that the motorman did. Nevertheless, the supreme court of Pennsylvania holds that the injury sustained resulted entirely from the negligence of the traction company, and that the case should not have been taken from the jury.

The court holds that when the motorman discovered the boy on the platform of the car, it was his duty to stop, and take him inside, or put him off. The moment the child was seen, the car should have been stopped, and failure to stop it instantly became negligence. Instead of stopping, and taking the boy inside, or putting him off, the motorman, as before stated, knocked on the window and kicked on the side, manifestly frightening the little fellow, and, the court goes on to say, the negligence became cruel; but before he knocked or kicked, having seen the boy, there was negligence in allowing him to remain on the platform of the moving car, and the knocking and kicking simply intensified it.

The youth of the boy, the court holds, exempted him from the charge of being a trespasser, in the legal signification of the word, and no negligence was imputable to him.

AS TO CONTRIBUTORY NEGLIGENCE OF BOY CROSSING IN FRONT OF MOVING CAR.

Costello v. Third Avenue Railroad Co. (N. Y.), 55 N. E. Rep. 897. Jan. 9, 1900.

The court of appeals of New York here reverses a judgment dismissing the complaint for what was held to be the contributory negligence of the plaintiff as a matter of law. He was 8 years old when, in attempting to cross the street diagonally in the middle of a block, he was run down and injured by a car, the motorman on which has just been engaged in an altercation with the driver of a wagon that had obstructed the progress of the car, and had but just left the track, the motorman turning on the electric current at the same time, and causing the car to shoot forward without his turning his face and surveying the track in front of him.

Under these peculiar circumstances, the court thinks that the question of the boy's contributory negligence should have been

submitted to the jury, the gross and well nigh criminal negligence of the motorman being undisputed, according to the record. The court says that in the city of New York, where the traffic is enormous upon its principal avenue, it is oftentimes necessary for the wayfarer to pass in front of moving cars, and it usually depends upon the surrounding circumstances of each case whether the particular act of crossing was negligent or not. If the pedestrian is obliged to cross the street a short distance in front of a car moving at a very moderate rate of speed, and with a vigilant motorman in charge, no danger need be apprehended; but if the latter may turn his back on the track before him, and send his car ahead with unexpected and dangerous velocity, the court holds that it is clearly a question for the jury whether the mature judgment of an adult might not fail to save him in such an emergency.

Moreover, even if contributory negligence were assumed, for argument's sake, the court says that the question remained whether the company might, by the exercise of reasonable care and prudence, have avoided the consequences of the injured party's negligence.

And, besides all this, the court holds that a boy 8 years old was not to be judged by the standard of intelligence and judgment applied to an adult in full possession of his faculties. It says that it has repeatedly held with reference to infants varying in age from 6 to 15 years that the law is not so unreasonable as to expect or require the same degree of care or circumspection in a child of tender years as in an adult.

DUTY OF COMPANY IN CHANGING STREET DRAINAGE.

Lion v. Baltimore City Passenger Railway Co. (Md.), 44 Atl. Rep. 1045. Dec. 6, 1899.

When a company, in constructing a cable system of street railway, undertook to change the accustomed flow of the surface water, and to concentrate it in underground drains and a vault at a point where but a part of it formerly had harmlessly flowed on the surface, the court of appeals of Maryland holds that it was bound, at its peril, to provide adequate means to discharge the water so gathered by it, and to discharge it in a way that would not be injurious to others. This, it says, was a perfectly plain duty that was incumbent upon it; and it was no answer to say that it relied on the judgment of competent engineers in the construction of its works, if in fact the works, as constructed, were inadequate to accomplish the purpose or were unskillfully built. The employment of a competent engineer to direct the work was not the fulfillment of a duty to avoid doing injury to another, when, notwithstanding the engineer's competency, the work, as constructed, did cause injury. The test of liability was not the fitness of the engineer, but the efficiency of the work. So the court holds that if the railway company elevated the bed of a certain avenue, and brought an increased volume of water to the corner of that avenue and a cross street, and then, by the negligent and unskillful construction of or attention to the sewers or drains and vault designed by it to carry off the water, failed to convey it away, whereby it overflowed the vault or receiver, and damaged the plaintiff's house, the company was liable.

MAY MAKE REASONABLE RULES AGAINST PASSENGERS CARRYING CERTAIN ARTICLES.

Dowd v. Albany Railway (N. Y.), 62 N. Y. Supp. 179. Jan. 8, 1900.

A man carrying two rifles, with bayonets attached, and a valise, boarded a street car. The conductor of the car informed him that he could not ride with those guns. Upon this request the man did not voluntarily act. Some minutes later the conductor again told him that he must get off the car, and thereupon forced him off, taking him by the collar of his coat, and pulling him. The man was not thrown down, and suffered no serious personal injury. He recovered a judgment for \$300 damages. In reviewing the case, the appellate division, third department, of the supreme court of New York says that it thinks that it would not be warranted in interfering with the verdict, except for the errors that were made in charging the jury.

There was offered in evidence, a rule of the company reading: "Passengers must not be permitted to take into the cars packages or goods that are cumbersome or dangerous, such as barrels,

boxes, trunks, gas pipe, and panes of glass." The court said to the jury that the company had a right to make reasonable rules, and that passengers must be governed by them, and then, in effect, left it to the jury to say whether this rule was reasonable. The appellate division thinks this was error, and holds that the court should have charged the jury, as a matter of law, that this was a reasonable rule.

Besides, the court further charged the jury, in effect, that they might find that the guns carried in the manner in which they were, were not dangerous, and the conductor was wrong in declaring them to be so. This, the appellate division holds, was also error. The man, incumbered with a valise, it says, carried these two rifles, with bayonets attached, in his hands, in a closed car in which there were a number of passengers, and passengers getting on and off at every crossing. The two guns, rigged and carried in that way by one man, with a valise also, it holds, were so obviously dangerous to others in the same car that it needed only the declaration of the conductor in charge to exclude the passenger proposing to ride so incumbered, and his declaration to that effect, it maintains, should have been conclusive, and the court should have instructed the jury that the only question for them to consider was whether unnecessary force was used in putting the man off the car, and if so, what was the damage suffered because of such unnecessary force.

For these reasons, the judgment was reversed, and a new trial granted.

DUTY WHERE NEW PASSENGER IS ON RUNNING BOARD WHEN PASSING FURNITURE VAN.

Henderson v. Nassau Electric Railroad Co. (N. Y.), 61 N. Y. Supp. 690. Dec. 19, 1899.

An open car, the seats of which were all occupied, and in which some persons were standing between the seats, was stopped to receive a passenger after the motorman had rung his bell to notify a furniture van proceeding in the car tracks ahead of the car to leave the tracks in order that the car might proceed. When the car then got to the van it had pulled to the side of the street and stopped so as to bring its rear end within about two feet of the track, and the passenger was injured by coming into contact with the van.

In affirming a judgment for damages in favor of the passenger, the appellate division, second department, of the supreme court of New York holds that the company was chargeable with notice that the car was crowded, and that this passenger and others stood upon the running board. The van was still in its front, and the motorman of the car, as he passed it, was chargeable with knowledge of the position the van occupied, and the small space that was left between it and the car. It was chargeable with notice that the distance was insufficient for persons standing upon the running board to escape contact with the van, unless, observing the same, they bent their bodies inward towards the car. Under such circumstances great care was imposed upon those charged with its operation to see that injury was not inflicted upon the passengers on the car. This duty was disregarded, and for such act the company was properly charged with negligence.

The passenger, the court holds, had the right to stand upon the running board, and to assume that the company would not so operate the car as to necessarily expose him to danger. It was his duty, if there was a seat within the car, to occupy it, rather than to stand in the dangerous position upon the running board. But it was evident that he was looking for a place within the car, as his duty required; and the company, having received him as a passenger, and then started the car before he had opportunity to see if there was a place which he might occupy within the body of it, must be held to have understood that he would make observation to find such place, and to know that his attention would be directed towards the inside of the car. It was as much his duty to seek a place within the body of the car as it was to observe existing conditions outside the car, and whether, when the car passed the van, reasonable care required that he should observe the side of the street, rather than to see if there was a vacant place within the car, presented a question for the jury. Nor was it conclusive evidence that he ought to have seen the van because one person upon the running board did observe it.

This case is distinguished from one where the car had passed

a truck before the passenger was received and it was held that he ought to have observed the existing conditions before he boarded the car, so as to have looked out for the truck coming up from behind.

TRANSFER POINTS AKIN TO STATIONS AND EACH PASSENGER NEED NOT SIGNAL TO STOP.

Schaefer v. Central Cross Town Railroad Co. (N. Y.), 61 N. Y. Supp. 806. Dec. 28, 1899.

The appellate term of the supreme court of New York holds that it cannot be said, as a matter of law, that each individual passenger must make a personal request of, or signal or communication of intention to, the conductor, that he or she desires to get off. Where a number of people arise simultaneously after one of them has signalled the conductor, it is his duty to give all of them equal opportunity to leave the car safely.

In this case, the car had stopped at a corner where it was usual for it to halt to permit transfer to connecting cars. The conductor had issued a transfer to the plaintiff for this crossing, and, the court holds, should be presumed to have known that she desired to alight at the place for which the transfer was given. It might also be said, the court continues, that points for which transfers have been issued bear some resemblance to regular stations of steam railroad companies, where it is incumbent on them to stop long enough to allow passengers a reasonable time to alight, whether or not the conductor knows of any passengers desiring to leave the car.

A conductor of a street railway car should give passengers a reasonable time to alight, and failure to do so is negligence. Whether the conductor did give the plaintiff a reasonable time to alight, the court holds, was, as also was the question whether he was advised of her intention to alight, a question of fact. Moreover, if the conductor was not on the rear platform, but somewhere towards the front of the car, it holds that it was equally his duty to ascertain whether the car could safely be started. It also holds that there was an invitation to alight contained in the conductor's announcement of "Broadway," when the car reached that thoroughfare.

Nor does the court consider that it is negligence in and of itself for a passenger to board or alight from a car without taking hold of the railings to guard against a sudden movement of the car.

PREREQUISITES TO COLLECTION OF FEES FOR RUNNING OF CARS.

City of Cape May v. Cape May Transportation Co. (N. J.), 44 Atl. Rep. 948. Nov. 13, 1899.

In an action brought by a city against a street railway company to recover an amount alleged to be due in accordance with an ordinance which provided that in consideration of the grant of authority to construct such railway, and to run cars thereon, a certain sum should be paid for "each passenger car," the supreme court of New Jersey holds that an averment of liability for "each" car run on said road is not sufficient.

It also holds that where the fees for the running of cars are by the city imposed by the ordinance only upon the railway company named in the ordinance, an action cannot be maintained by the city against the lessee of such railway for such fees, unless there be in the lease some agreement, condition, or covenant in reference to such ordinance made for the benefit of the city, and which inures to the benefit of the city, and then there must be an averment of such agreement, condition or covenant therein, as no privity of contract or obligation between the city and such lessee arises by the ordinance itself.

Moreover, a city, under the power merely "to regulate the streets thereof, and to prescribe the manner in which corporations shall exercise any privilege granted them in the use of any street," the court holds, cannot enact an ordinance imposing license fees for revenue upon a railway in the use of the streets. The power under such authority is one of police regulation, merely, and the fees imposed must be reasonable, in view of the accomplishment and fulfillment of such regulation. Under such a power the right of taxation for revenue is not conferred.

Lastly, under the act of 1885 (P. L. 1885, p. 317), which confers the power to license by ordinance the running of cars in the streets

of cities, and provides that the fees for such licenses may be imposed for revenue, the court holds that an ordinance enacted by virtue thereof must provide for such license in express terms, and indicate that the fees for such license are imposed for the purpose of revenue.

CONSTRUCTION OF FRANCHISE RESOLUTION RE-
QUIRING CONNECTION WITH ANOTHER ROAD
AFTER ITS COMPLETION.

Township of Hamtramck v. Rapid Railway Co. (Mich.), 81 N. W. Rep. 337. Dec. 21, 1899.

A township board adopted a resolution granting to a street railway company the right to construct a railway and maintain same during the corporate life of the company, upon certain conditions, one of which was that so much of the road as extended westerly of a certain point should be equipped and put in operation whenever convenient for the purpose of connecting with any street railway line built in the city, the connection to be made within two years after the completion of the railway in the city, on a certain avenue. The resolution also contained a provision that this franchise, and the permission hereby granted, should cease and be utterly void unless accepted in writing, by the railway company within ninety days.

Now this right conferred upon the railway company, taken in connection with the acceptance of the company, the supreme court of Michigan holds constituted what is known as a "franchise," and was not subject to revocation; and that the doctrine that forfeitures are not favored, and that equity will not decree a forfeiture except for substantial reasons, applied.

The term "completion," as used in the condition quoted, the court holds meant only such completion as would render the road built in the city suitable for the use contemplated by the parties in making the contract. In other words, it accepts the view that the two years would begin to run from the time when the road was substantially completed so as to answer the purpose of its construction, and was put in use as a public conveyance for passengers, although many more things might be required to complete the road in the technical sense of that term.

Again, it holds that the words "the connection to be made" meant the connection of the track of the railway to which this franchise was granted with the track of the railway built in the city for the purpose of allowing the cars of the former to pass over the track of the latter on the way to the central portion of the city. But the cars of the former were much heavier and much longer than the cars of the city line, and the evidence tended to show that for some time the track built in the city was not leveled up, nor ballasted, nor made safe for such larger cars. Wherefore, the court holds that the words "two years after the completion of the railway in the city" should be construed to mean two years after the completion of such railway to the extent that the cars of the company first mentioned might safely pass over its tracks.

RIGHTS OF REMONSTRATING OR INSULTING PASSENGERS.

Weber v. Brooklyn, Queens County & Suburban Railroad Co. (N. Y.), 62 N. Y. Supp. 1. Jan. 9, 1900.

The plaintiff, while a passenger on one of the defendant's cars, was forcibly ejected therefrom by the conductor. He had stepped to the rear platform, to remonstrate with the conductor for what the plaintiff conceived to be his abusive treatment of another passenger. An altercation ensued between the plaintiff and the conductor, which resulted in the removal of the plaintiff from the car. He brought an action for damages, and got judgment, which is here affirmed by the appellate division, second department, of the supreme court of New York. The controverted question was whether the assault involved in such removal was justifiable or not.

It was contended, on the one hand, that, inasmuch as the plaintiff voluntarily left his seat in the car, and interfered with the management of the car and its passengers, without cause, he waived his rights as a passenger, and the company was freed from liability for the result. But according to the plaintiff's narrative of the events which resulted in his ejection from the car, he did nothing

more than civilly to protest against what he considered the unkind treatment of an intoxicated passenger, whom the conductor had handled with unnecessary roughness before putting him off the car. Taking up the question at this point, the court says that it cannot be seriously supposed that a person, by such an act of remonstrance as this, forfeits his right to be protected from assaults by the servants of a common carrier in whose vehicle he is a passenger. As to whether the plaintiff had brought the assault upon himself the court holds was clearly a question of fact for the jury, to be determined from the circumstances preceding the assault and the circumstances of the assault itself.

Furthermore, the court holds that a conductor cannot rightfully assault a passenger merely because the passenger has insulted him, or otherwise provoked him, by mere words; and if he does assault the passenger by reason of such provocation only, unaccompanied by any threats or acts of personal violence, the railroad company will be liable for the consequences of the assault, under the well-established rule which protects passengers against the misconduct of a common carrier's servants. If a passenger in a railroad car is guilty of disorderly conduct, the conductor may lawfully require him to leave the car, and, in the event of his refusal to do so, may exercise such force as is necessary to eject him, but no more.

To avoid any possible misunderstanding, the court deems it well to add that, of course the passenger could not recover damages if he used the provoking language with the intent of bringing about the assault which followed.

POWER OF CITY TO ORDER LOCATION OF LOOP
CHANGED AND LINES EXTENDED.

State ex rel. City of St. Paul v. St. Paul City Railway Co. (Minn.), 81 N. W. Rep. 200. Dec. 15, 1899.

The supreme court of Minnesota holds that a municipality cannot abdicate or barter away, at least without express legislative authority, its governmental powers conferred upon it for public purposes. Hence any authority to use the streets granted to a street railway company must be construed as being subject to the general police power of the municipality over the public streets.

For example, if, by reason of increased traffic on the streets prescribed for the construction and operation of a "loop," or if for any other reason the use of those streets for that purpose became inconsistent with the convenient use of the streets by the public, or a menace to the safety of the public, it would, in the opinion of the court, be unquestionably within the police power of the city to enact an ordinance requiring the loop to be changed to some other reasonable location.

More particularly, however, is the court concerned in this case with the construction to be put upon section 18 of Ordinance 1227 of the city of St. Paul, commonly known as the "General Electric Ordinance." This section states that "the common council reserves and shall have the right, at any time, and from time to time, after January 1, 1892, to order the construction and completion, by said St. Paul City Railway Company, of any new lines of street railway or the extension of any present or future lines of railway upon any and all streets in the city of St. Paul upon which sewers shall have been constructed, and in operation within one year after such orders are made; provided, that when new lines or extensions are constructed all the provisions of the ordinance shall apply thereto."

The conclusion reached by the court is that the power thus reserved to the common council to order the St. Paul City Railway Company to extend any existing line or future lines of its railway is not limited to extension on streets or parts of streets not provided with any car service, but authorizes the extension of the car service of one line to or into the business or central part of the city, over streets or parts of streets upon which there is an existing track upon which the cars of another line are already operated.

But if it was attempted to require the extension of any line over a track on which another line was operated, entirely through the central portion of the city, out into a suburban district on the opposite side of the city, the court says that it apprehends that, unless there were some very exceptional circumstances creating a necessity for it, a court would very unhesitatingly hold that the common council had no authority, under either section 18 or the general police power, to require this to be done.

THE TRAMWAYS OF SUNDERLAND, ENGLAND.

Like most English towns the prosperous borough of Sunderland has in the past suffered from a lamentable deficiency of tramways. Having a population of about 150,000, situated at the mouth of the River Wear, in the county of Durham, a seaport, and a shipbuilding and engineering center, it has hitherto had only 10½ miles of tramway track, covering some six miles of streets, worked by horses. Doubtless here, as elsewhere, the purchase clause of the Tramways Act prevented the local company from making extensions.

The Sunderland Town Council has now made arrangements for taking over the lines, and at the last session of Parliament it obtained an act authorizing it to build extensions to a length of 23 miles of track. At present work has been commenced in equipping 13 miles of track for electricity, the contract having been let to Dick, Kerr & Co., London and Kilmarnock. The whole of the work is being carried out on specifications prepared by Mr. J. F. C. Snell, A. M. Inst. C. E., borough electrical and tramway engineer. In what follows it must be understood that the terms Town Council and Corporation are synonymous, as they are generally in Britain.

The municipality has adopted the course of giving contracts locally where no special advantage was apparent from going abroad, and at the same time not hesitating to obtain American apparatus when that seemed to be desirable.

Instead of building a separate power station the corporation is extending its electric lighting station by adding the units necessary for traction purposes. There will be five Galloway boilers, 28 ft. long by 8 ft. 6 in. diameter, working at 130 lb. steam pressure, with two Green's economizers each with 192 tubes. There is the usual by-pass flue to a new smoke stack 160 ft. high and 7 ft. in diameter at the top. The feed pumps, to be supplied by G. & J. Weir, Glasgow, will be each capable of pumping 4,000 gallons at a piston speed not exceeding 50 ft. per minute. Coal will be lifted to an overhead bunker, where it will be automatically weighed and distributed by conveyors into self-trimming bunkers, from which chutes will take it to Vicars mechanical stokers. There will be three three-crank engines of 420 i. h. p. each, direct-coupled to Pallion four-pole slot-wound dynamos, capable of an output of 750 kw. at 550 volts. This plant is made by the Sunderland Forge & Engineering Co. Surface condensers of the British Admiralty pattern, supplied by the Wheeler Condenser & Engineering Co., London, will be used. Each condenser will be able to deal with 16,000 lb. of steam, with a vacuum of not less than 25 inches. There are to be two Barnard cooling towers, provided with motor-driven 10-in. fans. The reservoir is of concrete, holding 16,000 gallons of water. The power required by the auxiliaries must not exceed 3½ per cent of the power of the main engines. A hot well with a coke breeze filter is to be provided, from which the feed pumps will draw and will deliver the water through pressure filters. The switchboard, the contract for which has not yet been let, will have the usual dynamo, feeder and Board of Trade panels.

There will be quite an elaborate system of feeders leading from the power house to the lines, as the trolley wires are to be divided into half-mile sections, each with its separate feeder. The feeder will, as usual, be placed underground in stone-ware ducts, and will feed into the trolley wires through section pillars erected along the side of the street with an equipment of switches, test terminals, telephone and lightning arrester. The specification calls for a distribution efficiency of 95 per cent for an evenly distributed load of 750 amperes.

The track will be of standard gage, and the rails will be 90-lb. 7-in. steel grooved girders in 40-ft. lengths, laid direct on a 6-in. bed of portland cement concrete. This is the usual modern British arrangement; cross timber ties or sleepers are scarcely known for street lines. The rails will be tied to gage every 8 ft. by steel tie-bars of 2 in. by ¾ in. The joints are to be secured by fish-plates weighing 60 lb. per pair and sole-plates 30 in. by 12 in. by ¾ in. securely bolted to the rails. The crossings will be braced by substantial sole-plates. The points are of the cast-steel type of Askham Brothers & Wilson, Sheffield. The joints will be bonded by No. 000 B. and S. Columbia bonds, and the cross-bonding opposite each pole is to consist of No. 00, B. and S. bonds. The paving between the rails and for 18 in. outside is partly of wood

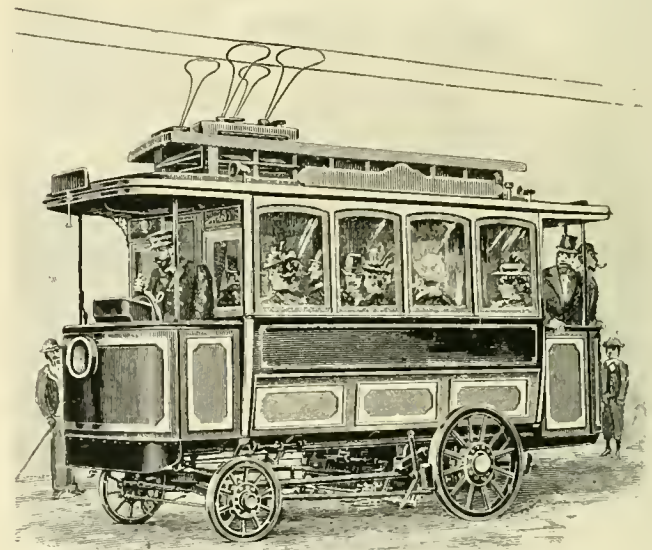
blocks and partly of granite or whinstone setts, size 6 in. by 4 in., with pitch grating. The maximum gradient is 8 per cent, and the sharpest curve has a radius of 40 ft.

According to the character of the road along which the line passes, the style of the overhead equipment will vary; in some places the span wires will be attached to buildings, in others center poles with brackets will be employed. The desire is to make the overhead work as unobtrusive as possible, and ornamental poles will be employed. These will be in one piece, tapering from 7 in. to 5 in. The trolley wires, .325 of an inch in diameter, are to be of hand drawn copper. To assist in conforming to the Board of Trade regulations as to drop of potential in the rails (maximum allowed being 7 volts) return feeders will be joined to two minimum potential points in the rails and carried to negative boosters in the power station. This plan will doubtless be unnecessary at first, but further extensions are being kept in view.

The rolling stock will consist of 26 cars, all mounted on Brill trucks. This type of American truck seems to be a great favorite already in England; it is in use on some lines and has been ordered for many more. Six of the cars will have maximum traction trucks, each car having a seating capacity for 61 passengers. Twelve of the other cars will be able to carry 46 persons each. Both of these classes are double-deck cars, which are the favorite type in England. The remaining eight are single-deckers, and are only used because there is an overhead bridge on the route, with a clearance of only 13 ft. 6 in. Dick, Kerr & Co.'s standard motors will be used. It is probable that the lines will be started up electrically in July, 1900.

ANOTHER ELECTRICAL OMNIBUS.

In our issue for December, 1899, page 847, we published illustrations of two electrical omnibuses used in Berlin, and herewith present a view of another vehicle in the same city which, like one of those previously shown, utilizes the street railway current. This omnibus has places for 12 passengers inside and for 6 on the rear platform. There are two motors connected to the rear axle by



ELECTRIC OMNIBUS, BERLIN.

single reduction gearing. The storage battery consists of 44 elements of the Pollak type, which is said to be sufficient for a run of from 10 to 12 miles. Four collecting bows are provided on the roof so that at stations the battery may be recharged, taking current from the street railway overhead lines. This car complete weighs 7,700 lb., and loaded, about 10,000 lb.

The Twin City Rapid Transit Co., of Minneapolis, has placed in many of its cars, fire extinguishers to afford ample protection to passengers in the event of cars taking fire.

FAILURE OF THE AUSTIN DAM.

On April 7th the masonry dam across the Colorado River at Austin, Tex., failed under the stress of a great flood. On the preceding day and up to 4 a. m. on the 7th, five inches of rain fell along the Colorado River and by 11 a. m. the water was 11 ft. deep over the crest. At 11:15 the dam broke on a vertical line about 300 ft. from one end and two sections each 250 ft. long were swept down stream; a few minutes later one piece toppled over and disappeared and the other was partially broken up and washed away, leaving, however, a section of the dam over 40 ft. long standing upright some 30 ft. below the line of the dam. The break left 500 ft. of the dam standing at the west end and 83 ft. at the east end.

When the dam broke the escaping water was forced sidewise and at the east end struck the power house, crushing the west windows and flooding the pump rooms. Mr. Harry L. Monroe, state agent of the General Electric Co., was in the building with Mr. H. C. Patterson, superintendent of the plant, and they had only been out of the wheel pits for three minutes when the break came. Mr. Walter Johnson, chief engineer, was on his way back to the pit, and his two sons, small boys, who were helping at the pumps,

the same month. In the report of city officials of Austin for 1895 we find the cost of the installation given as \$1,391,129 64, of which \$611,313.39 was for the dam.

The dam was 1,143 ft. long, 60 ft. high above low water mark, 66 ft. thick at the bottom and 16 ft. thick at the top. The up stream face is vertical and the down-stream face curved of ogee form; the lower part of the down stream face is curved to a radius of 31 ft.; the central portion has a batter of 4 $\frac{1}{2}$ in. to the foot, and the upper portion has a radius of 20 ft. The two faces and top were built of red granite and the interior of hard limestone rubble laid in port-land cement.

The power house was built on the rock ledges just below the east end of the dam and was 198 x 54 ft.; on the river side the walls were 112 ft. high and on the land side 32 ft. The equipment comprised Victor wheels, made by the Stillwell Bierce & Smith Vaile Co., aggregating 2,400 h. p., pumps of 8,000,000 gallons capacity per 24 hours, and electric generators of 500 h. p. capacity.

The building of the dam by raising the water level 60 ft. formed a lake covering over 1,800 acres, and between 20 and 25 miles long, which was named Lake McDonald, after the mayor, Mr. John McDonald.



THE AUSTIN DAM AND VIEWS AFTER THE FAILURE.

lost their lives, with six others. About midnight of the same day two-thirds of the west wall of the power house fell, carrying with it the roof over the dynamo floor and wrecking the corresponding portion of the east wall.

We reproduce a number of photographs kindly sent us by Mr. Frank E. Scovill, superintendent of the Austin Rapid Transit Ry. No. 1 is a view of the dam taken from the east end, and No. 2 a view from the west end showing the power house; the steamer "Ben-Hur," which appears in this illustration, was stranded and broken in two, as seen in No. 4. No. 3 shows the power house on the morning of April 8th. Nos. 4 and 5 were taken after the break and show the section of the dam swept bodily down stream. No. 6 is a car of the Austin Rapid Transit Ry. standing near First St. bridge (about 4 miles from the dam), where it was when power was shut off.

Mr. Scovill states that it was expected that the city would have water by May 15th, but that light and power were in the more distant future. The Austin Rapid Transit Railway Co. will probably install a power plant of its own.

This dam has been of great interest both as an engineering structure and because its construction was a municipal undertaking. Work was begun on the masonry of the dam May 5, 1891, and the last stone was set May 2, 1893; water flowed over the crest during

The engineer who was first placed in charge of the construction of the dam was Mr. Jos. P. Frizell, who resigned in June, 1892, because of the interference to which he was subjected by Mr. McDonald; the letter of resignation stated that Mr. Frizell has offended Mr. McDonald by insisting that the latter's son, then employed on the work, should perform the duties for which he was paid.

July, 1893, Mr. E. W. Groves, who succeeded Mr. Frizell as engineer in charge, also resigned, giving as one reason the constant interference in the engineering work by Mr. McDonald. Mr. McDonald on his part claimed that Mr. Groves did not have the requisite skill or ability and would not be guided by advice or listen to reason. Mr. Groves was succeeded by Mr. Gorham P. Low, who continued in charge till his death six months later. He was succeeded by the former assistant-engineer, Mr. Joseph Kepferle, who died in December, 1894. He was succeeded by Mr. G. W. Sublette, of Minneapolis, who remained in charge until June, 1895, when the construction work was practically completed.

A few months before the dam failed the fact that the city of Austin had defaulted on the \$1,400,000 of bonds issued to pay for the dam and power house brought this municipal undertaking into prominence and the results of its operation have been urged as an argument against municipal ownership. About the same time

also, the partial filling of Lake McDonald with silt and leaks in the dam which developed last year were made the occasion of criticising the engineer, it being alleged that city ownership tends to a more careless system of engineering that would be permitted by a private company which depends for existence on receipts and economy.

We regard such implied criticisms on the engineers responsible for this work as unjust and think the important point is not that a private company would necessarily have better engineers, but that having engaged a competent engineer, private owners would not permit a layman to interfere with professional work.

The water and electric supply business of the city of Austin has been a financial failure, quite aside from engineering questions, and for this the municipal management is certainly responsible.

NEW SEATTLE-TACOMA ELECTRIC LINE.

Franchises for building an electric railway from Seattle to Tacoma, Wash., have been secured by Fred E. Sander & Co. and W. P. Trimble, of Seattle, Wash. Mr. Sander has made the following statement regarding the enterprise: "We have secured a right-of-way for a double-track standard gage road between Seattle and Tacoma, from the Pierce County line to the city limits of Seattle, with the exception of one stretch of a quarter of a mile. The right-of-way is 66 ft. wide, and passes through the richest part of the country. We shall touch at South Park, Orillia, O'Brien, Kent, Christopher and Auburn. From the latter place we skirt the bluff into Tacoma, passing through a rich and fertile district.

"We expect to lease the power necessary to run the road from the Snoqualmie Falls company, but, failing to make satisfactory arrangements, we have provided for the erection of a water power plant of our own.

"The road will have low grades and few of them. We shall be able to handle large passenger and freight business with rapidity and ease. The road will be supplied with the best of rolling stock and equipment."

STREET RAILWAYS TOO LARGE FOR CITIES TO CONTROL.

At the annual meeting of the Academy of Political and Social Science in Philadelphia, April 19th, Prof. L. S. Rowe, of the University of Pennsylvania, delivered an address on the "Possibilities and Humiliations of Municipal Control" in the course of which he said:

"During the last decade a number of influences have been at work, all of which have tended to place the municipality in a very different relation to the class of corporations under consideration from that which it has heretofore occupied. The first of these is the rapid growth of the suburban districts of our larger cities, offering profitable opportunities for the extension of the gas, water and street railway services beyond the limits of the city. With every such extension the economy of production and distribution has been increased and has finally led to the total disregard of municipal, county or township lines. As regards the water service this movement has been further strengthened by the necessity of seeking sources of supply at great distances from the distributing centers. The economy of supplying all the localities along the route dictates the inclusion of a considerable section of a state within the area of exploitation of a single company.

"Finally in the case of the street railways, the change in motor power from horse to electricity has completely revolutionized the service. In fact, it furnishes the most striking instance of the changed relation of the municipality to this class of industries. What was only a purely local means of transportation has already become interurban and soon bids fair to establish a network of communication throughout the various states. As a result of these changes two questions present themselves.

"First, can the municipality still be regarded as the effective unit of control over this class of corporations? and

"Secondly, can the state permit the municipality to fix the conditions under which these industries may be carried on?

"One of the first principles of governmental control over industry is that the unit of control must not be inferior to the unit of

exploitation, that is to say, the power of the public authority must, at least, be coterminous with the field of operation of the industry. This has ceased to be the case with the street railway companies, and, to a less degree, with the water and gas companies. Just as the difficulties of state control over corporations—particularly transportation companies—doing an interstate business forced us into national control, so the extension of the municipal public-service industries beyond the limits of municipal control will force the substitution of some larger administrative unit—possibly the state itself—as the controlling authority."

ADVERTISING A STREET RAILWAY PARK.

The strictly pleasure travel over the lines of the Cleveland, Berea, Elyria & Oberlin Ry., has increased to such an extent and the possibilities of development in this direction are so clearly manifest, that the company has established a separate "outing department," under the charge of Mr. J. W. Butler, with the title of excursion manager. The duties of this department, as its name indicates, is to devise ways and means for encouraging pleasure riding, and it also has charge of a new park recently purchased by the company, on the Berea and Linddale branch, about seven miles west of Cleveland. These beautiful grounds include 30 acres of forest shade, with numerous springs and flowing streams of pure mineral waters, romantic glens and dells, and to enhance the natural attractions, an elaborate pavilion and ball room have been erected, athletic and camping grounds have been established, swings and seats scattered through the grounds and other amusements provided. The resort is called Puritas Springs.

Mr. Butler informs us the main advertising will be accomplished through the general press, which he considers the best means of reaching the public. Supplementing this, descriptive circulars and special letters will be mailed at frequent intervals to superintendents of Sunday Schools, societies, and fraternities, calling attention to the advantages and attractions of the park at Puritas Springs for outings and excursions of all kinds, particularly for children and ladies. The excursion manager gives his personal attention to these parties and sees that everything possible is done for their enjoyment and convenience.

Another of this company's methods for gaining publicity is by the distribution on the cars, and broadcast through the city, of small cards $1\frac{1}{4} \times 2\frac{1}{4}$ in., printed on white paper, in green ink, with a $\frac{1}{2}$ -in. pink strip down the center, and describing the principal attractions at the resort.

BIRMINGHAM RAILWAY & ELECTRIC CO.

The city of Birmingham, Ala., has an extensive system of electric railways, all operated by one company, the Birmingham Railway & Electric Co. having last year secured control of the Birmingham Traction Co. During the last year the company acquired by purchase $22\frac{1}{2}$ miles of road and built $7\frac{1}{2}$ miles; it also equipped $7\frac{1}{2}$ miles of the purchased track for electrical operation, rebuilt a portion of the city lines, built a new car house, rebuilt one of the bridges used by its cars and spent over \$20,000 in new special work.

The system comprises over 100 miles of track, and extends to all the neighboring towns, including Pratt City, Ensley, Bessemer and Powderly. The East Lake resort of the company has been described in the "Review." The line to Bessemer and that from Powderly to Bessemer are operated by steam.

THAT CHICAGO-MILWAUKEE LINE AGAIN.

In a recent interview, Mr. John I. Beggs, general manager of the Milwaukee Electric Railway & Light Co., is quoted as saying: "Inside of five years I expect there will be a through electric car running from Chicago to Green Bay. There are a number of gaps which must be filled in, but in the time I have named I think that the right of way will have been acquired and the road constructed. If the plans of the electric railway managers and promoters in this section of the country carry, one of the largest systems in the country will be in operation by 1906."

GARTON LIGHTNING ARRESTERS.

The season of spring storms being at hand, the lightning arrester problem is again confronting street railway and central station managers, who will be interested in the new models of arresters just put on the market by the Garton Daniels Co., of Keokuk, Ia. Fig. 1 is a new direct current pole arrester for railway, light or power circuits of 750 volts or less. The base and spool are of porcelain

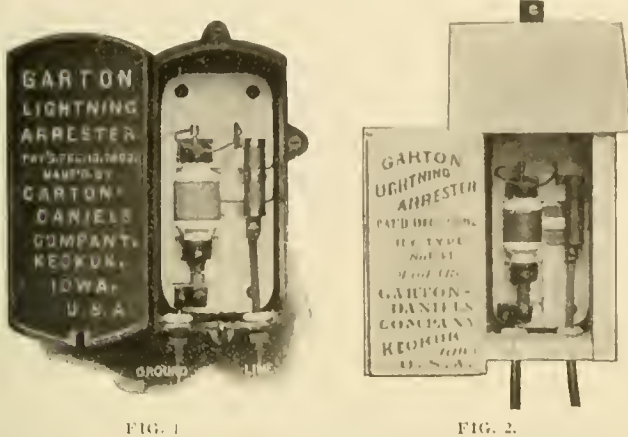


FIG. 1

FIG. 2.

and the makers feel confident that it will operate satisfactorily under all conditions. A novel feature of this arrester is the iron box which is so made that by loosening one screw the cover can be slipped off and swung to one side, making inspection easy. Fig. 2 shows the same arrester with wooden box. In all the new designs the principle of opening the circuit in two places after the charge has passed to earth is adhered to, thus allowing the use of

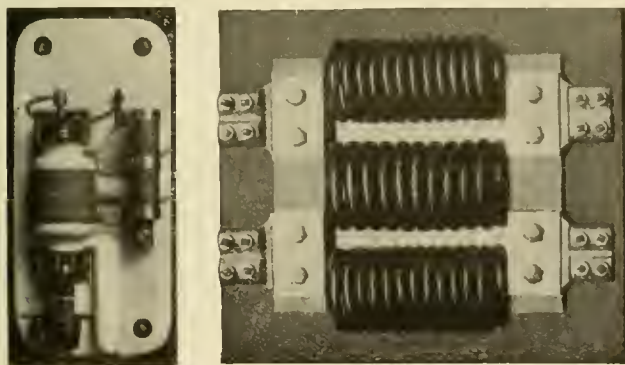


FIG. 3.

FIG. 4.

a much smaller air gap than would be practicable with a single opening in the circuit.

Fig. 3 is the new arrester used for protecting stationary motors of all sizes. With this arrester is used a new design of kicking coil known as the "type S"; this is a spiral of ribbon copper mounted on a dipped slate base.

Fig. 4 is one of a number of 1,200-ampere kicking coils furnished Siemens Bros. & Co., Ltd., of Woolwich and London.

The company has issued a 1900 edition of its catalogue on Garton arresters, which may be had on application at the home office.

NEW MASSACHUSETTS ROAD OPENED.

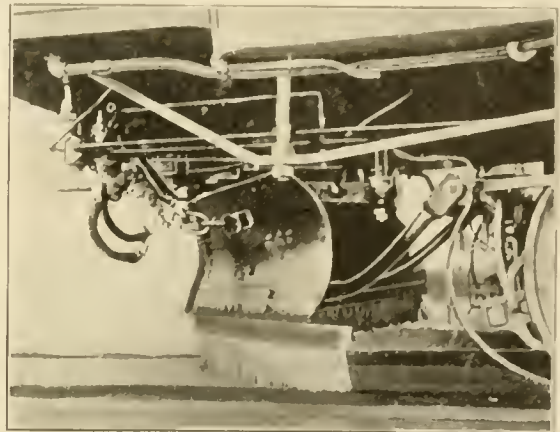
A new Massachusetts electric line, the Clinton & Hudson Electric Ry., was practically completed on April 18th. A car of the Worcester & Clinton Street Ry. in charge of Mr. John W. Ogden, who is superintendent of both the Worcester & Clinton and the Clinton & Hudson lines, with a party of officials and invited guests made the first trip.

Both of these lines have been acquired by the syndicate to be incorporated as the Massachusetts Electrical Co., and operate the electric railways in and about Worcester, as noted in our last issue, page 198.

The Worcester & Clinton road has an enviable record. It has never had an accident of any kind other than a derailment, and has never hurt a passenger or paid a cent in damage claims. The road was opened in December, 1898, and notwithstanding the operating expenses were 68 per cent of the gross receipt, it was able to pay a dividend on the first 10 months operation; since then operating expenses have been reduced and the receipts almost doubled.

N. Y., N. H. & H. SNOW PLOW.

By courtesy of Col. N. H. Heit, chief of the electrical department of the New York, New Haven & Hartford, we have received a photograph of the combination snow plow and sweeper used



SNOW PLOW ON THE THIRD-RAIL LINE.

on the motor cars of the electrically operated divisions. The plow is of the nose type secured to the truck by two curved arms. Along the lower edge of the plow is a heavy bristle brush which extends out so as to cover the third rail. This type of plow has been used for two years past and is found to be effective for heavy as well as light falls of snow.

KISINGER-ISON TROLLEY WIRE CONNECTOR.

When a tightly drawn trolley wire breaks, it is no easy task to join the severed ends, as the juncture must be made in spite of the absence of surplus wire or slack and when finished the joint must be smooth and symmetrical and present no obstruction to the passage of the trolley wheel. In addition the repair must usually be done quickly in order to delay traffic as little as possible.

The Kisinger-Ison Co., of Cincinnati, makes a connector for coupling the ends of broken wires that it is claimed will effect a saving in both time and money over the old method of soldering.



KISINGER-ISON TROLLEY WIRE CONNECTOR.

The device consists of a hollow sleeve with tapered ends and a central opening. The interior of the ends of the sleeve are tapered, the small ends of the taper being at the outward ends of the connector and large enough to admit the trolley wire. The severed ends of the wire are poked into the hole in the ends of the sleeve, and then locking devices in the form of toothed wedges, engage upon the side of the ends of the wire and against the tapering inner walls of the sleeve, the wire being thus pinched between one wall of the sleeve and the locking wedges. It follows therefore that the harder the pull the tighter the grip. One, two, or four wedges may be used in each end. With this coupling broken wires have been repaired by two men in three minutes.

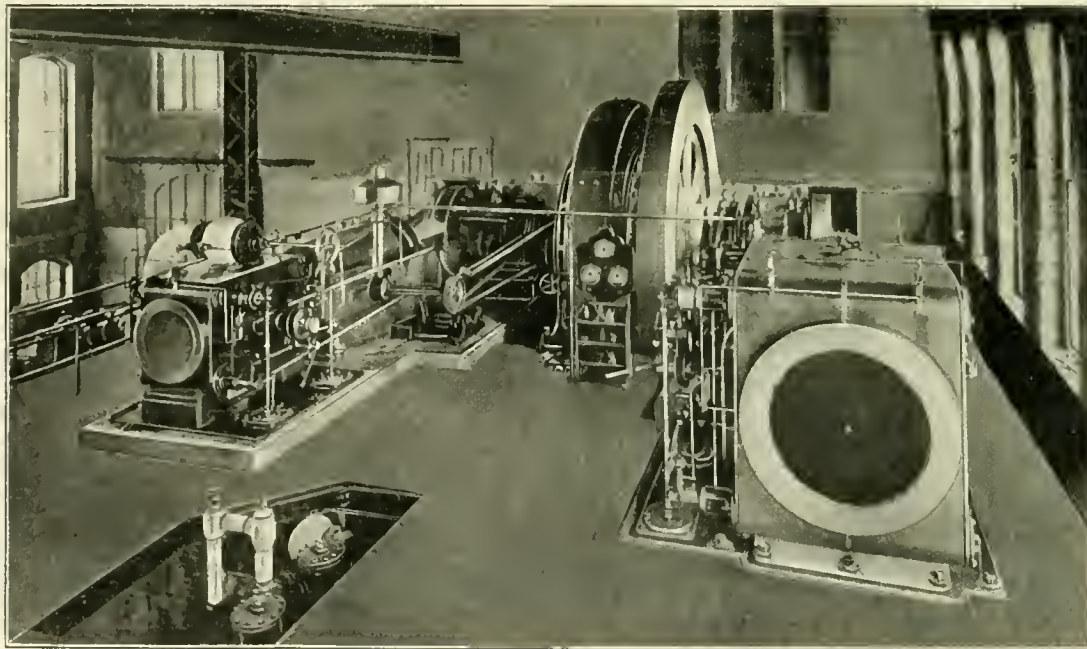
IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

ADDITIONAL UNIT FOR UNION RAILROAD OF PROVIDENCE.

The United Traction & Electric Co., of Providence, R. I., controls through the ownership of stock the following operating companies: Union Railroad Co., Providence Cable Tramway Co., property leased to Union R. R.; Pawtucket Street Railway Co.; Rhode Island Suburban Street Railway Co., which was organized last year and bought the property of the Cumberland Street Railway Co. and the Pawtucket Valley Electric Street Railway Co. (both of which were controlled by the United Traction & Electric Co.) and also bought the Oakland Beach branch of the New York, New Haven & Hartford R. R., and the Barrington, Warren & Bristol R. R. These last two were formerly operated by steam; the Oakland Beach branch, running down to Buttonwood on the west side of Providence Bay, 16 miles from the city, has been

being made in two pieces, divided to receive the packing ring; the junk ring in the low pressure piston is faced with hard babbitt metal almost the full width of the piston. The crank and cross heads are made of semi-steel; the cross heads are split and provided with large binder bolts to prevent the piston rods (which are screwed into the cross heads) from becoming loosened, should the lock nuts on the piston rods become slack. The cranks are of the disk pattern, heavily counterbalanced. The crank and cross head pins are of forged steel, the crank pins being forced into the cranks from the back side and provided with removable caps. The cross head pins are ground to a taper where they bear in the cross heads and are parallel for the rod brasses; they are held in place by four large screws on the outside faces of cross heads. Tripp's metallic packing is used on both piston rods and valve stems; corrugated copper gaskets are used on all joints in place of rubber. The crank pin brasses are of bronze, babbitted for their



1,600-H. P. FILER-STOWELL ENGINE, UNION R. R., PROVIDENCE.

equipped for electrical operation, and the company is also considering changing the motive power on the Barrington, Warren & Bristol R. R., which runs down the east side of the bay. The system of the Union, Pawtucket and Rhode Island Suburban companies comprises 173 miles of track.

The Oakland Beach road and some smaller extensions and the addition of some large and heavy cars to the suburban equipment of course brought an increased load on the power stations to meet which a new 1,600-h. p. unit has just been installed. This unit comprises a cross-compound condensing engine, built by the Filer & Stowell Co., of Milwaukee, Wis., direct connected to a 1,200-kw. General Electric generator. For the description of the engine and the accompanying illustrations we are indebted to Mr. M. H. Bronsdon, chief engineer of the Union Railroad Co.

The engine has cylinders 28 in. and 54 in. by 48 in. stroke, and is designed to run at 100 r. p. m. with 135 lb. of steam. The valve gear is designed to permit the governor to vary the point of cut-off from 0 to $\frac{3}{4}$ stroke in both the high and low pressure cylinders. Each piston is provided with but one packing ring, the junk ring

full width, and the cross head brasses of solid phosphor bronze. The connecting rods are of hammered iron, with straps, gibs and keys at the crank ends, and solid ends for the cross head brasses. The eccentric straps are babbitted for the full width.

The frames are the Filer & Stowell 1900 heavy duty tangye type with pillow blocks, frames and slides all cast in one piece, and are of massive construction. The slides are bored and the bed ends are made as large in diameter as possible, where they bolt up to cylinders. The frames bear full on the foundation from the pillow blocks to the ends of the slides, with the foundation bolts spread as much as possible. The shells of pillow blocks are made removable by raising the shaft 1-16 in. Heavy $\frac{3}{4}$ -in. pipe coils are cast in both bottom and side shells for water circulation. Wear is taken up by raising wedges moving vertically; the wedges bear full on the side shells and are provided with keyways and keys insuring their being raised alike on both ends. The main bearings are 22 x 42 in.; cross head shoes 18 x 31 in.; crank pins 10 x 10 in.; cross head pins 9 x 10 in. The shaft is of forged steel, 26 in. diameter in the armature and 22 in. diameter in the bearings.

One of the most interesting features of the engine is the fly-wheel, which is of novel construction. The wheel proper is cast

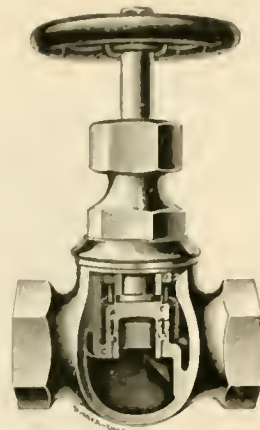
in two pieces, held at the rim joints by wrought iron links $3\frac{1}{2} \times 3\frac{1}{2}$ in. in section shrunk on; at the hub the two halves are bolted together. After the wheel had been turned smooth on the outer face it was re-enforced by a cast steel ring $7\frac{1}{2} \times 17$ in. in cross section



CLAMP HOLDING RING.

shrunk on. The ring was cast at Newark, N. J., and shipped by water to Providence, being delivered as it came from the mold. It was then fastened to the side of the fly-wheel, being held in

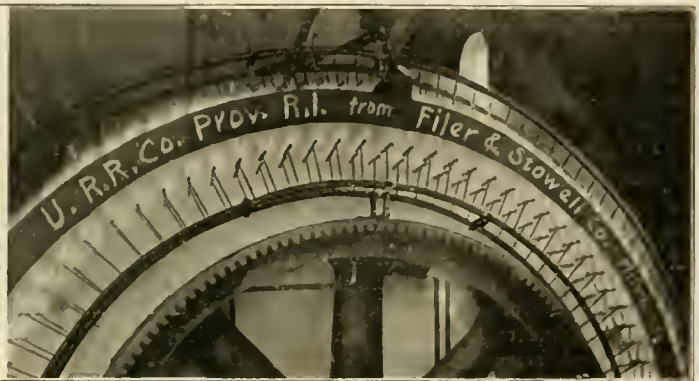
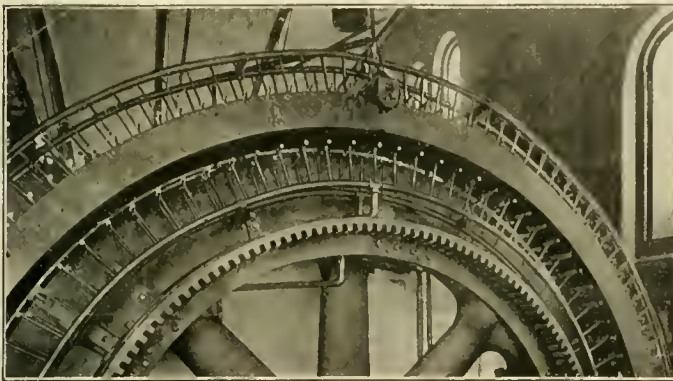
The straight way valves for this engine are all of the Chapman make. The throttle valve was made by the Crosby Steam Gage & Valve Co.; it is of the double ring seat type, so designed as to prevent leakage should any foreign substance become lodged in the passage.



CROSBY THROTTLE VALVE.

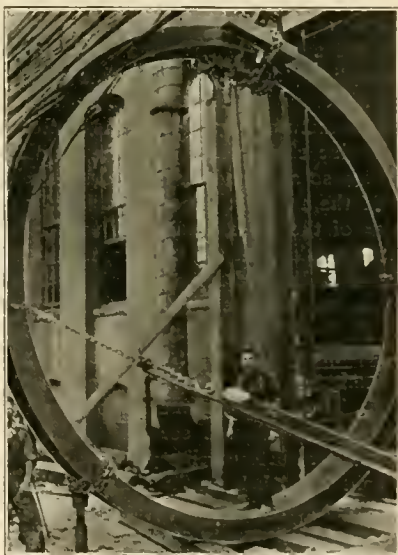
The installation of this unit brings the total capacity of the station up to 6,050 h. p. The new electrical equipment includes two rotary converters of 300 kw. capacity, which change the direct current to an alternating current at 460 volts, which is stepped up to 10,000 volts in static transformers for transmission to a sub-station at Riverview, 11 miles distant. The sub-station has static transformers and two rotary converters of 250 kw. capacity, which give direct current at 560 volts for the trolley line. A storage battery will be used at the sub-station.

Ten new cars have been purchased for the Oakland Beach line from the J. M. Jones Sons Co., of Troy, N. Y. These cars are 41 ft.



FLY-WHEEL AND RING, SHOWING ARRANGEMENT OF BURNER FOR HEATING THE RING.

place by clamps, as shown in one of the illustrations, and the interior surface turned. Four rings of 2-in. gas pipe, with 100 burners each were then put in position, as shown in the engraving and the ring heated until it was $\frac{3}{8}$ in. larger in diameter than the wheel, when it was slipped into place and allowed to cool. After cooling the sides and outer face of the ring were turned smooth. The exterior diameter of the completed wheel is 18 ft., and taking the elastic limit of the metal in the hub bolts and links as 25,000 lb. per sq. in. and of the steel ring as 30,000 lb. per sq. in., it is computed that the wheel may turn at 429 r. p. m. before the stresses exceed the elastic limits of the metals. The weight of the wheel complete is 102,000 lb.



DELIVERING THE RING.

The condenser is of the jet type made by Geo. F. Blake, and has simplex, vertical, twin-beam air pumps with steam cylinders 12 x 18 in. and air cylinders 30 x 18 in.; the air pump is of bronze throughout.

over all, and are equipped with four G. E. 57 motors and Christensen air brakes, and are mounted on Peckham trucks.

Among other improvements the Union Railroad Co. has during the past year erected a new car house between Providence and Pawtucket, which is 100 x 200 ft.

NEW BINARY-VAPOR ENGINE.

A recent report from Consul General Mason at Berlin describes in general terms the results of experiments made at the Royal Technical High School at Charlottenburg by Professor E. Josse with a binary-vapor engine. This machine consists of a cross compound steam engine with cylinders 340 and 530 by 500 mm. (13.39 and 20.87 by 19.69 in.) running at 41.5 r. p. m., and of an auxiliary sulphur dioxide engine with cylinder 200 x 500 mm. (7.87 x 19.69 in.) running at 77 r. p. m. The steam is worked in the compound engine in the usual manner and exhausted into a surface condenser, where the cooling fluid, instead of being water, is liquid sulphurous acid (H_2SO_3); the heat in the exhaust steam drives off sulphur dioxide gas from the acid, and this gas is worked in the cylinder of the auxiliary engine and discharged into a second surface condenser, where water is the cooling fluid. The sulphur dioxide is returned to the first condenser, which is also the boiler for the sulphurous acid, and is used over and over. The process was patented in 1889 by Mr. G. Behrend, of Hamburg, and Dr. Zimmermann, of Ludwigshafen.

As to results, the report states: "The steam engine is of the compound type, of good modern construction, and being given a steady load, developed 34 i. h. p., with a consumption of 8.6 kg. (18.96 lb.) of steam per i. h. p. hour. The auxiliary machine working with the sulphurous vapor indicated 19 h. p., that is, an increase of 56 per cent and yielding, instead of 1 h. p., 1.56 h. p. for the same

steam consumption, and reducing the steam consumption from 8.6 to 5.5 kg. (from 18.96 to 12.13 lb.) per i. h. p. hour.

"The experiments showed on the average that for every 15 kg. (33.169 lb.) of steam passing through the main engine, 1 h. p. could be gained in the auxiliary machine. Applied, therefore, to an ordinary single-cylinder steam engine, exhausting into the air at high temperature, the percentage of power saved by this new device would be very much higher than the economy reached in these experiments, which as has been shown, were made with a highly improved compound engine."

Dr. R. H. Thurston in discussing these results in the *Sibley Journal of Engineering* for April says that from the data at hand it is not apparent whether the economy reached is due to the excellence of the apparatus or the advantages of sulphur dioxide as the auxiliary fluid, and it is suggested that the result may to some extent be due to an improvement in thermal action and efficiency, coming of reduced wastes by heat exchanges between the working fluid and the metal of the cylinder walls. Dr. Thurston further states that the result of 12.13 lb. steam per horse power per hour is unexampled, being, when the low pressures are considered, practically all that could be expected of a quadruple expansion engine. The low speed and the small power of the engine, 53 h. p., make the results even more remarkable.

Some of our contemporaries in commenting on these tests make the point that if the steam engine were worked to as low a temperature as was the binary engine the theoretical efficiency would be the same. This is, of course, true, but it does not pay to reach the low limit in the steam engine because of the large cylinder volumes involved. Thus 1 lb. of steam at 70° F. has a volume of 334 cu. ft.; if the heat which this steam has when at 140° F. is used, as in the binary engine, it would evaporate about 6 lb. of the sulphur dioxide at 140° F., and this gas when expanded so that its temperature is 70° would have a volume of about 10 cu. ft. The higher pressures and smaller volumes of the sulphur dioxide give it advantages over steam for working between low temperature limits.

Laboratory experiments are quite different from commercial work, and it remains to be seen whether the steam-sulphur dioxide binary engine will prove practicable for general use or be classed with the many other improvements on the steam engine which have been relegated to the scrap heap.

NEW UNIT FOR TOLEDO TRACTION CO.

In our issue for September, 1899, page 593, we described the addition to the power house of the Toledo Traction Co., then building, and briefly mentioned the new unit which it was to accommodate. This unit consists of a vertical cross-compound Allis engine with cylinders 28 and 60 by 48 in. direct connected to a 1050-kw. Westinghouse generator, and since its installation in November last has carried nearly the whole of the railway load, which varies from 1,500 to 3,500 amperes, being supplemented when necessary by one or more 400-kw. generators with which it works in parallel.

The generator is "engine type," the armature and commutator being built together upon a ventilated cast iron sleeve, pressed upon the engine shaft. The field castings are divided in a vertical plane, accompanied with a cast iron sole plate. At the rated speed of 80 r. p. m., the machine gives 500 volts with no load, and over compounds to 575 volts with a load of 1,820 amperes. The last named load is carried continuously without undue rise of temperature, and various tests applied since the installation show that at 50 per cent overload the temperature is not materially increased. Tests have also shown that the guaranteed efficiencies of 91 per

cent at one-quarter load, 94 per cent at one-half load, and 94.5 per cent at three-quarters and full loads, have been more than attained in actual working. The position of the brushes need not be shifted if the load be increased from no-load to 50 per cent over-load. If the current in the shunt field be adjusted so that the

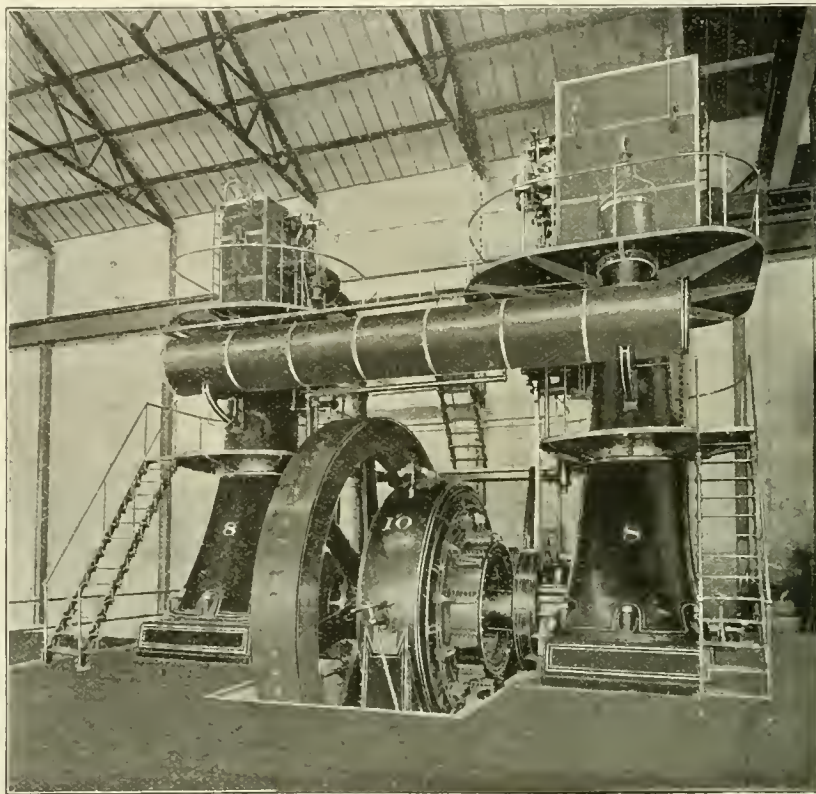


FIG. 1—1,050-KW. UNIT, TOLEDO.

voltage of the machine at no-load is 500, a load of 2,640 amperes at such increase of voltage as will be maintained by the combined shunt and series field current may be temporarily carried, and if, with the current in the main circuit, the circuit breaker be opened, there will be no bucking, serious sparking or other difficulty at the commutator.

The pole pieces are of laminated steel, and the field frame of cast iron. The windings are proportioned so as to reduce the distortion due to armature reaction to a minimum. The series coils are of copper bar formed into one layer; the shunt and series coils are separately insulated and so disposed as to admit of thorough ventilation. The insulation of the complete coils successfully withstood an alternating current of 3,500 volts.

The armature, Fig. 2, is of the slotted drum type, pressed upon the engine shaft, which is 24 in. in diameter. It has a multiple winding, so arranged that the circuits will not become unbalanced should the armature become displaced 1-16 in. from the geometric center of the fields, and when so displaced there will be no injurious sparking at the brushes, no vibration in the armature, and from each brush holder arm there will be drawn approximately its pro rata share of current. The core is built up of laminated steel sheet of the highest magnetic quality, built up on the cast iron spider; the sheets of steel are dovetailed accurately to the spider, the laminated core thus built up is held firmly between two end plates. The armature winding consists of flat copper bars, approximately rectangular in section, forged into shape without joints, and insulated before being placed in the slots. There are no bands, the coils being held in the slots by retaining wedges of hard fiber. The insulation of the armature conductors is of sheet material of high insulating quality applied in overlapping layers, held in place with taps, and the whole treated with a weather-proof and oil-proof compound.

The commutator, Fig. 3, is made up of bars of hard drawn copper, insulated from each other by mica. The number of bars is such that with an e. m. f. of 575 volts the average difference of potential between two bars does not exceed $8\frac{3}{4}$ volts. The bars are held in position at one end by a cast iron ring with a V section, the

ring being bolted securely to the armature spider. The opposite ends of the commutator bars are supported by segments of a similar section, firmly held in position by bolts and these segments are so arranged that one or more bars may be removed from the commutator without disconnecting other bars. The armature winding is thoroughly soldered to the necks of the commutator



FIG. 2—END VIEW OF ARMATURE.

bars; the necks are rigid, each of them being of hard rolled copper riveted and brazed to the commutator bar.

The arms carrying the brushes are strong and rigid, held at the end next the field casting. They are supported by a ring accurately fitted to the yoke, which may be shifted for adjusting the brushes by hand wheel and worm gear. This method of support leaves the commutator clear and comparatively free of obstructions and

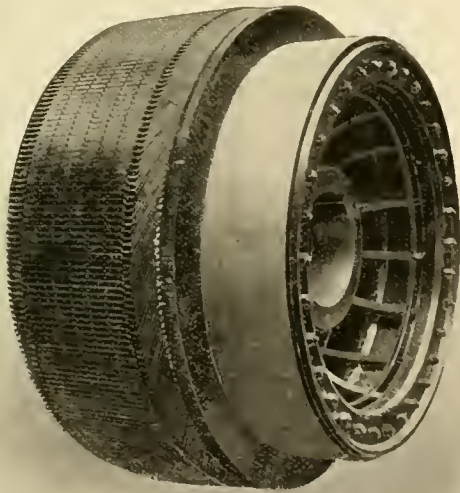


FIG. 3—ARMATURE AND COMMUTATOR.

open for inspection. The brushes are of carbon. The brush holders are of the sliding shunt type; their size affords ample surface contact for the brushes in the boxes.

Throughout the armature, spider, core and windings, large and open ventilating ducts are provided, and the design of the spider is such as to set up a forced circulation of air through these ventilating spaces. Space is also left between the shunt and series coils and the pole pieces, and between the shunt and series coils themselves, for maintaining a free circulation of air while the machine is in operation.

ELECTRIC RAILWAY IN NOTTINGHAM.

Mr. S. C. McFarland, U. S. Consul at Nottingham, Eng., writes the State Department that following the lead of Liverpool, Sheffield, Bradford, Glasgow, Manchester, and other cities of Great Britain, it is promised that an electric street railway service will soon supersede the present horse tramways in Nottingham. The present system is probably as antiquated as any in England. There are, in fact, three main systems or lines, each extending from near the central portion of the business section to the railway depots or outskirts, the whole comprising only about 6 miles of track; but there is no central depot, the down-town termini being several blocks distant from each other. No transfers are given, each line being conducted independently. The fares vary in a peculiar manner. On one of the three lines, which is about 1 mile in length over level ground, the fare is 1d. (2 cents). The other two lines have each one steep and long hill on their routes. If you desire to travel the full length of one of these lines, 2d. (4 cents) will be charged. If you desire to ride only to the top of the hill, the same fare will be charged. If, however, you happen to be on the top of one of these hills and desire to ride down either way, the fare is only 1d. (2 cents). This variation of charge is made, as the authorities explain, because a third horse is necessary to pull the heavy trams, which are modeled after the London bus pattern, with seats on top, up the hills. This tram service is supplemented by a number of buses, which carry patrons not only along the regular routes, but to suburbs beyond the limits of the tram lines. Upon these, similar fares are charged. Double tracks for the trams exist only on portions of the routes, and trams run about every ten minutes. When once the seats are full, inside and out, not another passenger is admitted.

One result of the imperfect system has been the creation of a fine, comprehensive, and reasonable cab service. That an adequate modern electric system will find an abundant field here, and that it will revolutionize present conditions to a great extent, is apparent. Opportunity is also afforded for the introduction of devices found to be successful in the United States.

Originally, the tram system was introduced and owned by a private company. Its operation was supposed to be profitable, and after considerable local agitation the city bought the system in 1897 and assumed control in June, 1898, paying par value for the stock—approximately £80,000 (\$389,320). A large number of additional employes were put in service, new cars and horses added, and improvements made in time schedules; but it seems to be questionable whether these improvements have paid. At the time of purchase, the question of electricity was agitated and a grant for the purpose finally obtained from Parliament. Committees from the council were appointed to investigate electric service elsewhere, and last year the United States was visited for that purpose by local engineers. The overhead idea was finally adopted, and it is announced that by December 25th of this year, one branch of the proposed system will be in operation, the others to follow quickly. No statement is obtainable as to when the whole system will be complete. The city owns both extensive gas and electric-light works, and it is assured that no expense will eventually be spared in creating a modern street railway system, with a central depot and adequate suburban service.

Contracts for experimental motors have been placed in Sheffield. If not satisfactory upon trial, other offers will be considered. The bodies of the cars will be built in England, but a Philadelphia firm is under contract to make and deliver the wheels. The wire contracts are likely to go to New Jersey. American steel rails are also under consideration. American bids for miscellaneous material will receive attention, and inquiries should be addressed to Mr. Arthur Browne, city engineer.

AGAINST JOINT USE OF TRACKS IN BOSTON.

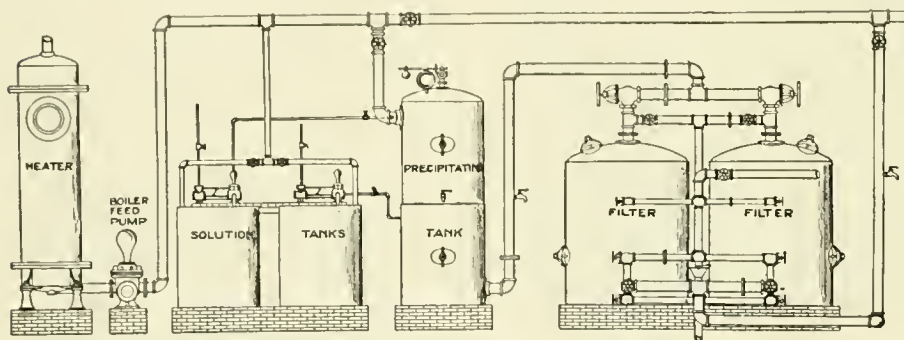
The Massachusetts legislative committee on street railways has unanimously voted against the petition to permit the Worcester & Boston road to run its cars over the Boston Elevated Ry. tracks in Brookline. The committee has decided to report a general bill for the joint use of tracks by street railways, but the Boston Elevated will be excepted from its operation.

The matter of putting vestibules on surface cars, the committee thinks, should be placed in charge of the railroad commissioners.

BACHMAN METHOD OF WATER PURIFICATION.

The evils resulting from bad boiler water are too well-known to need elaboration, and all owners of power plants are interested in the means for purifying water and preventing the formation of scale in their boilers with the attendant increase of fuel consumption and cost of cleaning. The Ideal Manufacturing Co., of Buffalo, N. Y., the maker of the apparatus used in what it terms "Bachman's Ideal System" of water purification, has achieved remarkably good results and claims for the system that it is the only one which will remove oil from water, which will remove carbonate of lime from hot water without hardening the filter bed, and which will automatically regulate itself to the changes in the amount of precipitating material required.

A general view of the apparatus is shown in the figure. An open heater is preferable as it precipitates a portion of the carbonate of lime and magnesia and saves the expense of precipitating these salts in the tanks. From the pump the water is taken to the upper portion of the precipitating tank which is in two sections; here there is introduced from one of the solution tanks the solution of reagents for precipitating the carbonate of lime and magnesia, iron, oil alumina and silica. The pump is so regulated as to furnish the proper amount of solution, this being determined by drawing a sam-



BACHMAN WATER PURIFYING PLANT IN ELEVATION.

ple of water from the lower part of the tank and testing it with a phenol solution.

When the first solution has been properly regulated the second pump is started and the second solution, for precipitating the sulphates of lime and magnesia as carbonates, and for so coating the precipitate as to prevent it solidifying in the filters, is introduced into the lower section of the precipitating tank. The amount of reagent supplied is regulated by testing samples of water.

From the precipitating tank the feed water is carried to the two filters, and thence to the boilers. The manner in which the system is working may be determined by testing a sample of the water after passing the filters.

The size of the precipitating tank will vary with the impurities in the water, the temperature, etc. The solution tanks are large enough to hold a supply for 8 to 12 hours. The filters need to be washed out at intervals of from three to six hours.

The street railways at Quincy, Ill., and Rochester, N. Y., employ this system of purification and have warmly recommended it.

NEW PLEASURE RESORT IN NEW JERSEY.

A group of prominent New York capitalists, including a number of Metropolitan and Third Avenue stockholders, have purchased a large plot of ground at Deal Beach, N. J., and will lay out an extensive park and summer resort covering some 585 acres to be known as Deal Park. Over \$1,500,000 have been put into the property and it is said at least \$1,000,000 additional will be used in improvements. Ground will be rented or leased to outsiders and many beautiful cottages will be erected at once.

Among the directors chosen to control the grounds are Daniel O'Day, (president); Thomas F. Ryan and Anthony N. Brady, of the Metropolitan Street Railway Co.; H. H. Rogers, of the Standard Oil Co.; Ex-Mayor Hugh J. Grant; Col. G. B. M. Harvey, head of the Harvey syndicate; and Geo. W. Young, president of the United States Mortgage & Trust Co.

ELECTRIC TRAMWAYS IN GERMANY.

Consul Hughes, of Coburg, on Mar. 7, 1900, quotes from a trade journal the statement that the length of electric lines in Germany shows an increase of 45 per cent over last year, the available power has gone up 57 per cent, and the growth of accumulator installations is represented by the figure of 164 per cent. The tramway accumulators now aggregate almost exactly a fourth of the dynamo power of the power stations; yet there are very few pure accumulator lines. Overhead conductors continue to predominate. Apart from the two pioneer lines of Siemens & Halske, at Berlin and Frankfort, of the years 1881 and 1884, all the electric roads have been built within the last nine years. The total length is 1,274 miles. Most lines have only a single track, which is made feasible by the almost universal practice of stopping at certain points only. The gas tram line at Dessau, which was considered so successful, will adopt electricity the coming summer.

CONSTRUCTION CONTRACTS SOON TO BE LET AT SYRACUSE, N. Y.

Mr. W. J. Hart, general manager of the Syracuse & Oneida Lake Electric Railway Co. writes us that his company has secured all necessary franchises from the cities, villages and towns through which the road is to run and will be ready shortly to let contracts for construction and equipment. The system will comprise 29 miles of track, one branch running from Syracuse to South Bay (Oneida Lake), 13 miles, and one from Syracuse to Phoenix, N. Y., 16 miles.

The officers of the company are: President, W. B. Kirk; vice-president, T. W. Meacham; secretary and treasurer, W. E. Wheaton; attorney, Louis L. Waters; general manager, W. J. Hart. Mr. Hart was at one time manager of the horse railway lines in Syracuse, was general manager of the Union Street Ry., of Saginaw, Mich., and constructed and operated the Interurban Ry. from Saginaw to Bay

City. He also constructed and operated the Detroit, Lake Shore & Mt. Clemens Ry., leaving the position of manager of that company last June to take up his present duties.

NO WONDER HE GOT A SEAT.

A young man got into a tram-car, and saw to his delight that the only vacant seat was by the side of a young lady acquaintance. He made for that seat with joyous strides, and her eyes answered his delighted looks. But just as he got there an elderly man on the same side moved up into the coveted place.

The young man approached more slowly, and accosted the young lady.

"How is your brother?" he asked; "is he able to get out?"

"Oh, yes," she answered.

"Will he be very badly marked, do you think?" he continued, and the old gentleman grew suddenly interested.

"Oh, no," said the fair deceiver; "with the exception of a few small marks in the middle of his forehead, you wouldn't know that he had ever had it."

"Were you not afraid of taking it?" the young man went on, while the old gentleman broke out in a cold perspiration.

"Not at all," she replied; "I have been vaccinated, you know."

The seat was vacated instantly, the two young hearts beat as half-a-dozen, and the prattle of "nice talk" strewed that part of the vehicle, while a gray-haired old man scowled upon them from the farther corner of the tram-car.—Tit Bits.

It is expected the new road from Rochester, N. Y., to Sodus Bay will be opened July 4th. The cars to be used on this line are double truck, with freight and passenger compartments. The outside finish is in royal blue with light trimmings; in silver lettering on the side panels appear the words, Rochester, Irondequoit Bay, Ridge Road, Sodus.

LAUGH WHILE THEY CAN.

The Railway Age, a leading exponent of the steam roads, indulges in an intoxication of mirth over the account by the newspaper reporter who recently made a trip from New York to Boston, using the trolley lines wherever possible. The affair strikes the Age as something exceedingly funny, but will hardly be so received by the thinking managers of steam roads anywhere, especially such roads as have already felt the competition of the few trolleys which have paralleled them and taken a large per cent of suburban travel. Our readers will recall the time when the trip from St. Paul to Portland, Ore., involved a steamboat transfer at the Missouri river and staging over the mountain gap three or four hundred miles. There was nothing very funny about that stage trip, but thousands of people traveled that way. It may lie within the possibilities of engineers and the future to some day fill the gaps of 58 miles now remaining and make a continuous trolley line between New York and Boston. The Age waxes vehement over the numerous collections of fare, which, however, aggregate about two-thirds of the steam rail rate, but fails to note that the passenger did not have to stand in line and show his ticket before he could get through a gate and again before allowed to enter his car. It is wise to make merry now while neither through track nor cars have been built, for within a very few years a large passenger business will be handled between the two eastern cities named, and it will go over the present trolley lines. It is also within the possibilities that through tickets and through cars may reduce the number of stops from "several hundred" to something like a few score. But read the story which our contemporary's young man lay awake nights to beat out:

AN ELECTRIC "PLEASURE EXERTION."

"Is the long-threatened substitution of electricity for steam in railway transportation about to take place? Is the frivolous trolley already replacing the ponderous locomotive, not merely for short suburban trips, but also for long-distance travel? Such a revolution has not yet become a matter of public knowledge, but the announcement that a journey between Boston and New York by trolley car is now possible seems to indicate that the prophets of 'electricity as the coming motive power' are about to see their predictions verified. The Boston Herald, a paper of good repute, has devoted over a page to an article descriptive of 'a trolley trip' between the cities named, with full details of route, stations, distances, time, rates of speed and fare; and the headlines ought to satisfy the incredulous that the thing can be done.

"The Herald undoubtedly sent two adventurous representatives from Boston to New York and they speak of their journey as a trolley ride; but examination of their itinerary does not suggest any fear that the through trains of the steam railways are likely to be discontinued at present. The reporters survived the journey and came back to write up what they call 'a pleasure trip,' the details of which will strike the reader as a very funny burlesque on that theme. Howell's 'pleasure exertion' mildly suggests the reality, as it would impress the bona fide traveler who might be tempted to try a similar journey between the two cities.

"In the first place, he would find that a 'trolley ride from Boston to New York' is at present impossible, because there are no trolley roads for a considerable part of the distance. Of the 262 miles between the two cities by the route indicated, it appears that only 204 miles were covered by electric roads, the remaining 58 miles being comfortably traversed over still surviving steam railways, not to mention a few gaps bridged by carriage or the good, old-fashioned 'Foot and Walker's line.'

"How many payments of fare does the reader suppose the traveler has to make on this so-called electric railway journey? Only 47! How many transfers from car to car—with several breaks of considerable length? Only about 30. How many stoppages for passengers, turn-outs, change of cars, change of road, etc.? Not stated, but undoubtedly several hundred. How many miles of standing up holding on to a strap, 'please move forward,' wedging upon a platform or waiting for the 'next car?' Unrecorded. How much dust and heat and cold and general discomfort, weariness and exasperation, especially when a steam train went flying by? Incalculable. How much time spent in the journey that is made by steam train in less than six hours? Nearly 55 hours. Cost of the 'electric pleasure trip' compared with railway fare? About double.

"It is often predicted that electric motors will far surpass the speed of steam locomotives. Let us time the runs on the Boston and New York electric railway route as at present operated. From various tables and statements in the Herald's elaborate article we construct the following complete schedule of hours of leaving and arriving, time of each run, terminal points and distances, for the 262 miles of the great composite journey:

SCHEDULE OF "TROLLEY CAR" JOURNEY FROM BOSTON TO NEW YORK.

Leave		Arrive		M. Miles
A. M.		A. M.		
8:40	Boston	9:16	Newton Corner	36 6.5
9:24	Newton Corner	9:50	Lower Falls	26 5
10:08	Lower Falls	10:35	Natick	27 6
10:43	Natick	11:01	S. Framingham	21 4
		P. M.		
11:05	S. Framingham	12:02	Marlboro	57 9
P. M.				
12:32	Marlboro	1:50	Worcester	78 16
2:04	Worcester	3:12	Spencer	68 12.5
3:40	Spencer	5:00	W. Warren	80 12.5
5:04	W. Warren	5:41	Indian Orchard	37 18
6:00	Indian Orchard	6:55	Springfield	55 9
A. M.		A. M.		
8:35	Springfield	9:17	State Line	42 6
9:38	State Line	9:48	Thompsonville	10 2
10:15	Thompsonville	10:19	Warehouse Pt.	34 6
11:10	Windsor Locks	11:50	Windsor	40 6
P. M.		P. M.		
12:11	Windsor	12:45	Hartford	24 6
1:02	Hartford	1:48	New Britain	16 6
1:40	New Britain	2:15	Plainfield	26 5
2:16	Plainfield	2:25	Southington	9 3.75
2:20	Southington	3:30	Meriden	64 10
3:33	Meriden	4:13	Wallingford	40 9
4:30	Wallingford	5:06	New Haven	80 12
5:15	New Haven	7:05	Bridgeport	110 21
A. M.				
8:50	Bridgeport	10:10	Norwalk	90 14
10:30	Norwalk	11:27	Stamford City Line	57 7
11:32	Stamford City Line	11:47	Stamford	15 2.75
P. M.		P. M.		
12:01	Stamford	12:45	New Rochelle	41 17
1:10	New Rochelle	1:37	Mt. Vernon	27 3.5
1:45	Mt. Vernon	3:02	129th Street, N. Y.	77 11
3:02	129th Street, N. Y.	3:17	Grand Central Depot	15 7.5
Total actual running time				1:29
Total distance				262

*Steam railway †Elevated road.	
Summary	
Electric lines	204 miles
Steam lines	53 miles
Elevated road	5 miles
Total	262 miles
Actual running time	21.56 hours
Entire time on the road	25.66 hours
Time lost in making connections	5.21 hours
Time of entire journey	54.61 hours
Cost:	
42 trolley car payments	\$ 2.61
4 steam car payments	1.16
1 elevated railway fare	.05
1 bridge toll; foot	.03
Total transportation charges	\$ 3.87
Hotels and meals en route	7.75
Minimum cost of trip	\$11.62

"Many wonderful records of fast time are credited to steam railways, but this schedule of a run between Boston and New York the great combination electric, steam, horse and leg power route certainly defies comparison. It has never been approached since the good old stage coach times, when the traveler, after making his will and committing himself with much doubt to the care of Providence, bade adieu to Boston and eventually found himself in New York, in rather less time and considerably more comfort than the 'trolley ride' here recorded seems to promise."

The Age neglects, in its comparisons as to speed and time, to lay much stress on the running time over the steam roads bridging the gaps in trolley system. Between Spencer and West Warren by steam train required 80 minutes to make 13½ miles; the preceding stage by electric car took 68 minutes to make 12½ miles, and the succeeding stage 37 minutes for 18 miles. Between Warehouse Point and Hartford 6 miles was by steam and required 40 minutes; the 6 miles next preceding and also the 6 miles next following took electric cars but 34 minutes. That the steam roads could make better time than this is shown later in the table, the other two runs by steam being at the rate of 36 and 23.2 miles per hour.

As a man must eat and sleep whether he stays at home or travels, the comparisons of cost should be \$2.71 for 209 miles as against \$5.00 for the 262 miles which is the railroad fare between Boston and New York.

On April 21st a gaily decorated car made the first trip over the lines of the Inland Traction Co., from Lansdale, Pa., to Sellersville, Pa., a distance of 13 miles.

Changing the Denver Cable Lines for Electric Traction.

BY C. K. DURBIN, GENERAL SUPERINTENDENT OF THE DENVER CITY TRAMWAY CO.

After a struggle of 14 years' duration, the Denver City Cable Co. and the Denver Consolidated Tramway Co. were consolidated, Mar. 3, 1899, into the Denver City Tramway Co. Operation by cable having proved disastrous to the cable company, which had twice been in the hands of a receiver, it was determined by the new company to convert the cable lines into electric lines as soon as the necessary permission could be obtained from the city authorities. Being advised by its attorneys that it had the right under its existing franchise to operate the cable lines by electricity, the company made application to the Board of Public Works for a permit to proceed with the work. The permit being refused on the advice of the city attorney, the matter was taken into the United States court, where it now rests, to come up for hearing in the near future at St. Paul. The "blanket" franchises of the company were then attacked by the city, which sought to repeal them, but was restrained from so doing by Judge Moses Hallet of the United States District Court, sitting at Denver. Rather than delay until the matter could be determined by the courts, the company requested of the city council permission to string wires over the cable lines and to operate them electrically for a period of 20 years. Much agitation was carried on by certain designing politicians and newspapers in favor of requiring a percentage of gross receipts, in consideration of the granting of a new franchise, and the platform of the Democratic party at the last city election contained such a provision. In view of this, it was forcibly urged upon the officials by the parties referred to, that they could not consistently grant a franchise which did not require a percentage of gross receipts. The mayor and councilmen, however, took the stand that it was not a new franchise which the company desired, but simply permission to change from cable to electric power under the former franchise; and notwithstanding all opposition, the company having accepted the city's demands for certain concessions, the bill was finally passed, and was signed by the mayor on March 22d last. The concessions made by the company were: The payment of a disputed paying bill amounting with interest to \$30,000. The payment to



DERRICK WAGON FOR SETTING POLES.

the city within 12 months from the passage of the ordinance, \$72,000 cash, at the rate of \$6,000 per month. The granting of transfers to all lines intersecting with former cable lines. The carrying of bicycles, three to the car, on payment of a 5-cent fare

for each wheel. Half-fare tickets for children between the ages of 6 and 12 years.

As before stated, the period for which the permission is given is 20 years, and neither the company nor the city waive their respective rights in respect to the "blanket" franchise, which is now being tested in the United States court. The company, feeling



CONCRETE WAGON AND CREW.

that it was only a question of a short time until the necessary permission would be granted, went ahead and obtained the materials for electrifying the lines, so that when the ordinance was finally signed, everything was in complete readiness to proceed with the work in the shortest possible time. A plat of each line, giving the exact location of each pole, had been prepared by the engineers, under the energetic supervision of Mr. W. G. Matthews, superintendent of overhead construction. A great deal of time had been spent in preparation of the details. Materials were systematically arranged and prepared for rapid handling. A chart giving exact details was prepared for each foreman, so that when the word was given it was merely a matter of obtaining the necessary labor. Two gangs of men were organized, one for the wooden-pole district, the other for the iron pole district, and set to work simultaneously. Work on the West Curtis St. line was started Thursday afternoon, immediately after the bill was signed, and that line was ready to be operated the following Saturday evening, the time consumed being a little over two days. At the same time work was started at the foot of 17th St. in the iron pole district. The erection of iron poles was the most interesting part of the work. Some time previously the company had built by the Studebaker Wagon Co. a derrick wagon, as shown in one of the accompanying illustrations. Too much cannot be said in praise of the work done by this wagon. On the second day of operation 127 poles were erected in 11 hours, a good many obstacles being encountered. Those in charge of the work are confident that with a clear field 150 poles can easily be erected by the wagon in 10 hours.

The modus operandi for the erection of the iron poles was as follows: The flagstones, where possible, were raised by men with long steel bars; where not possible to turn the stones out, and where there were concrete sidewalks, stonecutters were set at work. Next followed the diggers; part of the time, in order to keep ahead of the raising crew, it was necessary to put two diggers at a hole, and in fact, so fast was the work crowded, that at one time there were over 100 diggers at work in different parts of the city. All the loading, hauling and unloading of both iron and wooden poles was done by separate crews specially detailed for the work. The pole having been dropped into place, it was lined up by means of a plumb bob, and was held in place by three men with pike-poles, as shown in the illustration. Next came the work

of concreting. Gravel had been distributed at each pole, and three sacks of cement left at the same place. A small squad of men went ahead and mixed the cement and gravel dry on the pavement; they were followed by two concrete wagons, one for each side of the street. One of the engravings shows one wagon with a small force of men, who are finishing up one of the poles opposite the Brown Palace Hotel. The men would throw the gravel and cement mixed into the tray of the wagon, wet the mass from the accompanying sprinkling cart, mix it thoroughly and shovel into the hole, where it was well tamped. As many as 25 men were used with each wagon, about half the number being allowed to rest while the others worked, so that no time was lost. It was indeed a very busy scene, and the people were delighted to see the poles going up so rapidly; often a pole would be erected and set completely in five minutes. Other wagons followed, cleaning up the surplus gravel, cement sacks, etc., and the stonecutters came after, fitting the stones back into place as quickly as it could be done.

The poles being in place, the next work was to put up the span-wires and to string the trolley wires. This was done by separate gangs under separate foremen, and by means of wagons, as shown in the illustrations. The towers, were built especially for the work, and when the word was given it was only necessary to set them on transfer wagons which had been hired. The concrete around the iron poles was allowed to set about three days before any wires were strung. So thoroughly was the work done, that in no case did a pole give way in the slightest degree. The two terminal poles at the foot of 17th St. in front of the Union Depot, were made of two cable slot-rails riveted together, and were imbedded in a specially rich concrete 8 ft. deep.

In all 26 miles of trolley-wire were strung and 1,228 poles erected, 279 of which were iron, and 949 wooden. The total cost of labor was \$5,672.12, the details of which are as follows:

CHARACTER OF WORK.	IRON.			WOOD.		
	No.	Cost per Pole.	Total.	No.	Cost per Pole.	Total.
Delivering poles	279	\$ 0.36	\$ 100.12	949	\$ 0.37	\$ 353.63
Digging post-holes	270	.86	236.38	949	.89	844.87
Raising poles	276	.21	58.75	949	.30	283.40
Hauling sand and blocks	279	.95	257.65	949	.05	49.00
Setting poles	278	2.00	555.70	949	.37	355.20
Stonecutters	276	.87	242.00	.....	.....	.....
Cost of cement total per hole, 2.80 sacks; total used, 792 sacks	270	2.14	590.64	.....	.....	.....
Total.....		\$ 7.39	\$2,041.24		\$ 1.98	\$1,886.10

Cost of three special iron poles in front of Equitable Building and Brown Palace Hotel, \$100.63.

Total for iron poles, \$2,141.87.

Total for wooden poles, \$1,886.10.

Total, \$4,027.97.

Cost of erecting wires, \$774.00.

Average cost of stringing trolley wire, per mile, \$6.97

Average cost of erecting curves, \$9.89.

Average cost of putting up span-wire, 53 cents.

Miscellaneous expenses, getting materials ready, hauling supplies, cleaning streets, time-keepers, watchmen, foremen, etc., \$870.15.

SUMMARY.

Total cost erection of poles, \$4,027.97.

Total cost erection of wires, \$774.00.

Total miscellaneous expense, \$870.15.

Total, \$5,672.12.

These figures are given not as a criterion of cheapness, although the work might have cost as much or more if it had been done within a longer period of time; but they are given because it is thought they may be of interest to some one who contemplates a similar "rush job." The work was simply "crowded," and no expense was spared. The lines were all completed and put in operation by March 31st. No work was done on Sunday, so that the entire work was done in about seven and one-half working days. The lines were not all put in operation simultaneously, but were started up on different days. The gripmen were "broken in" as motormen quite rapidly, each man being on with his instructor an average of four days. The men were allowed wages while they were breaking in, and the instructors were paid \$5 extra for each man broken in. The men were all subjected to a written exam-

ination, and were then set at work, starting up the lines which they had formerly run over with cable trains. All the lines started without a hitch, and without accidents. Almost the entire credit for the preparation of the details and the carrying out of the work



TOWER WAGONS AND CREWS.

is due to Mr. Matthews, who has "grown up" with the company, and who previously had no experience with similar undertakings.

Current was obtained from the feeder lines already up, the power-houses of the company having a sufficient surplus for the additional cars. Probably an entire new station of about 4,000 h. p. capacity will be erected as soon as the machinery can be obtained. When this is completed the present stations will be dismantled



C. K. DURBIN.



W. G. MATTHEWS.

and their contents sold. Much work remains to be done on the two viaducts, about 3,000 ft. each in length, to render them suitable for the heavier electric cars. Rails weighing 65 lb. per yard will be laid, and the stringers and other timbers are being changed where necessary. A number of track connections, Y's, etc., are being built at the company's shops, which are now worked to their full capacity, day and night. It is the intention of the management to put the entire property in first-class shape, as soon as the work can be done.

RIGHT OF COUNCIL TO REGULATE SCHEDULES NOT ADMITTED.

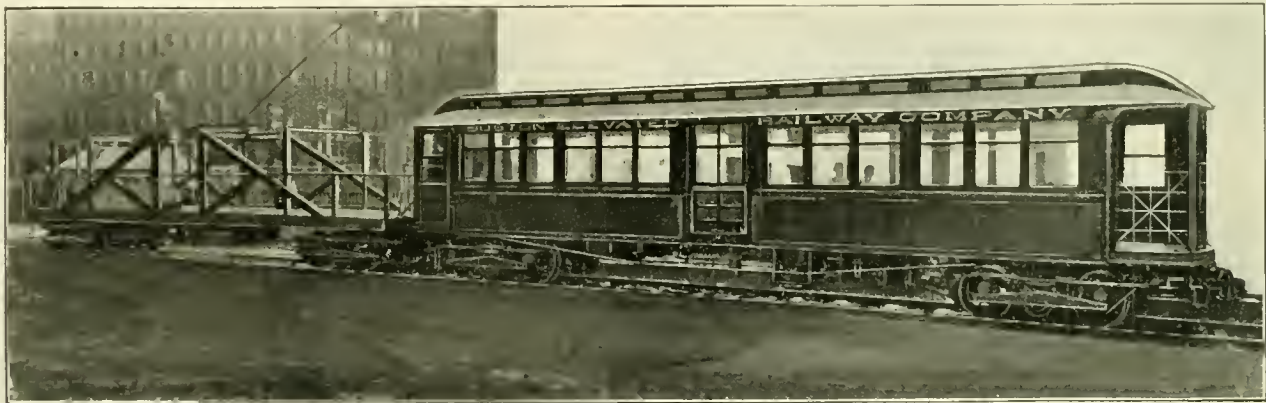
At a meeting last month the City Council of Montreal passed a resolution ordering the Montreal Street Railway Co. to change the running time on a number of its lines to give a more frequent service in certain parts of the city. After considering the resolution the directors of the company notified the council they could not concur in the assumption by the city that it had power to regulate schedules by simple resolution, and in order that the citizens who reside on the routes in question may not suffer a deprivation of their rights, the company offers to facilitate in any way in its power the obtaining of a judicial decision in the matter.

TESTS OF CONTROLLING SYSTEMS FOR THE BOSTON ELEVATED.

The illustration herewith is a view of one of the standard cars for use on the Boston elevated and also shows a dummy attached to the standard cars for making up the trains used in the competitive tests of controlling systems begun on April 3d. The standard cars are 46 ft. long with side doors and seat 48 persons; the net weight with equipment is about 27 tons.

There were three companies in the competition, the Sprague, the Westinghouse and the General Electric. The Sprague and the General Electric trains were each of four cars, one standard passenger car and three flat cars, all being loaded with pig lead or other ballast to give a total weight of 30 tons each. The Westinghouse train consisted of one flat car and three passenger cars from the experimental line between Wilmerding and East Pittsburg. All test cars had two motors, both being mounted on a Baldwin truck; on the Sprague and General Electric trains the motors were G. E. 55 built for the Northwestern Elevated of Chicago, while the Westinghouse train had Westinghouse 50 C motors.

The tests were made between the hours of 1 a. m. and 5 a. m. in the subway, two of the tracks having been provided with third rails; this addition is permanent and surface cars will be excluded from these tracks after the elevated section is in operation. The distance run by the test trains is 1.4 miles in the course of which is an 8 per cent grade with a 90-ft. radius reverse curve at the foot. Stops of



TWO CARS OF THE SPRAGUE EXPERIMENTAL TRAIN.

10 seconds were made at each of five stations, the total time being 6 minutes, which means an average speed of over 16 miles per hour excluding stops. Runs were made with one, two, three and four cars. All the instruments were in the passenger car. The various instruments were read at intervals of two seconds; the speeds were measured by noting the time of passing signal flags. The data are to be worked up by Mr. John Lundie, consulting engineer in the matter of equipment, using time as an abscissae and speed, distance, current, voltage, and grade as ordinates.

The Sprague system and the Westinghouse electric-pneumatic system of control have both been described in the "Review." In the General Electric multiple unit system the main controller, one under each car, consists of a series of solenoids each operating a contact; on each platform of each car is a master controller of the usual form, and the manipulation of any one of these controls the current in the solenoids of the main controllers causing them to act in unison. This system has no pilot motors or automatic throttling device.

Before regular operation of the elevated cars can be undertaken through the subway certain changes will be made in the special work to allow the use of deeper wheel flanges; the outer rails on curves will also be elevated where the dimensions of the tunnel permit of it.

The current consumption on the test trains was as high at times as 600 amperes per car, and to meet the fluctuations that are to be expected in regular service storage batteries will be installed in substations near the termini of the subway.

May 1st it was announced that the Sprague Electric Co. had been awarded the contract for controllers for 60 cars.

J. L. WILLCUTT'S LONG SERVICE IN SAN FRANCISCO.

At the annual meetings of the Market Street Railway Co. and the Geary Street, Park & Ocean Railroad Co., of San Francisco, Mr. J. L. Willcutt, secretary and controller of the first-named company, and secretary and general manager of the second, declined a re-election and was succeeded in these offices by his son, Mr. George B. Willcutt.

The pioneer street railway of San Francisco was the San Francisco Market Street Railroad, operated by steam, which was opened for traffic on July 4, 1860; two years later a branch line was built in Hayes St. As operated by steam, with a half-hour service, the road was a losing venture, and in 1866 was sold to the San Francisco & San Jose Railroad Co. (the first link of the present Southern Pacific system), of which Mr. J. L. Willcutt was secretary. A new company, the Market Street Railway Co., of San Francisco, was organized to operate the street railway, and Mr. Willcutt chosen secretary. About a year later six two-horse cars were substituted for the steam dummies. In 1879 the company decided to adopt cable traction, already in successful operation on other lines in the city, and greatly extend the system to meet the needs of the rapidly growing city; the new cable system was put in operation in 1883. In connection with these improvements the owners built the Park & Ocean R. R., a double track line 4 miles long, operated by steam dummies. Mr. Willcutt also served as general manager

until 1893, when the present Market Street Railway Co. was organized and a consolidation of twelve smaller corporations effected; after this he continued as secretary of the Market Street.

In 1887 the Southern Pacific capitalists bought a controlling interest in the Geary Street, Park & Ocean Railroad Co., and Mr. Willcutt was made secretary and general manager of that company, positions which he has held continuously till now.

During all this time Mr. Willcutt has also been secretary of the various steam road companies controlled by Southern Pacific interests, and being chosen to the same office in several other steam railroad corporations, at the recent annual meetings, the increased duties were such that he could no longer continue to act as an official of the street railways, though remaining as a director of the two companies. During his connection with the Market Street road the mileage has increased from 2½ to 185 miles, and the number of cars from 6 to 800.

Mr. George B. Willcutt, the newly chosen secretary and controller, is a young man of great promise, who has been connected with the Market Street company for a number of years, and thoroughly familiarized with all the details of his position. We wish for the son an equally long and successful career in the street railway field as that achieved by Mr. J. L. Willcutt.

The sinking of a steamer on the Atlantic last month caused the loss of a number of exhibits intended for Paris. Among these were a miniature of the Brooklyn Bridge, made by the Roebling Co., and orders have been given for its immediate reproduction. A complete electric railway system will be installed on the model.

INTERURBANS AT COLUMBUS, O.

We have made mention in recent issues of the efforts of various interurban electric roads to secure entry into the city of Columbus, O. April 21st it was announced that an agreement had been reached between the officials of the Columbus Railway Co. and the Worthington, Clintonville & Columbus Street Railway Co. whereby the latter company will operate its cars over the tracks of the former in the city. The compensation is to be on what is known as the "Dayton plan"; the Columbus Ry. will provide the tracks and power, and is to receive 3 cents for each passenger carried over the city lines in the interurban cars.

April 23d, the Columbus city council passed an ordinance giving the Columbus, London & Springfield Railway Co. a franchise on certain central streets. The vice-president of this company states that it is quite willing that the other interurbans shall make use of its tracks.

May 1st the Columbus, Buckeye Lake & Newark Traction Co. also secured the passage of an ordinance permitting it to enter the city. The company agrees to sell 7 tickets, good within the city limits, for 25 cents, and 28 for \$1.

May 3d the Columbus & Lancaster Traction Co. made an agreement with the Columbus Railway Co. to enter over the latter's tracks.

Other interurban companies seeking to enter the city are the Grove City & Green Lawn Street Railway Co., the Columbus, New Albany & Johnstown Traction Co. and the Chillicothe, Clarksburg & Columbus Railway Co.

WOODILINE FOR PRESERVING TIMBER.

Among all the processes for increasing the life of timber so placed as to be subject to rapid decay, that have been brought to public attention in recent years, none has proved to be more efficient and inexpensive than that of immersing the timber in a hot bath of liquid called "Woodiline." The composition of the liquid is not made public, but the American Wood Preserving Co., of Philadelphia, which developed this method of treatment, states that it is a mixture of certain powerful antiseptics with highly waterproof ingredients; the liquid is said to solidify and harden after entering the timber so that the timber is not only made materially tougher in its outer fibers, but the antiseptics are not liable to be washed out under the action of moisture, or to be evaporated.

The first important use of "Woodiline" in railway work was on the Amboy division of the Pennsylvania R. R., when some red and black oak ties treated by this process were laid in 1883; these proved to be sound after 16 years of service, though two and in some cases three sets of untreated white oak ties were in that time removed from positions immediately adjoining the treated ties. Since these tests the process has been extensively used by such railroads as the New York Central, the Chesapeake & Ohio, the Terminal Railroad Association of St. Louis, the Long Island, and on many smaller systems; it has also been used in Mexico, China and Brazil. Over three years ago the West End Street Railway Co., of Boston, placed an order with the makers for a large quantity of the preservative for treating the ties to be used in the subway. The experience of this road (now the Boston Elevated) has been very satisfactory; as is stated on page 253 of this issue, the ties treated with "Woodiline," even where covered with soil and sod, usually last as long as the rails.

For treating the ties by immersion they are placed in an open tank of the liquid, which is heated by steam pipes to 150° F. and allowed to remain for about 15 minutes, in which time a tie will absorb about half a gallon of the mixture. Only seasoned timber should be treated if the best results are to be expected; green or wet timber will not absorb the liquid.

Where the timber can not be immersed the liquid may be applied with a brush and good results obtained. For this method the preservative is heated in an iron pot to about 125° F. and the timber given three coats with a large brush; several hours should elapse between coats to give opportunity for drying.

The economy of this open-tank treatment by immersion simply, as compared with the more expensive methods of steaming the timber and forcing the preservative under pressure will readily be appreciated.

NEW ROAD IN THE OHIO VALLEY.

We are informed by Mr. H. S. Sands, purchasing agent for the Steubenville, Mingo & Ohio Valley Traction Co., that five miles of its proposed road are nearly completed. The present line extends from Steubenville, O., to Mingo Junction, O. At the power house are two Russell four-valve engines of 500 h. p. each, direct connected to Westinghouse generators and boilers of 800 h. p. capacity.

The general offices and a handsome car barn are located at Steubenville, where the company is also developing an extensive park, with casino, etc. Eight cars will be in operation by June 1st.

TRAFFIC IN ST. LOUIS.

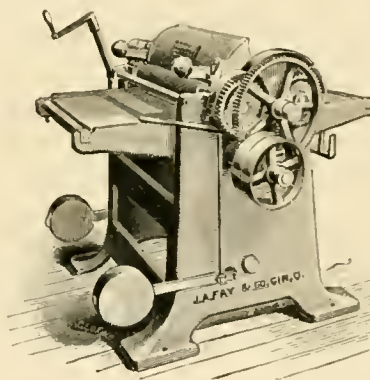
The reports of the street railway companies of St. Louis for the quarter ending Mar. 31, 1900, show trips run and passengers carried as follows:

	Trips.	Passengers.
St. Louis & Suburban Ry.....	54,266	2,995,941
St. Louis Transit Co.....	1,267,775	27,038,585
Total	1,322,041	29,944,526

For the last quarter in 1899, the same companies reported trips run, 1,558,315; passengers carried 32,783,639.

NEW FAY SURFACING MACHINE.

The accompanying illustration shows an improved machine recently brought out by J. A. Fay & Co., of 557-577 W. Front St., Cincinnati, and known as their No. 2 "Centennial" surface planer.



This type of machine is made in sizes 16, 20 and 24 in. wide and is adapted for surfacing all kinds of hard or soft wood. The cylinder is of forged steel with lips; pressure bars are fitted on each side of the cylinder for planing thin or short material. The bed plate and under rollers raise and lower together to suit the

thickness of the material to be planed, which is shown by an index gage, and always maintain their relative position with respect to the cylinder, and upper feeding rolls.

FREIGHT ON MASSACHUSETTS ELECTRIC LINES.

The legislative committee on street railways of Massachusetts has decided to report a general bill authorizing electric and street railways to carry freight. The decision was not unanimous, and one member reserved the right to dissent, on the ground that some equivalent privilege should be required of the companies.

PICKPOCKETS ON ELECTRIC CARS.

The Chicago police have received a large number of complaints from persons whose purses and valuables have been stolen while riding on street cars. It is believed that the thefts are all the work of one gang which consists of four well-dressed men. The method is for one man to block the doorway and while the victim is explaining that he wishes to enter the car, the other men who are on the platform crowd against him and in the confusion secure their booty.

Corporation Counsel Whalen, of Greater New York, announces he is preparing to bring suits on behalf of the city to recover \$1,200,000, due from various street railway companies for car license fees, percentage of earnings and repaving the streets between the tracks.

FOREIGN FACTS.

The first electric line at Santiago, Chili, has been opened to the public.

Extensions will be built to the Bangkok (Siam) Electric Tramways. Mr. W. J. Jacobson is manager.

It has been decided to rebuild the Mersey (Eng.) & Wirral Ry., and equip it with a third-rail electric system.

Trolley wire thieves are giving the management of the new electric lines in Mexico City considerable trouble.

There are 54 tramway bills now before Parliament involving the possible construction of 504 miles of track, and an expenditure of £12,014,255.

Electricity will be applied to a section of the Societa delle Ferrovie Mediterranee line, a steam road running from Genoa to Turin, Italy.

The new tramway system in the city of Norwich, England, is nearing completion. The lines are owned by the Norwich Electric Tramways Co.

A scheme for a light electric railway of 110 miles from Lecce, Italy, to Taranto, has been presented to the Deputazione Provinciale of Lecce.

Extensions to Wrekenton and Dunston will be built by the Gateshead (Eng.) & District Tramways Co., of which Mr. Henry Foley is manager.

A Board of Trade order was last month issued to the Batley (Eng.) Corporation, giving permission to lay electric tramways through the borough.

An issue of 4½ per cent first debenture stock has been made by the Calcutta (India) Tramways Co. to provide funds for converting the lines to electric traction.

Government permission has been secured by the Societa delle Tramvie Ferronie Electriche of Rome, Italy, for building an extensive electric tramway system.

Formal sanction has been granted by the Local Government Board to the Ilford (Eng.) District Council to borrow £70,000 for electric lighting and electric tramways.

At Glasgow, a skeleton car is being used for the purpose of teaching the horse car men how to operate electric cars. It is devoid of furnishings, and the wiring is exposed.

The City of Birmingham (Eng.) Tramways Co. is making overtures to the city council to replace the electric accumulator cars on the Bristol Road with the overhead trolley system.

A bill has passed the House of Commons granting the Stockport (Eng.) Corporation powers to build electric tramways. Mr. Webb is mayor and chairman of the electricity committee.

Contracts for the construction of tramways in Vienna, Austria, have been awarded to Schuckert Co., of Nuremberg, Germany. The lines are controlled by the Vienna municipal authorities.

The Japan-American Commercial Journal states there are 19 power houses in Japan for supplying electric power to tramways. Of these 6 are operated by water-power and 13 by steam or other powers.

Application is before the authorities for leave to equip the Birmingham (Eng.) & Midland Tramways, now operated by steam motors, with the overhead electric system. The Birmingham Council has always opposed the trolley, but it is hoped permission will be granted in this case.

Over 8,300,000 passengers were carried last year on the Middlesborough (Eng.) Stockton & Thornaby interurban road. This system was described in the "Review" for October, 1898, page 711.

Hereafter all employes of the tramway lines owned by the London County Council will work only 60 hours a week. The reduction in hours represents an increase of \$50,000 per annum in operating expense.

The House of Commons has passed a bill authorizing the Reading (Eng.) Corporation to build new electric tramways and to reconstruct for electric traction the lines of the local tramway company.

Electricity is to be substituted for mule power on the tramways at Torreon, Mexico. Further information may be secured from Salvador Diaz Alvarado, manager of the Compania de Tramvias de Lerdo, Lerdo, Mexico.

A company recently formed at Brussels, Belgium, is planning to construct an electric railway between Brussels and Antwerp, a distance of 28 miles. The Allgemeine Electricitats-Gesellschaft of Berlin is said to be interested.

The horse tramways at Georgetown, British Guiana, have been purchased by the Demerara Electric Co., and will be equipped electrically. Among those interested are C. H. Cahna and B. F. Pearson, of Halifax, Nova Scotia.

At Frankfort-on-Main, Germany, a considerable reduction in the passenger rates on the city's electric railroad has been made. In future the rates will be 10 pfennigs (2½ cents) for 4 km. (2½ miles), and 15 pfennigs for greater distances.

Volk's electric railway, running along the base of the cliffs at Brighton, England, has been reconstructed and is again open for traffic. The rails for a portion of the way are under water, and the cars are carried on a steel framework.

The British Compressed Air Tramways Co. has been registered at London, to equip tramways with compressed air motors. Among the directors are A. D. Brown, 31 Reighton Road, Upper Clapton, London, N. E., and P. E. Harris, 34 Wolcott Sq., London, S. E.

We have received a copy of the report of the sub-committee appointed by the County Borough of Cardiff, Wales, to report on a tramway system for the borough. The committee recommends the erection of several district stations and the use of double truck cars.

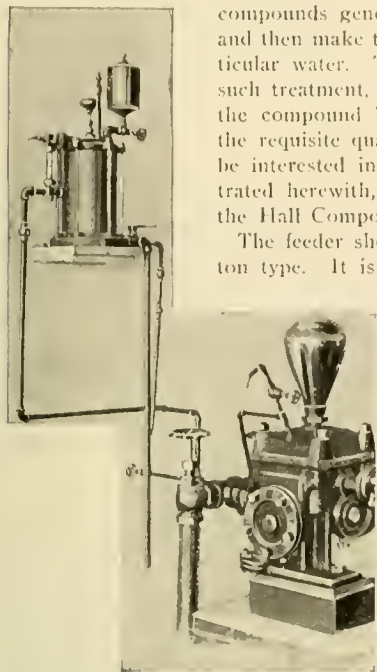
In order to meet the demand from street railways now building in the provincial towns of England, where the streets are particularly crooked and narrow, the British Thomson-Houston Co. has designed a special narrow-gage motor. It is known as the G. E.-60, and can be used where the gage is as narrow as 2 ft. 11½ in.; the motor is rated at 27 h. p. with a four-turn armature and 19 h. p. with a six-turn armature.

There are now on file in the Bureau of Foreign Commerce, Department of State, Washington, a plan of the city of Vladivostock, Siberia, and the profiles of the streets in which it is proposed to build a 12-mile electric street railway. The city wishes to grant concessions for a railway and lighting system, and the question of providing a water supply will also be brought up in the near future. American bids are desired. No time limit has been set for sending in proposals, nor for the completion of the work. The city will be responsible for payment.

An overhead electric line 8¼ miles long, 3 ft. 6 in. gage, commencing at Hathers and running through Loughborough to Quorn, is now being promoted by the Loughborough & District Electric Traction Syndicate, Ltd., with the support of the Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough, Leicestershire. The solicitors are Messrs. Le Brasseur & Oakley, of London, and the secretary is Mr. J. McLachlan, Queen Victoria St., London. The population of the district is estimated at 33,500, and the cost of the road, including equipment at \$541,000.

SIGHT FEEDER FOR BOILER COMPOUNDS.

It is nowadays a simple matter to get a boiler compound that is exactly suited to the needs of a steam user, as the makers of compounds generally analyze the feed water and then make the compound to suit the particular water. To get the best results from such treatment, however, it is necessary that the compound be regularly administered in the requisite quantities, and our readers will be interested in the compound feeder, illustrated herewith, that has been developed by the Hall Compound Feeder Co., of Chicago.



The feeder shown is of the company's piston type. It is mounted in any convenient position, and the lower portion of the cylinder connected with the feed-water line; the water thus admitted to the under side of the piston causes it to move up, forcing the compound (placed in the cylinder above the piston) out through the sight-feed glass, whence it is conducted to the suction pipe of the pump. The feeder is guaranteed to feed any liquid compound

and the rate may be varied to give from one to five hundred drops per minute. The other type of this device is a single diaphragm feeder, a flexible diaphragm replacing the piston of the piston type; the principle of operation is the same in both, and both feed through the pump and operate only when the pump is working.

These feeders are extensively used in Chicago, and we have received a very strong testimonial from Mr. Geo. R. Hinds, engineer of the West Chicago Street Railroad Tunnel Co.

MORE ABOUT WIRE THIEVES.

Patrick O'Neil, indicted for stealing copper bond wire from the Oswego (N. Y.) Traction Co. on April 25th, entered a plea of guilty and was sentenced to one year in the Onondaga penitentiary. Frank Champion, indicted for the same offense, was sentenced to the Elmira reformatory.

J. Mack, arrested at Alameda, Cal., with a sack full of copper bond wire taken from the track of the Leona Heights road, was, April 14th, sentenced to six months in the county jail; he had pleaded guilty to the charge of petit larceny.

The Polytechnic Street Railway Co., of Ft. Worth, Tex., has had so many bonds stolen from its track that it has adopted bonds which are placed under the fish plates.

Between midnight and daylight, April 24th, about 4,500 ft. of feed wire was cut from the poles of the Calumet Electric Ry., in Pullman Park, Chicago.

Wire thieves made an attempt to take feed wire from the lines of the Schuylkill Valley Traction Co., near Norristown, Pa., early on the morning of April 20th, but were frightened away by a watchman.

WATER POWER FROM THE ST. JOSEPH RIVER.

Information is at hand relative to the plans of the South Bend (Ind.) Power Co., a corporation organized in Indiana for the purpose of building a 12-ft. dam across the St. Joseph River near the state line between Indiana and Michigan and also erecting a power plant of 3,000 h. p. capacity for generating and transmitting electricity to South Bend and neighboring cities for light, heat and power. One of the principal uses to which this will be put will be the operation of an electric railway to be built from South Bend to Laporte and Michigan City in Indiana, and from South Bend to

Niles and Benton Harbor. The same interests will also put in another dam across the St. Joseph River, to the east of South Bend, where 6,000 h. p. will be developed.

Construction work on both the dams has been commenced and will be finished by fall. Direct connected, alternating generators, three-phase, of 1,500 kw. capacity will be installed at both plants.

The officers of the company are: President, E. A. Saunders; vice-president, M. V. Beiger; secretary, J. Du Shanc; treasurer, Chas. H. Tenney.

SOUTHERN OHIO TRACTION CO.

At the first regular meeting of the directors of the Southern Ohio Traction Co., held at the office of M. J. Mandelbaum & Co., Garfield Building, Cleveland, on April 30th, the following officers were elected for the ensuing year: President, Will Christy, of Akron; first vice-president, M. J. Mandelbaum, of Cleveland; second vice-president, H. Clark Ford, of Cleveland; secretary and treasurer, F. T. Pomeroy, of Cleveland; auditor, Warren Bicknell, of Hamilton, O.; general manager, F. J. J. Sloat, of Hamilton. The president, vice-presidents and secretary will have offices at 1022 Garfield Building, Cleveland, and the operating headquarters, with Mr. Sloat in charge, will be at Hamilton, O.

Mr. Christy writes us that a number of new cars have been ordered and the lines of the Cincinnati & Miami Valley Traction Co., and the Dayton Traction Co., which have been acquired by the Southern Ohio Traction Co., will be thoroughly rebuilt and re-equipped.

A HANDY TYPEWRITING MACHINE.

The Chicago Writing Machine Co., of 94-96 Wendell St., Chicago, makes a light, portable typewriter that, it is claimed, possesses all the qualities of the higher priced machines. It has the standard keyboard, printing 90 different characters, all on one steel cylinder, which can be taken out, cleaned and replaced in a few seconds. The carriage is light and easy running, and by means of a marginal regulator the machine can be adjusted for any width of paper. A lever mechanism enables the keys to be locked, so that an unfinished letter may be left in the roller without danger of interference.



The machine is well adapted to many of the requirements of a street railway office, including general correspondence, mimeograph work and the manifolding of orders and reports. By its use, also, the general manager, after short practice, can relieve himself of much of the inconvenience incident to writing with a pen.

NEW YORK FRANCHISE TAX.

The franchise values as finally agreed upon by the State Tax Commission of New York have been reduced about one-sixth as compared with the tentative values, and the taxes will not be so onerous for the large companies as had been supposed. Thus for the Metropolitan Street Ry. the valuation is \$52,292,317; this is treated as real estate and taxed at two-thirds of the assessed value, which with a tax rate of 2½ per cent (the same as last year), would make the tax about \$871,000. From this all other taxes paid will be deducted, leaving about \$271,000 as the increase. This is about ½ per cent on the capital stock.

It was announced that on May 15th the constitutionality of the franchise tax would be argued at Albany before the Appellate Division of the Third Judicial Division, the case having been brought before the court by the Queens Borough Electric Light & Power Co.

It is said an agreement has been signed by representatives of the Italian provinces of Naples, Caserta, Avellino, Benevento and 23 municipalities, for the construction of an electric railway between Naples and Benevento, a distance of 30 miles.

W. K. SCHOEPF.

On April 9th, Mr. W. Kesley Schoepf, for many years prominent in the management of the traction lines of Washington, D. C., arrived in Pittsburg to assume active direction of the Consolidated Traction Co., of that city, as general manager. Mr. Schoepf comes at the instance of Messrs. William L. Elkins, P. A. B. Widener, Thomas Dolan and Senator C. L. Magee, and will also become general manager of the Union Traction Co., which is now being formed, embracing the Consolidated, United and Monongahela Traction companies, and practically covering all the lines in the cities of Pittsburg and Allegheny; the new company will operate over 300 miles of road.



W. K. SCHOEPF.

Mr. Schoepf is an engineer and has been active in electric railroading since that power was introduced in street railway service. He is a son of the late Gen. Albin Schoepf, of the United States Army, and was born in 1864 at Fort Delaware, while his father was commandant of that post. His father was a Hungarian, who came to America with Louis Kosuth in 1850. Mr. Schoepf's mother was Miss Kesley, of Washington.

Early in 1883 he became engaged on the preliminary engineering work of the South Penn R. R., that was projected by the Vanderbilts as a parallel line to the Pennsylvania. He remained on the South Penn work, both in the preliminary and construction stages, until the settlement of the trouble between the Vanderbilts and the Pennsylvania, the latter agreeing to discontinue the construction of the West Shore road if the former would stop operations on the South Penn. Mr. Schoepf then went to Washington and was engaged for a time in the engineering work of the Government in that city.

In 1890, he became interested in the street railway lines of Washington, as chief engineer of the Rock Creek Ry., now a part of the Capital Traction system. He became associated in 1892 with William L. Elkins, P. A. B. Widener and Thomas Dolan in the development of the Washington systems and remained with them as long as they held control of the roads, or until 1897.

Mr. Schoepf was receiver of the Eckington & Soldiers' Home Ry., the Belt R. R., and the Maryland & Washington Ry., from 1896 to 1899, and still holds the formal receivership of one of the roads. He was prominent in the reorganization and reconstruction of the City & Suburban Ry., Washington, on which he installed the conduit electric system, being at that time vice-president and chief engineer. He holds large interests in the Washington roads, but has not had active management since his retirement, some months ago. He is a member of the Maryland and other clubs in Baltimore.

FAKE "WRITE UPS."

At a recent meeting of the Chicago Trade Press Association, an organization whose membership comprises the most influential trade journals in the West, it was determined to take some action to protect manufacturing and mercantile firms from the depredation of the "fake write-up men."

A number of alleged trade journals, several of them being printed in the Southern states, send out thousands of circular letters to merchants and manufacturers, enclosing proofs of ingeniously prepared write-ups. Each person to whom a letter is directed is led to believe that he has been selected because of the prominence of his firm. The men whom it is sought to victimize are informed that no charge will be made for the printing of this complimentary notice, but that sample copies will be sold at 15 cents per copy, or at 8 cents per copy in thousand lots. These journals have no legitimate standing in the community, and represent nothing except the desire of their managers to extort money from business men. The circular letters are so shrewdly worded and the office

of the publication is usually so far removed from the persons to whom the letters are sent, that many firms have been victimized. Almost every department of industry is represented by one or more reputable journals, and manufacturers and business men generally are advised to communicate with publishers of whom they have some knowledge before being led into fake schemes.

The several papers comprising the membership of the Chicago Trade Press Association have agreed to print this statement, with a view of protecting their patrons, and business men generally, from loss through such deception.

KANSAS CITY PLANS UNCHANGED.

We are in receipt of a letter from Mr. W. H. Holmes, president of the Metropolitan Street Railway Co., Kansas City, in which he says concerning the convention hall destroyed by fire last month: "We all feel the loss keenly, but Kansas City, with its usual spirit and pride, began rebuilding the hall before the fire was out, by subscribing money and employing men and teams to clear away the ruins. We have the National Democratic convention with us on July 4th and expect to have the building ready by that time. We will be ready for the American Street Railway Association this fall."



RUINS OF CONVENTION HALL, KANSAS CITY.

Having heard of rumors among the street railway supply men to the effect that the hotels at Kansas City would increase their rates during the convention in October next, we have made inquiries of Mr. W. A. Satterlee, chairman of exhibits, who writes under date of May 9th as follows: "I have visited the following four principal hotels of this city, and send you herewith the rates charged:

"Midland—(Headquarters)—American, \$3 to \$6 per day; European, \$1 to \$5 per day.

"New Coates—American, \$3 per day and up; European, \$1 per day and up.

"Savoy—American, \$2 to \$3 per day; European, \$1 to \$2 per day.

"Baltimore—American, \$3 to \$5 per day; European, \$1.50 to \$3 per day.

"These are the regular rates, and will not be raised during the week of the street railway convention. These four hotels would certainly be able to take care of all the street railway men who will come."

CEDAR POLES.

The Lindsley Brothers Co., of Menominee, Mich., has issued a small pamphlet entitled "About Cedar Poles," intended for the use of cedar buyers as a guide in estimating and ordering cedar products by car loads. The company conducts an extensive logging business in Michigan and on the Pacific Coast, having an office in Portland, Ore. Cedar poles 20 to 60 ft. long and 4 in. to 9 in. diameter at the top are carried in stock at the yards of the company, of which it has seven in Michigan and Wisconsin, and shipments can be promptly made. Longer poles will be furnished on request. The company also handles posts, shingles and ties.

FIRE AT OTTAWA AND HULL, CAN.

A disastrous fire swept over Hull, Que., and Ottawa, Ont., on April 26th, laying a large area in both cities in ruins and doing damage estimated at from \$15,000,000 to \$20,000,000. The flames broke out in the city of Hull, across the Ottawa River from Ottawa, about 10 o'clock in the forenoon and shortly after 12 o'clock reached Ottawa, nearly a mile distant. Here they extended through the Chaudiere, the industrial district of the city, fanned by a gale blowing 60 miles an hour, and before evening when the fire was

moved to a steam power house of the lighting company to be used in case of emergency, was saved. Power house No. 2, built last winter, adjoining No. 1, equipped with three pairs of Stillwell-Bierce & Smith-Vaile water wheels direct connected with an 1,800-h. p. Westinghouse generator escaped uninjured except slight damage to the water wheel regulator. Our system is now in full working order, the same as before the fire, except the section between the power house and Hull, about half a mile. Here the iron bridges over the timber slides were destroyed and it will take several months to rebuild them. In the meantime a temporary structure is being



GENERAL VIEW FROM HOTEL CECIL.
RUINS OF IRON BRIDGE No. 2.

RUINS OF IRON BRIDGE No. 1.
RUINS OF POWER HOUSE, OTTAWA ELECTRIC RY.

finally under control, it had reached a point three miles from where it originated.

Through the courtesy of Mr. Jas. D. Fraser, secretary and treasurer of the Ottawa Electric Railway Co., we are able to present

built to accommodate our tracks. The burned power house was valued at about \$100,000, covered by insurance. About three hundred poles, a large quantity of overhead and feed wire, and a number of ties and rails were destroyed. Our loss outside of power



TRACKS OF OTTAWA ELECTRIC RY., HULL.

herewith a group of views taken immediately after the catastrophe. Mr. Fraser also sends us the following information, under date of May 10th.

"Power House No. 1, of the Ottawa Electric Ry., which was equipped with three 400-h. p. and three 100-h. p. Westinghouse generators, was totally destroyed. Fortunately a 700-h. p. generator

house will probably reach \$10,000, on which there is no insurance. We will set to work at once to rebuild the burned station, and the new one will be modern and up to date in every respect, as is No. 2."

Mr. W. R. Taylor, secretary and treasurer of the Hull Electric Co., sends us the following statement of the situation in Hull:

"This company has two-thirds of its electric light lines destroyed

in the city of Hull—poles, wires, transformers, meters, etc.—besides nearly two miles of trolley lines, of which only the rails were left intact. We were fortunate enough not to lose any cars. Our city line in Hull now runs between rows of ruins; our Aylmer line was not affected except where it entered Hull."

STRIKE AT ST. LOUIS.

On the morning of April 29th the gripmen running from the North End car house of the Broadway cable division of the St. Louis Transit Co., refused to take out their cars because of the suspension of a gripman who had refused to break in a non-union man. The matter was referred to General Manager Baumhoff, who directed that the man be reinstated pending an investigation. The principal point at issue was the "recognition of the union," and on May 4th the men presented their ultimatum; President Whitaker explained that the matter would have to be submitted to the directors of the company, and, consequently, the threatened strike was postponed until after the 7th.

The proposition of the union and the letter of Mr. Whitaker to his directors are given in full below.

UNION'S PROPOSITION.

This agreement between the St. Louis Transit Co., of St. Louis, Mo., or their successors, of the first part, and the Amalgamated Association of Street Railway Employes of America, Division 131 of St. Louis, Mo., of the second part, witnesseth:

That in the operation of the street railway lines of the party of the first part, both parties hereunto mutually agree.

Sec. 1. That the party of the first part through its properly accredited officers do hereby agree to treat with the party of the second part through their properly accredited officers.

Sec. 2. That all conductors, motormen and gripmen shall be members of this association and must report for initiation within 30 days from the time they are employed; and when men are put in training they shall take out a card of permission from the association, paying one dollar (\$1.00) for the same.

Sec. 3. That all shopmen, shedmen and power-house men, not members of an organization affiliated with the American Federation of Labor, shall be members of this association.

Sec. 4. That such employes as are specified in sections two and three (2 and 3), who are now in the employ of the company, shall become members of this association within five (5) days after the date of this agreement.

Sec. 5. That all regularly employed trackmen, who may become members of this association shall have the protection of the same.

Sec. 6. That all business arising between the parties hereto shall be transacted directly by the properly accredited officers of the company and the properly accredited officers of the association, respectively.

Sec. 7. That in all cases where men are suspended from service the properly accredited officers of the company shall notify the properly accredited officers of the association within twenty-four (24) hours after such suspension; and within forty-eight (48) hours after such notification the properly accredited officers of the company shall give the properly accredited officers of the association the final decision of the properly accredited officers of the company in such cases; and within forty-eight (48) hours after such decision given by such officers, the properly accredited officers of the association shall give to the properly accredited officers of the company the final decision in such cases of the properly accredited officers of the association.

Sec. 8. That in cases where members of this association are suspended by the company the duly authorized officers of the association shall, upon written request of the members suspended, be permitted to inspect the record of such member as it appears upon the company's record book.

Sec. 9. That the properly accredited officers of the association, together with the properly accredited officers of the company, shall have full power to adjust all differences that may arise between the parties hereto.

Sec. 10. That if such named officers fail to reach a mutual agreement they shall have power to order the case to arbitration at once. The board of arbitration to consist of three (3) disinterested persons; and the finding of a majority of such board of arbitration shall be binding upon the parties hereto. The parties hereto shall each choose one member of such board and the two thus chosen shall select a third; the three members thus chosen shall constitute such board of arbitrators. When a case is submitted to arbitration each party shall name its arbitrators within three (3) days; in the case of the failure of either party to so name its arbitrators, the party so failing shall forfeit its case. It is hereby agreed that the arbitrators appointed by each party shall meet within two (2) days after they have been appointed, for the purpose of selecting a third arbitrator; failing to select the said third arbitrator, they shall meet daily thereafter at a place to be mutually agreed upon between said arbitrators, until said third arbitrator is selected. The failure of either arbitrator to attend one such meeting shall give to the party which has named the arbitrator who attends, the right to ask for a new arbitrator in such cases within twenty-four (24) hours after such failure by such named arbitrator; and in case of the failure of either party to comply with these provisions, such party so failing shall forfeit its case. In submitting matters to arbitration the differences between the parties hereto shall be submitted in writing.

Sec. 11. That any employe or member of said association by act or word interfering with or disturbing the proceedings between the properly accredited officers of the company and the association, upon any subject whatsoever, or interfering with or disturbing the service in any manner contrary to the spirit and condition of this agreement, shall, upon mutual satisfactory proof of the same, be dismissed from the service.

Sec. 12. That in cases where the association suspends a member who is, or

are, an employe or employes of the company for any violation of any properly established rule, said association shall request in writing (signed by its president and secretary) the suspension of such member or members by the company; the properly authorized officer of the company shall suspend said employe or employes at once, without pay, until such time as the association requests his or their reinstatement.

Sec. 13. That if any member of this association under this agreement, who may be suspended is found by investigation to be innocent of the offense or violation with which he is charged, he shall be reinstated in his former position and be paid for the total number of days which he loses on account of such suspension, at the number of hours per day for which his run calls on time schedule; but should he be an extra, he shall be paid an amount equal to the amount of wages paid to the extra who took his place during such suspension, but should he be last extra he shall receive equal to the pay of the man next ahead of him on the list.

Sec. 14. That a day's work for trainmen shall consist as nearly as possible of ten hours' work and be completed within twelve (12) consecutive hours (except where it is absolutely necessary for the accommodation of the company's patrons, men known as tripper-men may be kept out fourteen (14) hours, but no longer. That an accurate account shall be kept of the actual time served and trainmen shall be paid 20 cents per hour for the same.

Sec. 15. That the minimum number of hours which shall constitute a regular run shall be seven (7) hours, and any run of less than seven hours shall be considered an extra run.

Sec. 16. That a day's work for shopmen, shedmen, power house men and track men shall consist of ten (10) hours, and that all employes named in this section shall be paid time and a half for all overtime. Provided, further, that there shall be established a mutually satisfactory wage scale for above said men.

Sec. 17. That where regular trainmen report for work they shall be paid from 10 minutes after the time at which they are instructed to report; and when an extra man is assigned to work he shall be entitled to the same privilege as was the man whose place he has taken.

Sec. 18. That when a regular trainman shall fail to report at the time specified on the schedule he shall be placed at the bottom of the extra list for four (4) days, and when an extra man fails to report at the properly specified time he shall be placed at the bottom of the list for seven (7) days.

Sec. 19. That the company shall place in their several offices where men are required to report an open book in which men can register the particular day or days on which they wish to be excused from duty, and the men who register first for any particular day or days shall have first privilege, provided that members of the executive board and others having business to transact for the association shall be excused in preference to others, provided, further, that no man shall register in such book more than ten (10) days in advance of the day or days upon which he desires to be excused.

Sec. 20. That the conductors are required to clean only the inside of the cars, the platform and the end windows. The company shall clean the outside of the cars.

Sec. 21. That in order to prevent any friction or misunderstanding, all time tables that may be changed or instituted shall be submitted to the properly accredited officers of the association for their approval at least forty-eight (48) hours before going into effect; and shall be posted at the shed of the line for which they are made, twelve (12) hours before they go into effect.

Sec. 22. That extras shall not be required to remain on watch for a longer time in the morning than the time intervening between the reporting time of the first and last a. m. man; nor for a longer time at the time of dinner relief than the time intervening between the reporting time of the first and last p. m. man; provided, however, that on special occasions men shall report for duty at such time as the company may designate; provided, further, that men ordered to report for special duty shall receive pay from 10 minutes after the time at which they are ordered to report; but if not assigned to duty they shall receive half pay from 10 minutes after the time at which they are instructed to report until they are relieved. Provided, further, that regular men shall not be required to do special duty when extra men are available; neither shall regular men be required to make extra trips oftener than every seventh (7th) day.

Sec. 23. That all members of the association in the service of the company shall receive free transportation over all lines operated by said company; and any member abusing this free transportation privilege shall, upon satisfactory proof to the parties hereto, be dismissed from the company's service.

Sec. 24. That men off duty shall be entitled to the same privilege as other passengers while riding on the company's cars. Except that they shall never engage in conversation with an employe who is on duty.

Sec. 25. That any member who shall be elected to any office of this association which requires his absence from the company's service for not more than one year shall, upon his retirement from such office, again have his respective place in the company's employ.

Sec. 26. That this agreement and the provisions thereof shall be and continue in force from the day of its ratification by both parties hereto until such time as it may be altered by mutual consent of both parties through their duly accredited officers.

MR. WHITAKER'S LETTER.

St. Louis, May 7, 1900.

To the Board of Directors of the St. Louis Transit Co.

On May 4, Messrs. T. B. Edwards and others, who had theretofore been acting as a committee representing employes of the company, informed me that the agreement made with them and other employes on March 10, 1900, was abrogated by them, and they proposed that the transit company should make an agreement with the Amalgamated Association of Street Railway Employes of America covering the operation of the transit company's lines of railway in this city.

I urgently recommend that this proposed agreement, a copy of which is herewith submitted, be not made.

The amalgamated association does not own the property or any interest in it, and owes no duties with respect to it. It would be under no obligations to the owners or to the public. If it mismanaged the property, if its operation were inefficient, if passengers were injured as the result of its negligence, it

would be in no wise responsible. The proposed agreement would simply give it all the power of control and impose upon it no liability whatever.

It is provided in the paper submitted that no man shall be employed by the company unless he gets permission from the amalgamated association, for which he must pay the association \$1. This means that the association, which is under no duty or responsibility with respect to the property or the public, selects all employes, leaving the company, which is responsible for the conduct of the men when selected, without any voice in the matter. It also imposes a poll tax of \$1, which may, in the pleasure of the association, be increased, if the principle is once admitted, as a condition of a man's having leave to work.

It also requires that every employe who does not join this association shall be discharged from the service of the company. The same men who now make this demand insisted less than two months ago that all employes should be treated alike, without regard to membership in any organization. Believing them to be right at that time, their request was at once acceded to, and a written agreement was made carrying it into effect. That agreement has been faithfully kept by the company. Now, however, it is abrogated by those who proposed it.

It is clear injustice and oppression to put upon any employe any constraint or obligation which has no relation to the duties of his employment. If he does his work well, if he carries comfortably and safely the men, women and children committed to his care, he has a right to order his political, religious and social relations for himself. He may join any association he pleases, or he may refrain from joining; the company has no right to compel him to one course or the other.

It is further proposed that if the association suspends a member the company must suspend him as an employe. And as every employe is required to be a member of the association it follows that if he is expelled from the association he must be discharged by the company. In other words, the association would be vested with the absolute power of suspending or discharging any employe, however faithful and acceptable his service to the company, and this at the behest of an association which owes no duty to the company or to the public, and which might act from motives having no relation to the good of the service involved.

While the association thus demands the absolute power of suspending or discharging employes, it proposes that the company, which pays the men and is responsible for them, shall not suspend or discharge a man without the consent of the association, with the provision that if the company and the association disagree the matter shall be submitted to arbitration.

The company is made responsible by the law, and properly so, for the safe carriage of its passengers. When it fails in this duty through the negligence or incompetence of any employe, it is answerable in damages to the extent of the injury suffered. What is here involved is not a matter of privilege, but of duty. Matters of mere individual right or privilege, as they may be waived altogether, may be submitted to the decision of others. Matters of duty, as they cannot be waived, cannot be delegated. If the company believed an employe to be incompetent, it could not excuse itself to people who were injured by his neglect or inefficiency, on the ground that the association or a board of arbitrators had decided that he should be retained. The answer would be that the duty of selecting and retaining only careful and competent men was by the law imposed upon the company and upon it exclusively, and that it had no right to evade this duty in any manner whatsoever, or to devolve it upon anyone else.

The sum and effect of the proposed agreement is that the company shall have no voice in the selection or retention of its employes, and that the association may select for the company, and compel it to discharge or retain whomsoever it pleases. It is obvious that under such a system discipline would be impossible. Employed by the association and subject to discharge by it, and only by it, the prompting of self interest would tend to a partisan attachment to the association, rather than to faithful devotion to the duties of the service.

The evils of such a system have already manifested themselves as a consequence of the mere attempt to establish it. That attempt has incited to insubordination and to the impairment of proper discipline, and the service has distinctly suffered in consequence.

Upon the issue thus presented, there is no room for compromise of any kind. The company cannot relinquish the duties it was chartered to discharge. Its obligation to safely carry the three hundred thousand people daily committed to its care, is one of the most serious and important that can be undertaken by men. That obligation is imposed by the law, and by the law it is made single and undivided. It admits of no partition, and it cannot be delegated. And no man is fit to be vested with it who would shirk in any manner or in any degree the duties which it involves.

So long as the company undertakes the conduct of this great work, it must accept all the responsibilities incident to it, and as the proposed agreement involves an entire relinquishment of the powers necessary to the discharge of those responsibilities, I repeat my urgent recommendation that it be unqualifiedly declined.

Let us deal with our employes as such, and not otherwise; let us deal with them as men engaged in a useful, important and honorable calling, and give to them one and all the assurance that whoever has a grievance can in his own right obtain a fair hearing, and full and complete redress for every wrong. A showing of fitness must of itself be sufficient for getting into the service, and tenure of employment must depend upon nothing more than duty faithfully performed. In this way, and only in this way, will the best interests of the company, its employes and the public be promoted. Respectfully yours,

EDWARDS WHITAKER.

The directors failing to "recognize the union" as thus outlined, a strike was ordered and on the morning of May 8th the great majority of the men quit work. With the men who remained loyal about 20 cars were sent out; these were attacked by the strikers and as the police protection was inadequate they had to be withdrawn, making the tie-up complete. Three motormen were seriously injured by stones thrown at them; one striker and one "innocent-by-stander" were shot, the latter fatally.

No attempt was made to run cars on the 9th, excepting mail cars on three lines. No molestation was offered these cars, but one mail train was abandoned by its crew.

It is so difficult to use temperate language in characterizing the action of Mayor Ziegenhein in sending a letter to President Whitaker "urging the company to meet its employes half way and arbitrate their differences," that we content ourselves with recording the fact.

On April 29th a strike was inaugurated on the St. Louis & Suburban, but not enough men went out to cripple the service until after the strike on the St. Louis Transit system on May 8th. About 9 o'clock that morning the strikers gathered in force at De Hodiament station on the Suburban, boarding the cars and forcing the crews to quit work. By 10 o'clock the down-town service of the Suburban was practically stopped.

On the 9th the Suburban attempted to run cars under police protection, but was compelled to desist. The officers on one car fired on the crowd to repel an attack and one man was killed.

On the 10th and 11th cars were run on the Suburban and on several lines of the St. Louis Transit, under heavy police protection. Conflicts were frequent and a number of persons were injured.

A sympathetic strike attempted on the East St. Louis lines proved a failure, only a few men going out.

Governor Stephens on the 12th notified the police commissioners of the city that the lawlessness must be suppressed and said if the commissioners did not have adequate force he would call out the state troops.

As we go to press the situation has not greatly changed from what it was last week.

STRIKE AT KANSAS CITY.

Early on the morning of May 12th a strike was ordered on the Metropolitan Street Ry., of Kansas City, but only about one-third of the men went out. After some slight delays all the cars were running as usual. The company secured an injunction against interference with its cars.

WHISK BROOMS ON CARS.

All of the cars of the South Chicago Street Railway Co. have been fitted with small cabinets in which are carried whisk brooms for the convenience of passengers who are at liberty to step to the rear platform at any time and brush the dust from their garments. The innovation is fully appreciated by the patrons of the road.

A BREAK DOWN IN MILWAUKEE.

A newspaper dispatch states that on May 13th the entire system of the Milwaukee Electric Railway & Light Co. was tied up for 30 minutes by the burning out of the armature of the main generator at the new power house.

NEW LINES FOR CHICAGO.

Three new electric lines tapping the suburban territory northwest of Chicago are contemplated by an ordinance recently introduced into the Chicago council by the Chicago, Milwaukee & St. Paul Railway Co. The plans of the company include the building of 30.7 miles of track, including power stations and equipment at an expenditure of from \$2,000,000 to \$2,500,000. The lines will connect Evanston, Edgebrook and Bloomingdale with the business district of Chicago as junction will be made at the city limits with the Northwestern and Metropolitan Elevated roads and the Chicago Union Traction Co.

A new electric railway between Elizabeth and Plainfield, N. J., charges 20 cents for a single ride, as against 35 cents via a competing steam road. The distance is 12 miles.

Mr. F. W. Oakley, president, and Mr. Geo. H. Shaw, secretary of the Madison (Wis.) Electric Railway Co., were recent visitors at the "Review" office.

PERSONAL.

MR. J. G. WHITE, of New York, is making a business trip to Europe.

MR. J. M. ROACH has been chosen a director of the Chicago Union Traction Co.

MR. L. M. SHELDON holds the position of master mechanic of the Southern Ohio Traction Co.

MR. HENRY HINE on May 1st resigned his position as general manager of the Stanley Electric Co., of Pittsfield, Mass.

MR. FRED SEACORD, president of the Galesburg (Ill.) Electric Motor & Power Co., called at the "Review" office May 9th.

MR. H. A. BENEDICT, electrical engineer of the Hudson (N. Y.) Street Ry., has accepted a similar position with the United Traction Co., of Albany, N. Y.

MR. J. KAJUIRA, an expert electrician in the employ of the Japanese Government, is in this country inspecting telephone, telegraph and electric railway installations.

MR. P. McCULLOUGH, electrician of the Toronto (Ont.) Ry., will leave for Liverpool, Eng., shortly to assume a similar position with the Liverpool Corporation Tramway.

MR. J. F. PFETCH, who has had many years' experience in the management of electric railways, has joined the engineering staff of E. P. Roberts & Co., of Cleveland.

MR. J. Q. BROWN has resigned his office as superintendent of the San Antonio (Tex.) Street Ry., to accept the position of assistant manager of the Oakland (Cal.) Transit Co.

MR. A. A. HILTON, of the St. Louis Car Wheel Co., was a "Review" caller recently. Mr. Hilton reports that business is excellent and the prospects of the brightest.

MR. S. E. WHITTAKER, formerly of Chelsea, Mass., will succeed Mr. L. B. Wheildon as manager of the Portland (Me.) & Yarmouth Electric Ry., Mr. Wheildon having tendered his resignation last month.

MR. E. P. ROBERTS, of E. P. Roberts & Co., engineers of Cleveland, O., on March 27th gave a talk before the Civil Engineers' Club of Cleveland on the controlling factors in interurban electric railway design.

MR. C. F. STEIRLY, of Nashville, Tenn., has been appointed superintendent and chief engineer of power house for the Syracuse (N. Y.) Rapid Transit Co. This is the position resigned by Mr. J. G. McCormack.

MR. RALPH L. SHAINWALD, president of the Standard Paint Co., of New York, and Mr. Frank S. De Ronde, who represents the Standard company in several Eastern states, were "Review" callers last month.

MR. T. E. KENNEY, who has been the McKeesport division superintendent of the United Traction Co., of Pittsburg, for nearly two years, has been transferred to the Glenwood division. He is succeeded by Mr. John Daily.

MR. C. D. SHEPARD last month resigned as superintendent and purchasing agent of the Palmer ((Mass.) & Monson Street R. R. and has formed business relations with F. T. Ley & Co., contractors, of Springfield, Mass.

MR. NORMAN ROWE has resigned as electrical engineer of the Pacific Coast office of the Westinghouse Electric & Manufacturing Co., to become chief engineer of the San Il De Fonzo transmission plant in the City of Mexico.

MR. C. W. FOOTE, general manager of the Cincinnati & Miami Valley Traction Co., which was recently absorbed by the Southern Ohio Traction Co., leaves for Santa Barbara, Cal., where he becomes general manager of the Arrowhead Irrigation Co.

MR. J. R. CARRIER, formerly superintendent of transportation of the Syracuse (N. Y.) Rapid Transit Ry., has received an appointment to the same office with the Connecticut Lighting & Power Co., whose headquarters are at Waterbury, Conn.

MR THOMAS J. NEACY, general manager of the Filer & Stowell Co., Milwaukee, last month presented to St. John's Cathedral and St. Rose's Catholic Congregation the sum of \$1,000 each to be applied to the education of needy students preparing for the priesthood.

MR. JOSEPH SACHS, in a recent paper before the American Institute of Electrical Engineers, on "The evolution of safe and accurate fuse protective devices," discusses the best methods of protecting electrical machinery from excessive currents and describes the various types of enclosed safety fuses now on the market.

MR. HUGH J. MCGOWAN, general manager of the Indianapolis Street Railway Co., at a recent meeting was elected president, succeeding Mr. H. P. Wasson, and will hereafter perform the duties of both positions. Shortly after his election Mr. McGowan stated his company would spend at least a million dollars in reconstruction work this year.

A NUMBER OF CHANGES have been made in the personnel of the St. Louis Transit Co., in addition to those mentioned in the last issue of the "Review." Mr. Joseph S. Minary, superintendent of the Northern Division, and Mr. John I. Pearson, chief engineer, have tendered their resignations to take effect at once. Mr. F. S. Drake, master mechanic, left several weeks ago to take up new duties in the East. Mr. Thomas W. Murphy, claim agent, has also accepted another position.

MR. THOMAS P. EGAN, president of the J. A. Fay & Egan Co., the large wood-working machinery manufacturer of Cincinnati, was recently nominated for presidential elector from the second congressional district of Ohio. Mr. Egan is in no sense a politician, and his selection is therefore a tribute to his high standing in the community and amongst the large manufacturers of the country. Mr. Egan goes to Paris in June to visit the Exposition, where his firm is making a large exhibit, having been requested by the government to represent the United States there, and he will return in time for the election.

OBITUARY.

MR. JOHN LOVE, whose name is prominent in the list of early inventors of electrical apparatus, died last month. He was the patentee of the Love underground conduit system.

MR. A. S. HALLIDIE, the inventor of the cable street railway, died of heart disease at his home in San Francisco on April 25th. Mr. Hallidie was 73 years of age. During the winter of 1869 Mr. Hallidie conceived the idea of a system of traction for supplanting horses on the steep grades of San Francisco streets, and largely through personal friendship succeeded in getting three other men to join him in building a cable line. After a long struggle the line was built and a trip to hold the franchise was made down Clay St. shortly after midnight on the morning of Aug. 1, 1873; a month later regular operation was begun and the road was run by the builders until its sale to the Ferries & Cliff House Railway Co. in 1891. Other lines quickly followed the first one, and within 20 years over 700 miles of cable street railways were in operation in this country.

MR. SALVATOR POTIS was found dead in his room at the Technical Club, Chicago, on the afternoon of April 17th, he having committed suicide with a revolver. Mr. Potis was about 40 years of age, and a native of Caracas, Venezuela, from which country he was sent to the United States when a boy by his father, who was a general in one of the revolutionary armies. He graduated

from the University of Pennsylvania, came to Chicago 15 years ago, and entered the service of the West and North Chicago Street Railroads, where he was soon promoted to the office of chief engineer. In that position he constructed the largest plants of both roads, the Van Buren St. tunnel under the Chicago River, and the large station of the Union Loop elevated. About two years ago he returned to his native country, but a few months since came back to Chicago, taking charge of the work of the Illinois Telegraph & Telephone Co., which is tunneling the business streets with immense conduits. About three years ago Mr. Potis suffered repeated bereavements, losing by death within six months both his parents, his wife and one child. Ever since that time he has been subject to periods of intense melancholia, and it was undoubtedly during one of these that he took his life. He leaves one child, a son, nine years of age, who is living with relatives in Venezuela.

ELECTIONS.

THE BLUE RIDGE ELECTRIC RAILWAY CO., a new company at Hagerstown, Md., has officers as follows: President, B. F. Walty; secretary, Augustus Beck; treasurer, Peter Rouzer.

THE RED WING (MINN.) & TRENTON TRANSIT CO. has appointed the following officers: President, E. H. Blodgett; vice-president, Peter Nelson; secretary, L. C. Smith; treasurer, W. H. Putnam.

THE LOCKPORT (N. Y.) & OLCOTT ELECTRIC RAILWAY CO., at a meeting last month elected officers as follows: President, Henry J. Pierce, of Buffalo; vice-president, F. N. Trevor, of Lockport; secretary and treasurer, W. B. Rankine, of Niagara Falls, N. Y.

THE WEBSTER (MASS.) & DUDLEY ELECTRIC STREET RAILWAY CO., has made a number of changes in its management. The new list of officers is as follows: President, Lyman R. Eddy; vice-president, E. N. Bigelow; secretary, Charles Haggerty; treasurer and superintendent, John Flint.

THE CONSOLIDATED STREET RAILWAY CO., of Grand Rapids, Mich., has been reorganized as the Grand Rapids Railway Co. The officers are: President, Anton G. Hodenpyl; manager, G. Stuart Johnson; secretary, B. S. Hanchett; treasurer, Wm. H. Anderson; directors, L. J. Rindge, Wm. H. Anderson, Wm. Judson, John A. Covode, Thomas F. Carroll, J. Boyd Pantland and A. G. Hodenpyl. The directors are all local capitalists.

METROPOLITAN AND THIRD AVENUE, NEW YORK.

On April 11th the directors of the Metropolitan and of the Third Avenue arranged for a lease of the latter property to the former company for 999 years; the action was subject to the approval of the stockholders of the two companies. The Metropolitan is to guarantee the principal and interest on \$50,000,000 of bonds or so much thereof as may be necessary to fund the floating debt of the Third Avenue and complete the reconstruction work now in progress and other improvements, and all the liabilities of the subsidiary lines; then to pay during the first four years of the lease whatever the net earnings of the Third Avenue system were above the fixed charges and operating expenses; to pay during the next two years 5 per cent on the capital stock of \$16,000,000; to pay during the following four years 6 per cent; that brings it up to ten years; after ten years, and for the remainder of the lease, to pay 7 per cent on the stock.

Kuhn, Loeb & Co. agreed to take the \$35,000,000 of the bonds to be issued at this time, paying about par therefor.

On April 17th the meeting of the Third Avenue stockholders to ratify the proposition to issue the bonds was fixed for May 11th. On May 17th they will meet to vote on the lease. On May 17th also the Metropolitan stockholders will meet to approve the lease and to vote on a proposition to increase the capital stock of the company from \$45,000,000 to \$52,000,000. This \$7,000,000 increase in capital stock has been voted for by the Metropolitan directors. President Vreeland announced some time ago that an increase in

the company's capitalization would probably be necessary in view of various projected improvements.

Under the receivership the operation of the Third Avenue for March showed the following results: Total receipts of \$214,885, disbursements \$82,555, balance \$132,330, interest and taxes \$34,247, and surplus over charges \$98,083.

WHY SOME PARK ATTRACTIONS FAIL.

No matter how attractive a park may be in respect to its natural charms and beauties, after a certain time these are apt to fail as drawing cards in themselves, and must be augmented by new and varied inducements, or the park will soon cease to fulfill the purpose for which it was intended, i. e., the creation of additional traffic.

It is now generally conceded that one of the very best ways of sustaining the interest of the public in a resort of this nature, is by carefully selected and frequently changed vaudeville and light opera performances, held where possible in an open air theater. It is true that there have been cities where attractions of this kind have failed to attract, and money has been lost in the venture; but almost without exception, where such failure has occurred, it has been invited by relying upon inexperienced judgment in the selection of the amusements. A summer park audience is different from almost any other gathering that can be imagined, and usually includes people with all the varied religious, political and social ideas in the community, so that while bright, snappy performances must be furnished at all times, there must be nothing to offend any of the tastes represented. It must be remembered in addition that the larger part of the audience is accustomed to good entertainments at the regular city theaters and halls, and will not be content with mediocre or indifferent attractions, even if they are free. A street railway company can hardly fail of success, however, in its summer amusement investment, when its attractions are in the hands of a proper person, who has had experience in this line and knows how to detect what a community desires, and then is able to properly cater to that demand.

That success is sure when the conditions are properly fulfilled is proven by a few statistics that have been furnished us by a well-known park manager. He writes as follows: "The writer has in mind a city of 35,000 population where the manager of the park will affirm that with a properly selected amusement company on its rustic stage at a comparatively nominal cost, the street railway carried to the park in one week 45,000 paying passengers at 10 cents for the round trip, realizing \$4,500 on the investment. The writer also knows of a city of 30,000 population, where at the end of the season of 14 weeks, the treasurer of the street railway company made a statement that for this period it had averaged 30,000 fares weekly, at 10 cents for the round trip, making \$3,000, and that the reserved seats at 10 cents each had averaged \$300 weekly. This amount, \$3,300, was many times the sum paid for the attractions. These are but instances of many similar experiences and are not exceptional cases."

LARGE ELECTRICAL CATALOG.

The Western Electrical Supply Co., of St. Louis, Mo., this month brought out one of the largest and best arranged general electrical supply catalogs that has ever been issued. It is a book of 1,100 pages, and is divided into departments, a complete line of representative goods being illustrated in each division. It covers direct and alternating generators and motors, lighting supplies of every description, street railway supplies and house goods and telephone supplies.

This company's policy has always been a progressive one, and it is a firm believer in advertising in all forms, holding that "strict business integrity, fair treatment of customers and judicious advertising are a keystone to all business success."

A few of the firms for which the company acts as territorial agents are: John A. Roebing's Sons Co., Ohio Brass Co., Indiana Rubber & Insulated Wire Co., Adams-Bagnall Electric Co., Emerson Electric Manufacturing Co., Ansonia Electric Co., Warren Electric Manufacturing Co., Eddy Electric Manufacturing Co.

Wages of conductors and motormen of the West End Traction Co., of Pittsburg, have been increased from \$2 to \$2.25 per day.

HALF FARES.

A mail service has been authorized on the Cincinnati, Newport & Covington.

Wages of employes of the Richmond (Va.) Traction Co. have been increased 10 per cent.

The Cincinnati, Newport & Covington Street Railway Co. has put sprinkling cars on its lines.

Fifty new double truck open cars have been received by the Cleveland Electric Railway Co.

The power house of the Philadelphia, Morton & Swarthmore Electric Co. has been completed.

Rumor has it that the Chicago Union Traction Co. has offered \$325 a share for the control of Chicago City Ry.

Ira D. Ludington, of Rochester, N. Y., has the contract for building the Rochester & Sodus Bay Electric Ry.

Wages of the 125 men employed by the Duluth (Minn.) Street Railway Co. were increased 10 per cent on May 1st.

The Grand Rapids (Mich.) Ry. has issued a very pretty folder entitled, "Where and How to Go," to advertise its lines.

Employes of Salt Lake City (Utah) Street Railway Co. will hereafter receive 19 cents per hour instead of 18, as formerly.

A cut of 10 per cent in the wages of motormen of the Third Avenue Railroad Co., New York, was made last month.

The oldest street railway conductor in St. Louis is W. D. Hall; he is 80 years old and has been ringing up fares since 1872.

The new cars of the St. Louis Transit Co. have in addition to the lights in the ceiling a single lamp at every alternate seat.

During the winter several fare boxes have been stolen from the cars at Winnipeg, Can., where no conductors are employed.

Power will hereafter be supplied to the United Traction Co., of Albany, N. Y., from the plant at Mechanicsville on the Hudson River.

Earnings of the Chicago Union Traction Co. for April were \$600,952, an increase of \$14,864, or 2.53 per cent over the previous month.

It is reported that the Manhattan Elevated, New York, is considering putting in electrically driven movable stairways at its stations.

A prize of \$5 was offered for the most appropriate name for a new theater at St. Joseph, Mo., owned by the street railway company.

The Consolidated Traction Co., of Pittsburg, has decided not to permit advertisements to be pasted on the windows of its cars in the future.

Work was commenced April 18th, on the Kansas City, Topeka electric line, of which W. E. Winner, of Lawrence, Kan., is the promoter.

It has been stated a committee from the Montreal Common Council will visit New York to investigate the advantages of the conduit system.

An average daily increase of \$1,500 over last year is shown by the report of earnings of the Union Traction Co., of Philadelphia, for March, 1900.

The formal opening of the Elizabeth & Westfield Street Railway Co.'s through line from Plainfield, N. J., to Elizabeth, N. J., took place on April 26th.

The Supreme Court of Alabama in a recent decision upholds the ruling of a lower court that whites and negroes should occupy separate portions of street cars.

The Omaha (Neb.) Street Railway Co. is vigorously prosecuting the two men arrested last November charged with stopping a car and robbing the conductor.

The Wichita (Kan.) Railroad & Light Co. has issued \$300,000 of 5 per cent 20-year bonds. Of the proceeds, \$250,000 will be used for paying construction accounts.

A summer theater will be established at Rock Spring Park, near Alton, Ill., by W. M. Sauvage and J. F. Porter, president of the Alton Railway, Gas & Electric Co.

A handsome brochure describing and illustrating Orchard Beach, a pleasure resort near Manistee, Mich., has been published by Geo. W. Swigart, of 411 River St., Manistee.

A rainfall of 6 in. at Birmingham, Ala., recently, so crippled the lines of the Birmingham Railway & Electric Co. by washouts that travel had to be temporarily suspended.

The franchise granted the Alliance (O.) Sebring & Salem Electric Railway Co. became void on May 2d, as no work had been done upon the line within the specified time.

An ordinance has been passed by the Paducah (Ky.) common council, fixing a license tax on all cars in the city. This will be \$10 per year for motor cars and \$5 for trailers.

Representative Bell, of Colorado, has introduced a bill in the House at Washington limiting the number of passengers on cars in the District of Columbia to the seating capacity.

United Traction Co., of Pittsburg, reports for the month of March, 1900: Gross earnings, \$148,009; net earnings, \$82,814; interest, rentals, taxes, etc., \$59,099; surplus, \$23,714.

Motormen and conductors of the United Traction Co., of Pittsburg, on April 21st, received notice of an increase in pay to 21½ cents an hour. The men do not belong to a union.

The oldest street railway employe in point of service in the state of Massachusetts is said to be Francis A. Herring, of Somerville, who has been in the business for 37 consecutive years.

A through service from Pittsburg to McKeesport has been instituted by the Monongahela (Pa.) Street Railway Co., in competition with the through line of the United Traction Co.

The Atlanta (Ga.) Railway & Power Co. requires all its motormen and conductors to undergo a rigid physical examination which costs them 50 cents each. This rule went into force May 1st.

Capitalists owning the Pittsburg (Pa.) & West End Traction Co. have organized the Carnegie & Rosslyn Park Street Railway Co., to build a new feeder line to the Traction company's system.

A rate war is on between the Kansas City & Leavenworth Electric Ry. and a competing steam road. The former has cut the fare between Kansas City and Leavenworth from 90 cents to 75 cents.

The controversy between William Ziegler and the other security holders of the Lake Street Elevated, Chicago, pending in the courts since 1896 has been compromised; the details have not been made public.

The Lexington (Mass.) & Boston Street Railway Co. gave a banquet commemorative of the opening of its railway at the Town Hall in Lexington, on the afternoon of April 14th. Speeches were

made, mutual congratulations exchanged, and the occasion was thoroughly enjoyed by those who were fortunate enough to be present.

New cars have been received by the Canton-Massillon (O.) Electric Railway Co. to take the place of those recently destroyed by fire. The old service will now be resumed.

A perpetual injunction restraining the Erie (Pa.) Transit Co. from crossing the Nickel Plate tracks was issued on April 16th and will necessitate the Transit company securing some other route into Erie.

The St. Louis Transit Co. is said to have acquired control of the Exposition Building, Music Hall and the Coliseum, in the city of St. Louis, and will establish an elaborate winter and summer garden resort.

Alderman Patterson, of Chicago, proposes that the street railways shall haul garbage from the 35 delivery stations to the crematories or dumps, the garbage cars being hauled between midnight and 5 a. m.

The Winnebago Traction Co., of Oshkosh, Wis., has been incorporated with a capital stock of \$650,000 as a reorganization of the Oshkosh Traction Co., which is owned by Emerson McMillan of New York.

A new freight box car is being built by the Rochester (N. Y.) Railway Co. It will be run as a trailer and is 18 ft. long, 8 ft. wide, has one window in each end, and one in each side, and a sliding door in the center.

We are advised by Mr. Jas. A. Collins, secretary and assistant general manager of the Cincinnati Street Ry. that his company is considering the advisability of installing storage batteries at two or more of its generating stations.

A handsome terminal station will be built at Niagara Falls, opposite Reservation Park, for the Buffalo & Niagara Falls Electric Ry. The Niagara Falls line will be generally improved and several miles of new 85-lb. steel rails put down.

The trolley mail service at Hartford, Conn., has been discontinued temporarily because all the bids received by the postoffice for emptying the boxes on the cars were considered too high. In March last 74,000 letters were collected on the cars.

Extensive preparations are being made by the Brooklyn Rapid Transit Co. for handling the Coney Island crowds next season. Loops will be put in at the terminals and switches will be placed at various points to facilitate the movements of cars.

Contracts for the erection of three generating stations have been let by the Toledo (O.), Fremont & Sandusky Electric Railroad Co. The buildings will be of brick and with the electrical apparatus and machinery the proposed improvements will cost \$100,000.

Among the street railways that have recently increased the wages of their employes are: The Fox Electric Ry., Green Bay, Wis., an increase of from 1 to 3 cents per hour depending on past service. The Decatur (Ill.) Electric Street Ry., an increase of about 12 per cent.

The \$208,000 of 6 per cent North Chicago Street R. R. certificates of indebtedness, issued Jan. 1, 1891, but subject to call at par, have been called for payment. This makes \$413,000 of North and West Chicago debentures retired since the Union Traction Co. secured control.

A verdict for \$1,300 damages has been granted against the Milwaukee Electric Railway & Light Co., to a man who was thrown from a car by its sudden starting. The plaintiff testified he had a large bundle in his arms, which prevented him from catching the railing.

All employes of the Northampton (Mass.) Street Railway Co. who have outside work of any kind to do will hereafter have a working day of nine hours instead of ten. The pay remains the same. This action was voluntary on the part of the company.

The formal opening of the Georgetown (Mass.), Rowley & Ipswich Street Ry., the connecting link between Newburyport and Boston, occurred April 30th. President Barnes of the company was presented with a sterling silver loving cup by the business men of Newburyport.

Owing to a strike of teamsters and laborers the work of rebuilding the street railway lines at Decatur, Ill., was interrupted April 23d. Contractors offered the teamsters \$2.75 a day for 10 hours' work, but the latter demanded \$3.00 for nine hours. Laborers were paid \$1.35 a day for 10 hours, but wanted \$1.50.

Mr. W. S. Ruthell, superintendent of the Citizens' Railway Co., of Waco, Texas, writes us that the reports of damages to his line from the recent wind and rain storm in Texas were greatly exaggerated. He states that two culverts destroyed and a few hundred loads of gravel washed out were the only effects visible.

General Manager du Pont, of the Detroit street railway system, announces that during the coming season a storage battery plant will be erected in Detroit to help carry the heavy loads during busy hours. The company will expend \$150,000 in this improvement, but Mr. du Pont estimates that the saving in fuel will more than make it a paying investment.

The Brooklyn Heights Railroad Co. has sued the Brooklyn City Railroad Co. for \$2,000,000. The latter company in 1893 leased its property to the former for 999 years and the suit is believed to be instituted in a friendly spirit, because the Brooklyn Heights directors did not wish to assume the responsibility for carrying out a contract made by their predecessors.

In 1899 the exports of manufactures from the United States amounted to \$338,675,558, an increase of nearly \$48,000,000 over the preceding year. The manufactures constituted 28.13 per cent of the total exports, which is greater than for any year except 1865, when they amounted to 33.14 per cent; the value of exports of manufactures in 1865 was less than \$86,000,000.

For the first quarter of 1900 the Citizen's Street Railway Co., of Detroit, reports net earnings of \$173,735, as against \$132,205 for the first quarter of 1899; the Detroit Electric Railway Co. shows for the same period of 1900, net earnings of \$54,504, as against \$36,242; the Fort Wayne & Belle Isle Electric Railway Co. shows \$17,978, as against \$16,300. This is a gain in earnings of 30 per cent for the three roads together.

The Indianapolis Street Ry. was recently sued by a colored mind-reader, who alleged she received personal injuries through the negligence of the company. In a demurrer the defendant claimed that being a mind-reader, the plaintiff should have known of the intention of the trainmen to start the car, and showed contributory negligence. Besides this defense, however, the company had witnesses.

The U. S. Board of Engineers on Deep Waterways has been making new measurements of the flow of water in the Niagara River. Taking the mean level of Lake Erie at 572.78 ft. above sea level, the mean flow of the river is given as 221,500 cu. ft. per second. Should 10,000 cu. ft. per second be diverted from the discharge of the Niagara River by the Chicago drainage canal, the effect would be to lower Lake Erie by 0.4 ft.

Action has been brought against the Twin City Rapid Transit Co., of Minneapolis, by the county attorney to collect \$11,000 claimed to be due under the state statute on foreign corporations. The company holds that inasmuch as it simply acts as clearing agent for the Minneapolis Street Railway Co. and the St. Paul City Railway Co., both domestic corporations, it should not pay the foreign tax, even though it was chartered in New Jersey.

NEW PUBLICATIONS.

THE ANNUAL CATALOG of Purdue University for 1899-1900 contains a summary of the different courses and lectures, a description of the laboratories and apparatus, conditions of admission, degrees and other data on the University and its work.

"NOTES ON PARAGUAY" is the title of an interesting pamphlet that is being distributed by the Philadelphia Commercial Museums. It is edited by Enrique Plate, of Asuncion, Paraguay, and deals with the industrial and commercial advantages of that republic, which is rapidly taking a place among the leading countries of South America.

A DESCRIPTION of the natural beauties of Colorado has just been published by Mr. P. S. Eustis, general passenger agent of the Chicago, Burlington & Quincy R. R. To anyone interested in the grandeur of Western scenery and particularly to one contemplating a visit to the country described the book will be indispensable. Copies may be obtained by forwarding six cents in stamps to Mr. Eustis at his Chicago address, 209 Adams St.

"THE FOUR CORNERS," the official weekly organ of the Rochester Railway Co., of Rochester, N. Y., will be published during the summer season of 1900. Volume I ran from May to November, 1899, and Vol. II, No. 1, bearing date of May 4, 1900, reached us a few days ago. In his announcement the editor says: "The 'kickers' column' will be kept up to the standard. During the winter a big lot of awful cute kicks was collected. They will be tersely told without stings, as the editor of the Street Railway Review' would have them."

"PRACTICAL ELECTRICITY," published by the Cleveland Armature Works, Cleveland, O., will prove a valuable addition to the library of any student of electricity. Beginning with the fundamental principles of electrical science, the book takes the reader through the various branches to a point where the careful student can comprehend the complete designing, care and operation of a dynamo or motor. Special features are a list of review questions at the end of each chapter, and a dictionary defining 1,500 electrical words, terms and phrases. The price of the work is \$2 per copy.

"AMERICAN STREET RAILWAY INVESTMENTS," 1900 edition, has been published by the Street Railway Journal of New York, and seems to have been prepared with the same degree of accuracy as in former years. This edition of the "Red Book" contains 289 reading pages, including 29 maps of the principal street railway properties. It is issued about two months in advance of the date of issue in previous years, and includes a large amount of financial and statistical information not to be found elsewhere. Of the 1,252 reports of street railway companies, over 80 per cent have been examined and officially approved by the companies themselves.

A LECTURE on "Mechanical Ventilation and Heating by a Forced Circulation of Warm Air" was delivered at Sibley College, Cornell University, a short time ago, by Walter B. Snow, and is now reprinted in pamphlet form by the B. F. Sturtevant Co., of Boston, from whom copies can be secured on application. The author first presents data on the relative costs of heating and of ventilation for different rates of air change, and the proportional decrease in the necessary temperature of the admitted air, and increase in cost of ventilation, with the increase in volume at the intake. He then describes typical installations of heating and ventilating apparatus with the results secured in each case.

"WONDERLAND," the annual publication of scenery and pleasures to be found along the Northern Pacific Ry., is now being sent out by the general passenger agent, Mr. Chas. S. Fee, St. Paul. This annual has become each year more interesting and attractive, the aim being to present the territory occupied from a different standpoint each time. This year the strong features of "Wonderland" are the history of earliest exploration and settlement, and numerous illustrations contrasting the car and locomotive equipment of the first few years of operation with the splendid rolling stock of today. The covers are from strong designs

modelled in clay, and nearly every page bears a beautiful illustration. The book is a gem. A copy will be sent to any address on receipt of the postage—6 cents.

"COMPOUND ENGINES" is the title of a monograph recently issued by the Power Publishing Co., of New York. The pamphlet comprises 50 pages, 6 x 9 in., and is bound in flexible covers uniform with "Condensers" published by the same company. It is a series of three lectures by F. R. Low, reprinted from the columns of Power; the first deals with the principles governing the cylinder proportions of compound engines; the second is on combining indicator diagrams, and the third treats of receivers. The matter is plainly stated and by the use of concrete examples and diagrams it is endeavored to make the subject clear to every one. We regret to note that the author defines "power" as the "force exerted through space;" there is already quite enough confusion caused by the popular use of this term as synonymous with energy, without misusing it in a technical book. The price of the book is 50 cents.

"DYNAMOMETERS AND THE MEASUREMENT OF WORK," by J. J. Flather, professor of mechanical engineering at the University of Wisconsin, was originally published in 1892. The first edition comprised descriptions of the construction and principles of operation of the various forms of dynamometers used in measuring power, the work being used as the basis of a course of lectures to engineering students. A second edition has just been published and in it the author has added new chapters and greatly enlarged the scope with a view to making the book more useful for shopmen and engineers generally. Four of the new chapters deal with the measurement of electrical power. The measurement of the power of water motors is also fully discussed. In the chapter on the power required to drive machines there have been collated the results of all the reliable tests available; these data fill 50 pages and constitute a valuable reference for a man called upon to design a shop. The work comprises 403 pages with 141 illustrations; 12 mo, cloth binding. The publishers are John Wiley & Sons, of New York. London: Chapman & Hall, Ltd. Price, \$3.

CAUTIONS ON TRANSFER SLIPS.

Beginning with May 1st the Chicago Union Traction Co. has had the customary warnings to passengers, usually seen on placards inside the car, printed on the back of the transfer slips. The notice is in German as well as English, as may be seen from the reproduction shown herewith.

Passengers must not get on or off this car while it is in motion. Many accidents occur from people boarding and leaving the car in motion and facing in the wrong direction.

When leaving the car, step off facing in the direction the car was moving before it stopped.

Passagiere sollten nicht auf diese Car steigen oder von derselben absteigen, während sie im Gange ist.

Viele Unfälle kommen vor, wenn Leute beim Einsteigen oder Absteigen von einer im Gang befindlichen Car sich der falschen Richtung zuwenden.

Wenn man von der Car absteigt, sollte man sich der Richtung zuwenden, in welcher die Car fuhr, ehe sie anhält.

RAPID TRANSIT IN NEW YORK.

The mayor of New York on April 13th approved the bill extending the powers of the Rapid Transit Commission to all boroughs in the city; this bill also gives the commission control over avenue and tunnel franchises.

On April 17th three contracts for material and eight contracts for construction were awarded. The Carnegie Steel Co. will furnish 72,955 tons of structural steel, the Sicilian Asphalt Paving Co., 775,795 sq. yd. of asphalt waterproofing, and the United Building Material Co., of Philadelphia, will furnish the cement.

The construction contracts cover the sections from the Post Office to Great Jones St., from 104th St. to 181st St. (west side), and from 103d St. to 135th St. (east side).

The Galipolis (O.) & Point Pleasant Ry. suspended business on May 14th, and discharged all its employes. The road has not been making expenses.

STANDARDIZING OF STREET AND SUBURBAN CARS.

Editor "Review": Is there a necessity or need for such, or even an advantage in it to railroad companies, car builders or the public? Perhaps, before answering these questions, it should first be determined to what extent cars should be standard, and whose standard is to be adopted.

If by a standard car body is meant that the general dimensions, as to length, width, height and size of platforms, or, in other words, those features governing the general appearance of cars are to be alike, that is one thing, and hardly worth considering. But, if it is intended that the dimensions of sills, crossbars, posts, carlines, rafters, platform knees, sash, doors and all other detail are to be uniform, so that parts of cars from one maker will be interchangeable with similar parts from another, the problem at once becomes complicated, if not entirely impracticable of solution.

It might seem possible that a style of car could be agreed on, drawings and blue prints, covering all details, made and such sent to different manufacturers to work from, and cars interchangeable in all parts be the result, but the experience of the writer leads him to conclude it would not be so in practice, but, even though it was practical, would it be worth the cost? He doubts it.

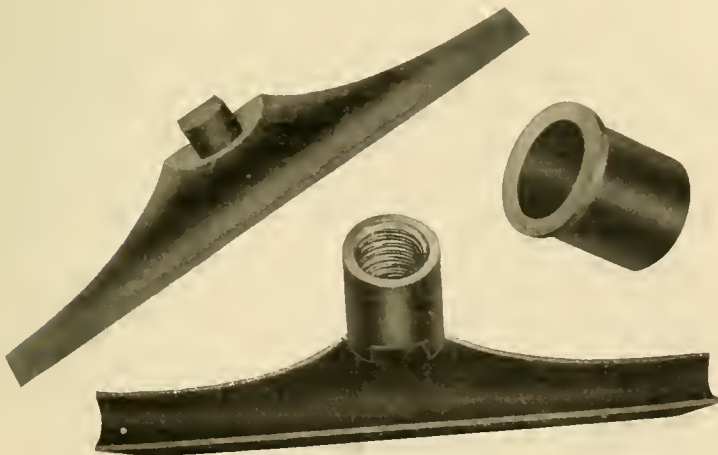
I am inclined to the belief that it is not feasible to secure standard cars, because:

1. They would be standard in name, but not in fact.
2. It would discourage improvements in design and durability.
3. It would stifle the spirit of enterprise in individual railroad managers and car builders.
4. It would be unsatisfactory and monotonous to passengers.
5. It would encourage procrastination on part of railroad managers and attendant evils.
6. It would entail loss on car builders and their customers.
7. Local conditions are not alike.
8. Conditions and requirements are constantly changing.
9. It would degrade the art of car building.
10. It is against the best interests of humanity, for it would tend towards the suppression of individualism, which should be exalted, if the highest development of the citizen and mankind is to be attained.

CAR BUILDER.

FAULKNER TROLLEY EAR.

The accompanying illustrations show a new type of trolley wire ear known as the Faulkner, recently placed on the market by the Ohio Electric Specialty Manufacturing Co., of Troy, O. The ear consists of three castings, of which back views are shown as well



REAR VIEW OF SEPARATE PARTS.

as a front view of the assembled whole. All of these parts are made of tough bronze metal and they are ground to gage so as to be interchangeable and insure a good fit on the trolley wire. The two lower portions almost completely surround the wire; when the two jaws A and D are in place the thimble or collar C is slipped over the shank and the bolt B screwed in pulling up the lower jaw, while the collar forces the upper jaw down and the wire is firmly clamped.

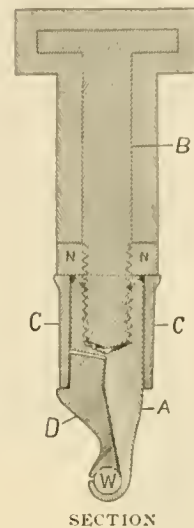
The Faulkner car is also designed for use with the "Type W" hangers as well as those having insulated bolts. The curved lip on the lower jaw is 1/16 in. thick, but at each end is ground down to an



FRONT VIEW OF HANGER COMPLETE.

edge so that it presents only a slight obstruction to the trolley wheel.

The special advantages claimed for this ear are that it can be quickly put on or taken off, the operation requiring only two minutes; no tools or soldering are required; the ear automatically detaches itself from the wire in case the hanger stud breaks, and thus prevents danger of injury through the wheel or pole striking; spare ears can be carried on the cars and put in place by the conductor or motorman; it rarely gets loose, but has a tendency to become tighter with use; it can be readily adjusted or moved along the wire and new line strung to great advantage; it is equally as well adapted for curves as for straight track; it can be used with all types of hangers having a stud projecting from the insulation; only one piece wears out and it can be replaced, the parts being interchangeable.



SECTION

The standard size is 6 in. long by 2 1/2 in. high, but longer ears are furnished on request; the parts are made to fit any size of wire or hanger stud.

CONSOLIDATIONS AT SEATTLE, WASH.

The Seattle Electric Co. has been organized at Seattle, Wash., and will operate the properties of the following companies: Seattle Traction Co., West Street & North End Electric Ry., Madison Street Cable Ry., Union Trunk Line, Consumers Electric Co., Seattle Steam Heat & Power Co., Third Street & Suburban Ry., Union Electric Co. and Burke Lighting Plant.

The new company has 20 miles of cable and 30 miles of electric railway. The property will be under the management of Stone & Webster, of Boston. The company will have \$1,250,000 of preferred stock, \$5,000,000 of common stock and an authorized bond issue of \$5,000,000, of which \$1,500,000 will be held in treasury.

The officers are: President, Jacob Furth; vice-president, H. B. Sawyer; treasurer, W. C. Forbes; secretary, George Donworth; assistant treasurer, Frank Dabney; assistant secretary, Eliot Wadsworth.

NOT NECESSARY TO "MOVE FORWARD."

The superior court at Milwaukee holds a passenger cannot be ejected from a car for refusing to obey an order of the conductor to move forward. The decision says that the man who stands up in the car, if he does not block the aisle, has as much right to his place as a passenger has to the seat he occupies, and the conductor has no more right to oblige a person to change position than he has to oblige one to give up his seat to another.

Two recommendations were made last month by the Railway Committee of the Ontario Provincial Parliament. One provides for the adoption of fenders on all cars and the other limits the passenger fare to be charged on electric railways to two cents a mile.

General offices of the Houghton (Mich.) County Street Railway Co. will be located at Hancock, Mich. All franchises have been secured and arrangements perfected for immediately commencing work.

STRIKE AT LITTLE ROCK.

On April 28th the Central Trades Council of Little Rock, Ark., sent a committee to Gen. Mgr. W. C. Badger, of the Little Rock Traction & Electric Co., and demanded the reinstatement of a half dozen men recently discharged, "better treatment of employes," and recognition of the union. The reply of the company was as follows: "It is indispensable that the company should at all times have and exercise the right to discharge any employe whenever, in its opinion, such course is necessary or prudent; and it cannot recognize the right of any person to dictate whom it shall take into its employ, or whom it shall discharge."

The men decided to strike and quit work on May 2d. May 5th Pres. Allen N. Johnson petitioned the Federal Court for the appointment of a receiver, and the court named him for the position, and issued an order restraining all persons from interfering in any manner with the operation of the cars.

IMPROVED UNDER FEED STOKER.

The Under-Feed Stoker Co. of America has been organized under the laws of New Jersey and will control the Jones under-feed stoker patents in this country, having general offices at 218 LaSalle St., Chicago.

The stoker consists of a steam cylinder or ram, with a hopper for receiving the coal, located outside the furnace proper, and a retort or fuel magazine inside the furnace into which the green fuel is forced by means of the ram; tuyere blocks for the admission of air are placed at either side of the retort and at the bottom of the



SECTION OF JONES' UNDER-FEED STOKER.

retort, where the fire never reaches, is an auxiliary ram or pusher for getting an even distribution of the coal. The coal is forced underneath the fire, each charge of fuel raising the preceding charge upward until it reaches the fire. The coal is coked before it reaches the fire and as the gases are liberated under the bed of coals and at the same time mixed with air, they necessarily pass through the fire and perfect combustion is secured. Air is supplied through the tuyere blocks by a blower. After the fire is thoroughly started



ELEVATION OF STOKER.

not more than two charges of the ram should be fed at one time, as otherwise green coal will be forced into the fire.

The claims made for this stoker are: Economy of fuel because of more perfect combustion; adapted to any kind of fuel; a smokeless stack; simplicity; easy control; durability; no mechanism exposed to the fire. Comparative tests made by reputable engineers show gains of from 16 to 23 per cent over hand firing.

The officers of the company are: President, George Gooderham; vice-presidents, Charles H. Smyth, Elias Rogers, Henry M. Pellatt; secretary, T. A. Rowan; managing director, Charles H. Smyth; manager, Fred A. Daley; chief engineer, James Miine.

CHANGES AT PITTSBURG.

In addition to the appointment of Mr. W. Kesley Schoepf to the position of general manager of the Consolidated Traction Co., of Pittsburg, as mentioned elsewhere in this issue, there have been a number of changes in the official staff of that company. Among these are the resignation of Mr. Jas. A. McDevitt, secretary of the corporation since its organization, the appointment of Mr. F. Uhlenhaut, jr., of New York, to the office of chief engineer, and the creation of a new office, that of comptroller, with Mr. Samuel E. Moore, formerly of Philadelphia, as the first incumbent. Mr. Uhlenhaut was at one time employed with the Thomson-Houston Co., and has been assistant engineer and also chief engineer of the Philadelphia Traction Co., assistant engineer of the Metropolitan Street Ry., of New York, and expert consulting engineer of the Telephone, Telegraph & Cable Co., of New York, which place he leaves to go to Pittsburg. Mr. Moore is an accountant of reputation, having for years held the position of secretary and auditor of the Carnegie Steel Co., and later auditor of the Philadelphia Co., a corporation controlling a number of gas, electric light and street railway properties.

PRICE OF STEEL RAILS.

Chicago quotations for new steel T rails range from \$35 to \$40 per ton; angle bars are quoted at 2 cents; spikes, \$2.40; bolts, \$3.30. Prices at Eastern mills about the same. Relaying steel rails are \$28 to \$30.

Andrew Carnegie, in an interview telegraphed from London on May 10th is quoted as saying: "I do not believe any serious reduction in prices will occur in the American iron and steel market. The world's demand shows signs of increasing rather than decreasing. The recent drop was merely a transition from fictitious to real values."

GAVE HER HER OWN WAY.

The division superintendent of a certain line in Cincinnati believes in taking a woman at her word. A conductor called him up and asked what to do with a female passenger who had forgotten to ask for a transfer, and after boarding the second car not only refused to pay again but demanded a transfer to a third line, saying she would ride all night unless she obtained it. The superintendent replied to let her ride. She spent the evening making the round trip from Cincinnati to Winton Place but when the car was run into the barn for the night she concluded to find more comfortable quarters.

LACKAWANA RAILROAD.

If one were asked after a dozen or more rides over the main line or branches of the Delaware, Lackawanna & Western R. R., what portion of the route presented the most attractive features, or how the service compared with that on other lines in New York or Pennsylvania, we fancy he would agree with us in saying that the section between Corning and Binghamton was the most to be admired, and that if a comparison were to be instituted no other road surpassed this in comfort, speed, convenience, attention of employes, or even in scenic features.

The advertising circulars sent out by this road call attention in glowing terms to the natural beauties of the rugged region about the Delaware Water Gap, and from there on to the coal regions about Scranton. These pen pictures are not overdrawn, for the scenery is indeed attractive and beautiful, but for a picture of quiet beauty and the mingling of nature with the handiwork of man, the route in either direction between the cities named must bear the palm. The rich fields with growing crops in great variety, including both grains and fruit, the different rivers and the fields backed by comfortable homes, surrounded by flowering lawns, with the grazing land on the hills still farther in the background please the eye and fill the traveler with a sense of beauty and even grandeur that can hardly be outdone by one's ideals of the realms of bliss that the preachers teach are the homes of the blessed beyond the river of time. By day or by night, in summer or in winter, there is a something about the scenery and service of this road that makes one desire to repeat the trip at every possible opportunity.

CHAS. J. MAYER,
President.

A. H. ENGLUND,
Sec'y & Treas.

THE MAYER & ENGLUND CO.

10 SOUTH TENTH STREET,
PHILADELPHIA, PA.

CABLE ADDRESS:
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A. B. C. Code, 4th Ed.

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Van Wagoner & Williams Hardware Co., Dropped Forged Copper Commutator Segments.	Cleveland, O.	W. T. C. Macallen Co., Standard Overhead Insulating Material.	Boston, Mass.
The Protected Rail Bond Co., "Protected" Flexible Rail Bonds.	Philadelphia.	Bradford Belting Co., "Monarch" Insulating Paint.	Cincinnati, O.
American Electric Heating Corporation, Electric Car Heaters of Every Design.	Boston, Mass.	Sterling Varnish Co., Sterling New Process Insulating Varnish.	Pittsburg, Pa.
Chisholm & Moore Manfg. Co., Moore's Chain Belts.	Cleveland, O.	Garton Daniels Electric Co., Garton Lightning Arresters.	Keokuk, Ia.
New York & Ohio Co., "Packard" Incandescent Lamps.	Warren, O.	D. & W. Fuse Co., Enclosed Non-Arching Fuses.	Providence, R. I.

Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

We carry the largest stock in this country of Strictly Electric Railway Material.
We are now occupying our entire building, five floors and basement.
Special Attention Given to Export Business.

Send for Catalogues.

ECHOES FROM THE TRADE

THE ATLAS RAILWAY SUPPLY CO., Chicago, has moved from the Monadnock Block to rooms 1523-1524 Manhattan Building.

MR. ROBT. L. McQUAT advises us that on April 25th the firm of Varney & McQuat was dissolved and he succeeded to the entire business.

McGILL, PORTER & BERG., 309 Dearborn St., Chicago, sent to all its friends at Easter a beautiful portrait in colors of a young woman's head.

THE WHITE MANUFACTURING CO., of Chicago, maker of gasoline appliances, has moved into new and larger quarters at 102-104 Michigan St.

WAGENHALS arc headlights are used on cars of the New Jersey & Hudson River Railway & Ferry Co., Undercliff, N. J., and are giving excellent satisfaction.

THE SIEGRIST LUBRICATOR CO., of St. Louis, Mo., is to equip all the plants of the Terminal Railroad Association of St. Louis with the Siegrist automatic oiling system.

THE B. F. STURTEVANT CO., of Boston, has brought out the third edition of its Bulletin "H," describing special types of fans with open and enclosed bi-polar and multi-polar motors.

THE PHOENIX IRON WORKS CO., of Meadville, Pa., has removed its Chicago office to Rooms 202-203-204 Western Union Building. Mr. Cary remains as the company's Chicago representative.

THE KEHIN ELECTRIC RAILWAY CO., of Kawasaki, Japan, placed the order for its trucks with J. G. Brill Co., Philadelphia, and for motors and controllers with the Westinghouse company.

AN ORDER TO SELL the real estate of A. Groetzinger & Sons, of Allegheny, Pa., bankrupts, having been applied for, a hearing in the matter will be held at St. Nicholas Building, Pittsburg, May 22, 1900, at 11 o'clock.

THE MOLONEY-BENNET BELTING CO., of Chicago, announces the removal of its offices to 34-36 South Canal St. This company's motto is "We Lead," usually printed under a picture of a little cupid leading a lion by the mane.

THE BURT MANUFACTURING CO., of Akron, O., furnished the oiling system for the newly opened electric plant of the Compania de Ferrocarrilas del Distrito Federal de Mexico, which owns the street railway lines of Mexico City.

THE LINK-BELT MACHINERY CO., of Chicago, writes that it has sold all the patents, stock and good will of that portion of its business known as the electrical mining machinery department to the Goodman Manufacturing Co., of Chicago.

A. L. IDE & SONS, of Springfield, Ill., have published a supplemental catalog giving data on their new "Ideal Special" engine. This model is the same as the well known "Ideal" with the exception that it has a flat balanced type of valve, driven direct from the eccentric rod, avoiding the use of slides, rocker arms or offsets. No additional stuffing-boxes are introduced, but by the

system of interior connection from valve-rod to valve, the valve seat is brought close to cylinder walls and clearances kept low.

HUNTER ILLUMINATED CAR SIGNS have been adopted for all the cars in Kansas City, Mo., and will be placed in position before the convention in October. These devices have also been ordered for all the open cars at Wichita, Kan.

MR. J. W. HARTY has been appointed western agent for the Detroit Steel & Spring Co., with offices at 1126 Monadnock Block, Chicago. Mr. Harty takes the position made vacant by the death of Mr. G. H. Quinn, which occurred last month.

THE STANDARD UNDERGROUND CABLE CO. announces the removal of its New York offices to more commodious quarters at No. 50 Liberty St. (corner Nassau), and at the new location will be glad to welcome its customers and friends.

THE BUCKEYE ENGINE CO., of Salem, O., through its Chicago agent, H. E. Troutman, recently sold the Illinois Steel Co., of Chicago, one 1,800-h. p., 30 and 60 by 48 in. direct connected cross compound engine for one of its large steel plants.

THE CHASE CONSTRUCTION CO., of Detroit, Mich., is drawing attention to some of its recent work by means of a tasteful wall poster 10 x 8 in. bearing miniature photographs of special features on several roads for which it was general contractor.

CHASE-SHAWMUT CO., of Boston, has a new catalog on its standard "Knock-out" junction and outlet boxes, for which one of the strong claims is that they can be instantly disconnected from the conduit by unscrewing the nipples from the inside of the box.

THE CRANE CO., Chicago, has closed a contract with the St. Louis Transit Co. for all the valves required in its new power plant at Vandeventer Ave.; the company has just completed the installation of the piping in the plant of the Cincinnati, Aurora & Lawrenceburg Electric Ry.

THE BETHLEHEM STEEL CO., of South Bethlehem, Pa., has taken an order for crank-shaft forgings to go to Australia, the purchase having been made through the New York office, by a representative of the Australian engineers who recently visited the United States on a tour of inspection.

H. C. GRAHAM, of 137 Grand Ave., Milwaukee, was on May 5th appointed receiver for the Milwaukee Railjoint & Welding Co. He announced that the company's property in his hands, consisting of three complete cast-welding outfits and a stock of steel and scrap iron, would be sold at public auction May 15th.

E. P. ROBERTS & CO., controlling engineers, of Cleveland, have changed their offices from the Osborn Building to the Electric Building on Prospect St. In a neat booklet recently issued they point out the advantages of employing competent engineers when building new lines, and describe some of the work they have done.

SHEAFF & JAASAD, 85 Water St., Boston, Mass., are building a number of street railway power plants. These include one at Lexington, Mass., for the Lexington & Boston Street Ry. Co.; one of 300 kw. capacity at Medway, O., for the Springfield, Dayton & Urbana Street Ry.; one at Portland, Me., and one at Exeter, N. H.

MR. W. T. VAN DORN, Monadnock Block, Chicago, recently returned from a business trip in the East. He reports trade in excellent condition, orders for couplings having been received last month from 15 different companies. The wide-spread demand for Van Dorn goods is shown by the fact that these orders came from various roads all the way from Chicago to Japan.

THE PITTSBURG REDUCTION CO. has changed its New York office from the Havemeyer Building to the Phelps-Dodge Building, corner Cliff and John Sts., where it will carry a small stock of standard sizes and grades of aluminum ingots, sheets and wire. Mr. Chas. W. Hall has left the employ of the company

and Mr. S. K. Colby, the Eastern sales agent, will assume charge of the New York local business.

THE J. G. BRILL CO., of Philadelphia, is sending out the seventh of its series of circulars relating to its truck No. 27, which it calls the "Perfect" passenger truck. The chief claim made for this type is that it is built with the characteristic properties of a three-legged stool, that is there is always an equal weight on each one of the supports, which in this case are the four wheels.

THE INTERNATIONAL CORRESPONDENCE SCHOOL at Scranton, Pa., has opened a new course known as "Railway Motor Engineering," which is intended for operators and those who wish to become operators of electrical machinery, as dynamos, motors, etc. It has been prepared by Eugene C. Parham, superintendent of the Nassau division of the Brooklyn Rapid Transit Co.

THE STAR BRASS WORKS, Kalamazoo, Mich., maker of the Kalamazoo trolley wheel, has appointed Mr. Geo. E. Pratt as its expert and general contracting agent, with headquarters at Philadelphia. The rapidly growing popularity of the Star company's product has made an eastern office a necessity, and with this and Mr. Pratt's wide acquaintance it will be in better position than ever to vigorously push its specialties.

MR. MAJOR, of the Major Cement Co., of New York, writes us that he considers the enviable reputation enjoyed by his cement to be due to the fact that in its making nothing but the very best materials are used. He states that one of the ingredients costs \$3.75 per lb., and another costs \$2.65 a gal., while a large share of the so-called cements and liquid glues on the market are nothing more than 16-cent glue, dissolved in water or citric acid.

HOHENADEL BROS., of 211-213 Madison St., Chicago, make uniform caps for the Chicago Union Traction Co., the Chicago City Railway Co., the Metropolitan Street Railway Co., of Kansas City, Mo., the Milwaukee Electric Railway & Light Co., the Twin City Rapid Transit Co., of Minneapolis, and several other street railway companies. The firm has recently published a new catalog describing its goods. This will be sent on application.

THE PAIGE IRON WORKS, of Chicago, has sent us its 1900 catalog describing the various types of switches, frogs, crossings, switch stands, rail braces, guard rails, track tools and special work which it makes. At the back of the book are a number of valuable tables. These include weights of flat rolled bars per lineal foot, weights of square and round bars, data for determining dimensions of frogs and turnouts, and a table of middle ordinates.

THE CREAGHEAD ENGINEERING CO., of Cincinnati, is making the second shipment of overhead material for the electrical works of the Boston & Maine R. R. at Portsmouth, N. H. The Creaghead flexible bracket system has also recently been ordered for the Spartansburg (S. C.) Railway, Gas & Electric Co., the Milford, Attleboro & Woonsocket Street Railway Co., and also for a line running from Northampton through East Hampton, Mass.

THE BERLIN IRON BRIDGE CO., of East Berlin, Conn., is erecting at Pittsburg, Pa., an additional manufacturing plant that will have a capacity of from 3,000 to 4,000 tons of completed material per month, and will be one of the best equipped establishments of its kind in the world. Electricity will be the motive power throughout. Over 20 Chisholm & Moore traveling cranes of various sizes and designs are among the labor saving devices that will be installed.

THE COMPRESSED AIR CO., with a capital of \$8,000,000, was incorporated in New York April 9th and will take over the property of the American Air Power Co., of New York, and the Compressed Air Motor Co., of Chicago. The new company will have \$750,000 of 7-per cent, non-cumulative preferred stock and \$7,250,000 of common. President Cooke states that the company has orders for 128 cars from the Metropolitan Street Ry., of New York, for use on the cross-town lines. The directors are: William L. Elkins and Thomas Dolan, of Philadelphia; G. E. P. Howard, Henry D. Cooke, Francis R. Foraker, William C. Duxbury, Charles



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C. B. FAIRCHILD, EASTERN REPRESENTATIVE.

CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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NO. 6

"The point of a comprehensive set of accounts to be kept so that the condition of business can at all times be understood is a great deal more important than we imagine until we go into it, and the more you get into it the more information you will get."—E. H. Jenkins, in discussing a paper before the Southwestern Gas, Electric & Street Railway Association.

The "Big Four" railroad is having considerable trouble from the competition of the many electric lines running between stations which it serves, but the management announces that no effort will be made to inaugurate a rate war. The general superintendent is quoted as saying, "We might put on trains every hour, make the electric line lose money and lose money ourselves, but when it is all over the electric lines will still be there." This is one of the distinguishing features of electric lines. They are always there.

A new kind of trouble for street railways has appeared, and it is a good deal larger than a man's hand; in fact it is about the size of a fat man. Brooklyn is responsible for the discovery of this strange type of damage claim. A woman in that city has secured a verdict for \$2,300, as a recompense for the great bodily discomfort occasioned by the unceremonious manner in which a certain fat man passenger sat down upon said plaintiff while both passengers were upon a street car.

If the higher courts sustain the award the fat man will become an object of suspicion, to be classed with the grab-handle man and other fiends.

Electricity has undoubtedly worked wonders in the last decade but it is not wise to claim too much as was inadvertently done by Sir W. H. Preece (according to the report of his address as pub-

lished in Engineering of London) in discussing the Relation between Engineering and Electricity." Sir William is quoted as follows: "The waste force of nature are thus within our grasp. The waterfalls of the Highlands may work the tramway of Glasgow; Niagara Falls already work those of Baltimore." The following issue of Engineering contained a letter asking for the publication of complete detail of the Niagara Fall-Baltimore installation. The American reader will at once recognize Baltimore as a slip of the pen for Buffalo.

On another page of this issue is a very interesting paper on station economies, read before the National Electric Light Association by Mr. W. L. Abbott, of the Chicago Edison Co. The sub-heads of this paper are "Oil and Waste," "Cylinder Lubrication," "Hours of Work" and "The Fuel Question" and under each of these the station engineer will find valuable pointers. Mr. Abbott has what might be called a "dispatching" system for assigning the boiler and engine room forces by means of which the number of men on duty is made to correspond almost exactly to the load curve of the station and the maximum economy secured. Stress is laid on the fact a fireman will burn fuel costing from 10 to 15 times as much as his wages, and therefore the importance of cutting down expenses by educating the fireman. The econometer diagrams very forcibly illustrate the value of station records of performance, especially those whereby the quality of the individual man's work can be examined.

In our last issue was published an extract from an address by Professor Rowe of the University of Pennsylvania, wherein he made the point that cities were not the proper political units to control street railways for the reason that the territory served by these transportation lines was even now in many instances far greater in extent than the municipality itself. In the future this condition will become even more marked. In England since the advent of electric traction a great many municipalities, and other local authorities, have embarked in the transportation business and even the comparatively short experience had up to the present shows that local jealousies existing between contiguous towns and boroughs has greatly hampered the legitimate development of the electric railway enterprises along lines that would make them of the greatest benefit to the patrons of the system. The municipalities appreciate the advantages of extending their tramway systems into adjoining towns and villages, what we would call the suburbs, but find that it is next to impossible to make arrangements with these other municipal boards for the joint operation of the lines.

It is interesting to note how the non-technical press of England is following the lead of our own daily papers in printing under scare head lines, exaggerated and distorted accounts of accidents due to the presence of electric tram cars in city streets—a practice, however, that is fortunately not so much the fashion in this country as it was a year or two ago, when the imagined "Juggernaut" qualities of the electric motor car furnished so much material for the enthusiastic but harebrained reporter. As one example of this pernicious habit a leading English newspaper after an accident in which a boy was injured by a motor car, published a long account of the mishap under the headline, "Child Electrocutted" when as a matter of fact from the paper's own account, it is evident that electricity had nothing to do with the accident, which undoubtedly would have occurred had horses been the motive power.

These misguided attempts to block the progress of electric traction will have no more lasting effect than did the effort to prevent the introduction into English cities of the overhead trolley, on the ground of its unsightliness, concerning which scarcely a word is now heard.

A writer in one of our electrical exchanges in discussing the proposed operation at the rate of 60 miles an hour on an interurban road now building is inclined to question the practicability of the plan in some respects. He admits the ability of the motors to drive cars at that speed, but fears there will be little left of the overhead construction after a few trips with the trolley jumping the wire. In our opinion his fears are not well grounded. We agree with him that a trolley off the wire at a mile a minute might work havoc, although devices are in successful service for preventing such catastrophes. With the overhead work in first class condition, as it would necessar-

ily have to be for operation at over 30 miles an hour, and with a smooth track there should be little trouble from this source. Indeed, the speed in question would in itself demand a roadbed of the first order, well graded, surfaced and ballasted. Our observation has been that soft track and inequalities of track surface have quite as much to do with trolleys jumping as any one thing. Curves have always been a favorite place for the trolley to jump, but electric cars would hardly try to enter any but very slight curves at 60 miles an hour, and indeed they have no occasion to do so, as the car is so readily controlled both in reducing speed and taking it up again that the loss of time at such points would be immaterial.

The prime requisite for high speed electric service is substantial and smooth track, and with this and the double trucks which are now built with a special view to fast and safe travel the mile a minute becomes less of an electrical and mechanical problem than was a speed of 25 miles an hour not so very many years ago.

The advertisement in a trade journal does a vast amount of good work, for which the paper in which it appears gets absolutely no credit whatever. In these days the busy manager in a hurry to get information or prices, seldom stops to include in his letter a few words which would have informed the party addressed where the inquiry originated. We have just experienced a case of this identical thing, which leads to these few lines on the subject. The writer was in need of some certain material and hunted up a trade paper devoted to the business in question. From advertisements he selected three names, all of which he saw for the first time, and opened correspondence. The result was an order for over five hundred dollars worth of material from one of these three. It was not for several days after the transaction had been closed and the goods delivered, that the purchaser happened to think he had not thought of telling the seller that the trade was due entirely to having seen his advertisement in a certain trade paper. If one directly interested in the actual work of publishing a trade paper forgets to mention the source of information which was directly responsible for placing an order with a certain party, it is no wonder that the average buyer should forget to give that credit which is so much appreciated by both the publisher and the advertiser.

Throughout Europe the urban transportation companies most generally charge a fare proportional to the length of the ride and the number of passengers is limited to the seating capacity of the car; in some instances a few passengers may be permitted to stand on the platforms, but the number of these is also strictly limited. The effect of these regulations and methods is first to greatly limit the ability of the companies to serve the public, and second to discourage territorial expansion of cities. The graduated fare is perhaps too thoroughly established in Europe to be readily altered for years to come though more and more stress is being laid on the effect of the American system of uniform fares which enables the workman to reach his home in the suburbs at no greater cost for transportation.

As regards standing room on street cars the practice abroad will probably be more easily and quickly changed. The *Tramway & Railway World* says editorially in a recent issue:

"The immoral and unsanitary condition of the slums are almost entirely due to the unnatural and unnecessary crowding of the population into insufficient space. America has found that this can be remedied by giving rapid transit at cheap rates into the suburban districts. This rapid movement of the working population is, however, obtained at the expense of some personal discomfort during the rush hours of morning and evening. From the moral and sanitary points of view the result is infinitely above the cost of obtaining it. * * * * If tramways are to meet the needs of the people as fully as they can do, it is essential that standing room in the cars should be made use of at certain hours of the day."

The announcement at the National Convention of Railroad Commissioners by Mr. Ashley W. Cole, chairman of the New York Railroad Commissioners, that on and after July 1st of the current year the street railways of New York would make their reports to the Commissioners in accordance with the "Standard System" of accounts adopted by Street Railway Accountants' Association is the second public—we may say official—recognition of the excellent work done by the Accountants' Association in the three years since its organization.

The importance of a uniform system of accounting for public service corporations was again forcibly presented in a paper by Mr. J. B. Cahoon, read before the National Electric Light Association at its meeting in Chicago last month. Mr. Cahoon, who is well-known in the street railway as well as the electric lighting field, having been general manager of the street railway, lighting, gas and water companies of Elmira, N. Y., for several years, took the position that the primary necessity for a uniform system of accounting lies in the fact that public service corporations must unite for self-defense against the advocates of municipal ownership. The claims made for municipal plants are improved service, more diffused use, and lower rates, and the greatest of these is lower rates. The managers and city officials reach their conclusions concerning lower rates only through self-deception due to improper accounting; the private company's strongest answer is to tell the truth. Without doubt the salvation of the private companies engaged in operating public utilities lies in convincing the voter that they can furnish a cheaper and better service. This cannot be done more effectively than by exhibiting the true cost of the service under private and under municipal operation. Comparisons imply uniformity of method, and hence the necessity of a standard system of accounts.

Thanks to the work of the Street Railway Accountants' Association the principal street railway companies of this country and the Railroad Commissioners of the various states are in accord as to the method in which the accounts should be kept.

The strike now in progress on the lines of the St. Louis Transit Co. is one of the most remarkable labor disputes of which we have any knowledge; there was no question as to hours of work, rate of wages, or the ordinary details over which friction often, unfortunately, arises between employer and employe. The issue in this case was clear cut: Should the company which is responsible in law for the diligence and competence of its servants, have jurisdiction over the selection and retention of its employes, or must the matter be left to an association of the employes which both individually and collectively are irresponsible? The demands of the men left no room for compromise, and the result is that for more than 30 days the city of St. Louis has been the scene of lawlessness. Bloodshed has been an almost daily occurrence and fatalities not infrequent.

The governor of Missouri spoke thus of the strike: "I am satisfied that the trouble along the street car lines and the whole spirit of anarchy which I find prevails so largely in the city of St. Louis at present is being fomented and extended by the machinations of a certain coterie of politicians, who hope by their course to in some manner make gains in the approaching primaries. This element is sending speakers to meetings held to express sympathy for the strikers all over the city, and if not counseling disorder, it is at least materially encouraging it." If this be the case, the intelligent foreigner need not marvel at some of the other things which the exigencies of politics force our leaders to do.

The management is maintaining a firm and resolute position. It is operating a considerable portion of the system during daylight hours, and has sufficient competent help to restore the usual full service. Nothing but lack of protection prevents this being done.

In the meantime business of all kinds suffers. No merchant could hope to conduct his business under the plan demanded by the strikers, hence the strike has little sympathy from this source. There has never, in our opinion, been so senseless and unjustifiable a street railway strike as this. The men have been well treated. They fail to offer in evidence cases of unjust treatment or discharge, and the very unreasonableness of their demands is sufficient to convince any level headed person of their unfitness to be allowed to do what they ask. As usual the former employes disclaim any part in the attacks upon persons and property; it is noticeable, however, they do not offer to assist the authorities in preserving order, and not a few have been apprehended in acts of violence. It is one of those cases where unprincipled leaders from other cities have worked the men up to a belief in evils which have no actual existence, and where the men otherwise would have taken no part in acts they are engaging in. When the trouble is all over and these same ex-employes have had time to quietly review the part they have taken, they will do so with regret and astonishment that they could have been so misguided.

Interurban Between Bucyrus and Galion, O.

A franchise for building an electric railway from Bucyrus, the county seat of Crawford County, in the northcentral part of Ohio, to Galion, O., was taken out five years ago, and some preliminary work was done, but owing to the stringency of the money market the scheme had to be postponed, and two years later the franchise was surrendered. In the autumn of 1898, however, the Ohio Central Traction Co., incorporated under the laws of Ohio, with \$225,000 capital stock, secured a franchise, and though there have been unavoidable delays, the enterprise has been carried to successful completion.

The active work of construction was commenced in May, 1899, but by reason of difficulty in securing iron and steel, the line was not fully completed until last August. From the opening of the road for traffic the patronage has been entirely satisfactory, giving

utes, though it can be made in much less time, as there are no grades and few curves.

Both the power house and the barns are located on the eastern end of the line. The buildings, which are of modern style and handsome appearance, are substantially constructed of brick and steel, and well adapted to their purposes. The power house is divided into boiler room and engine room, each 60 x 40 ft., giving plenty of space. A coal track runs to the rear of the furnaces, and beyond this there is a fine campus of two acres, with a bountiful supply of water. To provide against delay from possible breakdowns, boilers, engines and dynamos are in duplicate, each set having sufficient capacity to furnish all the power, and light which may be needed under ordinary conditions. Each boiler and engine is rated at 250 h. p. The boilers are the water tube type



POWER HOUSE AND CAR BARN OF THE OHIO CENTRAL TRACTION CO., GALION, O.

promise of a good, permanent investment, and the convenience to the people is thoroughly appreciated, for the trip between the two cities by steam road, although the distance is not great, formerly required transfer and delay with considerable annoyance.

The length of the road is a trifle less than 12 miles, but with side tracks it is somewhat more. As the system was built for permanent operation by its present owners, nothing but the latest and best material and equipment have been used. The roadbed is laid with 60-lb. T-rails; in the cities they are in 60-ft. lengths, and in the country in 30-ft. lengths. Crown bonds, made by the American Steel & Wire Co., were used. The rails are laid on oak ties, 2 ft. c. to c., and ballasted with gravel. All overhead work was furnished by Wm. Wharton, jr., & Co., of Philadelphia.

Four motor cars and four trailers made up the original equipment, but three more cars have been added. These are 36 ft. long mounted on Brill double trucks, and heated with Consolidated electric heaters. Cars leave every half hour from each terminal, the distance between the cities being covered in about 45 min-

made by the Turner Engineering Co., of Bucyrus, and are giving excellent satisfaction. The engines were made by the Slater Engine Co., of Warren, Mass. The dynamos and switchboard, which is of black marble, are from the General Electric Co., of Schenectady, N. Y. The line voltage is kept at about 600 volts at the power station.

The car barns are 35 x 150 ft., with pressed steel fronts, and contain three tracks, with room sufficient for a dozen or more cars. Provision is also made for a repair shop. In the power house building, though separate from the power room, is the general manager's office, consisting of two rooms, one for public business and one for private. Both are comfortable, and neatly, though not extravagantly furnished.

Midway between the two cities, each of which has 8,000 inhabitants, is located Seccaium Park, owned and operated by the company. In addition to being a gem of nature, it is rich in historic traditions; the location makes it one of the handsomest parks in Ohio. It has fine old trees for shade, has an unailing supply of excellent water, presents fine landscapes, and a general

topography of beauty. A commodious theater has been built, with pavilions, dining hall, waiting rooms, band stands, an artificial lake, bowling alleys, museum, etc., and in the short time that the



W. E. HAYCOX.

road has been in operation the park has been thronged day after day by picnic and pleasure parties. During the summer season theatrical entertainments are given every night, the park being on the regular amusement circuit with Columbus, Toledo and other cities. The attractions are changed weekly. Within the boundary of the park once stood the village of Seccaium, celebrated in legends as one of the famous places of Indian history, for it was here that the tribes of the North and South often met and exchanged their furs and wares, and held

their conclaves and pow-wows. On a prominent rise in the park stands a monument erected by the Historical Society, to commemorate and mark the battle ground where Colonel Crawford's men in 1782 fought their last battle with the Indians in Crawford's campaign against the Sandusky tribe. It was in this campaign that Colonel Crawford, after whom the county is named, was captured and burned at the stake.

The management of the railway company is well pleased with the success of the line, and has completed arrangements to extend the eastern end to Crestline and Shelby. Work on this extension

ELECTRIC POWER FOR MONTREAL.

The State Department is advised that it is the intention of the Shawinigan Water & Power Co., of Shawinigan, Quebec, to make available at Montreal by means of an 80-mile transmission line, the power which is being developed at Shawinigan Falls. The necessary works and line construction will be installed with the idea of ultimately transmitting 75,000 h. p. though but 30,000 h. p. will be utilized at present. If the plans are carried out Montreal will soon become the chief Canadian center for cheap power for manufacturing purposes.

NEW INTERURBAN IN MICHIGAN.

A company has been formed at Grand Rapids, Mich., under the name of the Grand Rapids Spring Lake & Grand Haven Rapid Transit Co., with \$500,000 capital stock, to connect the cities named in title by a high speed electric line which will cater to both freight and passenger traffic. A central power station located 12 miles west of Grand Rapids will deliver alternating current to the line at 10,000 volts, which will be reduced at sub-stations and the current converted for direct current motors. The directors are: Justin R. Whiting, St. Clair, Mich.; Geo. W. Carman, Marine City, Mich.; S. L. Merriam, Detroit; I. J. Cilley and E. C. Cilley, of Grand Rapids.

SPARROWS IN CAR HOUSES.

The large car houses of street railways, especially the buildings having truss roofs and high gables, offer particularly inviting quarters for English sparrows, and managers are greatly annoyed by these ubiquitous birds. A few years ago one of our correspondents recommended shooting into the building with fine bird shot whenever necessary and stated that a few shots would suffice to scare the birds away for a considerable time.

Mr. Thomas Farmer, mechanical engineer of the Detroit street



SCENES ALONG THE LINE OF THE OHIO CENTRAL TRACTION CO.

will begin within the next month or two, and it is expected the line will be in operation by September. The company also contemplates building another extension from Bucyrus to Upper Sandusky, a distance of 18 miles, passing through Nevada, and has secured the right of way in Indiana for a 16-mile line from Wabash to Peru, two growing cities of 12,000 inhabitants each. The cars of this line are all equipped with New Haven fare registers. The officers of the Ohio Central Traction Co. are: President, I. A. Kelsey, West Haven, Conn.; treasurer, Samuel Morehead, New Haven, Conn.; secretary, R. W. Johnston, Galion, O.; general manager, W. E. Haycox, Galion, O.; Messrs. Blakesly & Son of New Haven, Conn., were the contractors.

railways advises us that he recently drove the sparrows from one of the car houses of that system by turning an owl loose in the building. As soon as the owl had caught one or two sparrows the others took to flight. To keep the owl inside the windows should of course be covered with netting.

The United Traction Co., of Pittsburg, reports for the month of April, 1900, gross receipts, \$153,382; net receipts, \$79,293; fixed charges, including taxes, \$58,150; surplus, \$21,142.

A verdict for \$100 was last month given in a suit against the Superior Rapid Transit Railway Co., of West Superior, Wis., for ejecting a passenger who presented a transfer that had been incorrectly punched.

The Calumet road, Chicago, will expend \$33,500 in improvements

CONSOLIDATION IN PITTSBURG.

June 20th a meeting of the stockholders of the Consolidated Traction Co., of Pittsburg, will be held and a vote taken on a new proposition to lease the road to the Union Traction Co. for a term of 900 years. As mentioned in our issue for April, page 198, the majority of the stockholders voted in favor of a lease to the Union Traction Co., under which the preferred stock of the Consolidated would receive 7 per cent and the common stock 4 per cent. A suit was at once instituted in behalf of the minority holders of common stock and this action led to the new proposal in which the guaranteed dividend on preferred stock is cut to 6 per cent. The suit mentioned has been withdrawn and it is believed there will be no serious opposition to the new lease.

FINED FOR DEFECTIVE SERVICE.

The Montreal Street Ry. by its contract with the city agrees to furnish a 5-minute service on certain routes and the city magistrates evinced a disposition to exact a strict performance. Six actions brought against the company for neglecting to give the 5-minute service were decided last month. Two cases were dismissed on it being shown that the delays were caused by repairs in the streets undertaken by the city; in two cases where the causes of irregularity were accidents to the brakes or the motors, fines of \$8 were assessed; in the fifth action a fine of \$25 was imposed, and judgment suspended in the remaining case, as it was in fact for the same offence as the fifth one.

TRAMWAYS IN VALENCIA, SPAIN.

As an evidence of the progress being made in electrical matters in Spain, Horace Lee Washington, U. S. Consul at Valencia, makes the following statement to the Department:

"I have to report that the business of the General Tramway Co., of Valencia, embracing some 25 miles of rails, has been taken over by a French company, which is substituting electric power for the steam and horse traction hitherto employed.

"Electric cars are now running between Valencia and the port, a distance of 3 miles. The system employed is the overhead cable and trolley. The cars are of Spanish construction, and the electric machinery and rails are from Belgium.

"The dimensions of cars are 7 m. (nearly 23 ft.) long and 6½ ft. wide. The other lines, which the same company will shortly inaugurate, to connect Valencia with other places, are: Catarroja, 5 miles; Torrente, 4½ miles; Masamagrell, 7½ miles."

POSTAL SERVICE IN MINNEAPOLIS.

The Postoffice Department has been carefully investigating the conditions in Minneapolis and St. Paul preparatory to introducing a railway postoffice on the Twin City Rapid Transit lines. About the first move towards the service proposed will be the abandonment of the three sub-stations on the west side; in lieu of these about thirty drug store stations will be established, at which carriers will be located in groups of from three to six. The government will then place on all lines in the district covered by the new system, specially constructed cars to be used as mail cars exclusively. These will be run on schedule time and will collect and distribute mails to the sub-offices. The mail boxes will be retained as they are now, but carriers will make regular collections and turn their mail into receptacles on the car lines. The greater portion of the mail will therefore have to be handled at the central office in place of the sub-stations; this means that some carriers will be removed, but employment will be given them in other capacities.

Employes of the Spokane (Wash.) Street Railway Co. are prohibited by a rule of the company from smoking on a street car while in uniform, even when off duty.

About a dozen street car conductors at Akron, O., had their pockets picked one day last month by a gang of thieves. The cars were unusually crowded owing to the presence of a traveling show at the Fair Grounds.

JOHN M. ROACH HONORED.

On May 17th, Mr. John M. Roach was elected president of the Chicago Consolidated Traction Co., succeeding Mr. C. T. Yerkes, the change occurring as a result of the recent purchase by the Union company of the Consolidated Traction property, and on May 29th, Mr. Roach was made president of the Chicago Union Traction Co. to fill the vacancy caused by the resignation of Mr. Jesse Spalding. Mr. Roach will continue as general manager of the combined systems, comprising nearly 540 miles of track.



JOHN M. ROACH.

Mr. Spalding's retirement was made necessary through the demands on his time of his extensive private business and in his letter of resignation he urged in the strongest terms the selection of Mr. Roach as his successor. A portion of his letter is as follows:

"The organization of your company has been fully completed and I have become thoroughly satisfied that Mr. John M. Roach, your present general manager and one of your vice-presidents, is in every way fitted and competent to successfully operate your railroads. I feel the time for my retirement, as originally contemplated, has come.

"Upon suggesting this course to my friends it was requested that I remain in the office at least for the current year, but upon reflection I have concluded that my resignation should be tendered now, and that I should insist upon its acceptance. My principal reason for this conclusion is that I believe the interests of your company would be best served by the election in my stead of Mr. Roach, and that if now elected he would have the opportunity of demonstrating to the stockholders of your company before their next annual meeting his entire fitness for the position.

"In the next place, many questions affecting the interests of your company are arriving which cannot be disposed of before the annual meeting and which ought to be taken up and concluded by the same person as the head of your company. In view of these facts, and expressing to each and all of you, as members of the board of directors, my sincere thanks for the cordial, constant and united support I have always received at your hands, I hereby tender my resignation as president of your company and request your immediate action thereon, respectfully requesting and urging that Mr. Roach be elected by your board to fill the vacancy occasioned by my resignation."

The appointment of Mr. Roach to these high offices is a well deserved recognition of his services in the past and is proof of the confidence and esteem with which he is regarded by the stockholders and directors of the Union Traction Co., now in point of mileage the largest street railway property in the world.

The total gross earnings of all the Detroit street railways from January 1st to May 1st, were \$714,270, against \$589,056 during the same period last year.

The Street Railway System of Ithaca, N. Y.

BY H. S. COOPER, GENERAL MANAGER.

The street railway system of Ithaca is unique in several particulars. Lying almost entirely within the corporate limits of a city of 16,000 resident population, it has a 10 minute schedule all the year round on nearly 6 miles of track, often handles crowds of 5,000 to 7,000 people at a time, and has a record of 25,000 fares collected on its cars in one day. On its main line it overcomes an elevation of 400 ft. in a mile, and of over 450 ft. in less than a mile and a half; does this regularly winter and summer with crowded cars, using only standard size electric motors, and although it has been doing this since 1893-4, there has never been a fatal accident, nor one that could be called bad or costly. Its power house is situated at the bottom of a gorge 200 ft. deep, and over 200 ft. above the lowest part of its line.

When it is added that the company's relations with the municipality are, and always have been, of the most cordial nature, that its patrons are its best friends, that the public regards it and treats it as one of the best adjuncts of the city, that Cornell University, notwithstanding the known conservatism of such institutions in regard to their properties, has in a very liberal manner allowed the road to be run through its campus, that many of the employes of the company have been with it since its start in 1888, that no trouble has ever arisen between them and it, and that as a body they work wholly and faithfully for its interests, when all this is said, its claim for uniqueness is pretty fully proved.

Ithaca, the site of Cornell University, is built partly on the so-called "flats" at the head of Lake Cayuga and partly on the surrounding hills. The university is beautifully situated some 500 ft. above the lake on the brow of an abrupt hill, and up this hill, across it, around it and down it the street railway climbs. Starting from its level track in the business portion of the city, it strikes into 400 ft. of 8 per cent grade, then into 700 ft. of 10 per cent, then 400 ft. of 7 per cent, then 700 ft. of 9 per cent, then a curve of 130 degrees, 60 ft. radius and 10½ per cent grade, and then a continuous succession of grades, and curves on grades, until it reaches an elevation of over 450 ft. when it descends by another route, skirting steep hill-sides and crossing deep gorges; the route gives some of the most romantic views to be had from a trolley car anywhere, and especially within the corporate limits of a city. At one point the car runs on a side hill close to the edge of a gorge nearly 400 ft. deep, and at this point a lake view of twenty miles in one direction, and a valley view of ten miles in the other may be had, while the little "Forest City" nestles at the foot of the hill.

An addition to the line has just been completed by which it returns on itself, making a complete loop or belt line around through the best residential portion of the city, the University campus and a new and beautiful residence section, lying on the edge of the main gorge and commanding a magnificent view of the lake and the valley at its head. In addition to this, the company operates a spur, which rises still another 50 ft. to a station on one of the branches of the Lehigh Valley R. R. It also operates a branch about two miles long in the level valley, which reaches Percy Field, the athletic grounds of the University, and has as its terminus, Renwick Park, on the shore of the lake. This has been developed by the railway company, and is now one of the most complete and beautiful pleasure parks in the country. It has a large and elegant amusement pavilion, one of equal size for refreshments, covered waiting station, a high observation tower containing the water tank, a splendid artesian well of clear, cold, pure water, a band stand, a large steamboat dock, fifty private boat-houses, a public boat-house, bath-house, and the usual refreshment booths, swings, merry-go-rounds, etc. Owing to its proximity to the lake it is an ideally cool and refreshing spot, and having abundant shade, plenty of fine green swards and nice gravel drives and walks, it has become quite a popular resort, not only for the students and townspeople, but for excursionists from the surrounding country, and even distant cities. The Ithaca band, a musical organization having an almost national reputation, gives tri-weekly concerts in the park, and with vaudeville of clean character and in reasonable amount, with picture-machines, amusing specialties and its collection of animals, the park constitutes a daily attraction

that profitably increases the receipts of the company. The park is run clean in every respect, no liquor or beer is sold or allowed to be sold or drunk on the premises, and intoxicated or disorderly characters are not permitted to come or stay on the grounds. Everything is kept as clean and neat as possible, the writer having found through long experience that this course not only pays as an attraction, but that the public as a rule is prone to reciprocate; that if a place of public resort is kept in a slovenly and shiftless manner the public will resent it by a slovenly and shiftless behavior, but if it is kept comfortable, convenient and "spick and span," that the public will insensibly aid in maintaining it so.

No charge is made to patrons of the cars for entrance to the park or to any concerts or attractions, but during attractions or concerts a charge of 5 cents is made for every person entering the park otherwise than by the cars. No charge is made for entrance to the amusement pavilion but 5 cents each is charged for reserved seats during the performances.

The cars regularly used on the hill line are 18-ft. closed and 7-bench open cars driven by G. E. 800 motors with Form B 4-turn armatures, and W. P. 50 motors with Form D armatures wound for standard speed; the gear ratio is 14 to 67, the wheels are 30 in. in diameter. The ordinary hand brake with a single shoe to each wheel is used, but all the brake rigging is made extra heavy, and double brake-chains, made of tested chain, are used on both ends of every car. The Phelps form of brake mechanism is used, but so arranged that the heavy or unequal loading of the car does not materially alter the position of the brake shoes relative to the wheel, nor does the breaking of the chains or levers on one end of a car affect the efficiency of its use on the other end. These points of duplication of parts liable to break under stress, permanence of relation between shoe and wheel, and independence of braking on each end, have been found to be vital ones and close attention is paid to them. The brake shoes found most economical as regards both shoes and wheels, and all things considered most efficient in braking effect are made of a medium soft gray iron, have a large surface and cover the flange and entire width of the tread of the wheel. Care is taken in putting on new shoes that the surface is in full contact with the wearing surface of the wheel and a thorough nightly inspection is made of all shoes to see that they continue in this position and that the brake pressure is equalized as much as possible on all four wheels. In conjunction with the hand brake there was used at one time an emergency brake which, upon the tripping of a lever on the platform threw down a "skidding shoe" under both wheels at that end. The lower face of this shoe was filled with carborundum and when it was let down the wheel was supposed to run up on it forcing the carborundum face against the rail and making it act the same as a drag-shoe on a country wagon. The mechanism was, however, so complicated that it was impossible to keep it in order for a single trip in snowy or slushy weather. It was also absolutely useless on sharp curves or at very high speeds, was uncertain at all times and the carborundum filling was only good for one stop, so its use was discontinued this spring. A modified form of this same brake without the carborundum effect and with much simpler and more effective mechanism will be placed on the cars this summer.

Four sand boxes are used on each car and on days when the track is slippery all grades over 7 per cent are sanded by hand. This is done with a long-spouted watering pot, the spout made out of a straight piece of 1-in. heavy brass tubing made perfectly smooth inside. To the end of this spout is attached a small wheel of about 3 in. diameter and 1½ in. face, having a single flange on one side like a car wheel. This wheel is run on the rail and after a little practice the rail can be sanded as fast as a man can run, placing the sand quickly on top of the rail and regulating the quantity as desired by simply elevating the pot or lowering it. The very best of clean, sharp sand is used, as nearly pure silica as can be obtained, it having been found that a very little of such sand goes farther and gives better frictional results than a much larger quantity of ordinary sand containing loam or clay. The silica sand also keeps the rail clean while the common

sand makes it muddy and often causes the very trouble it is intended to obviate. The sand is thoroughly dried and well screened and kept so.

Where steam or hot air is available a very simple and automatic drying and screening arrangement may be used which requires but little labor or attention. The one in use here was made as follows: A heater coil was made with two pieces of 2-in. pipe as headers and the ends capped. Into the sides of these pieces holes were drilled and tapped for 1-in. pipe, right hand in one piece, left hand in the other, the holes spaced so that when the 1-in. pipe is screwed into both headers the result is a gridiron heater coil having 1-in. spaces between the pipes. The cap on one end of one header and the opposite end of the other is tapped for steam supply and exhaust connection and in the case of steam, a trap is placed in the exhaust. This coil is inclined at an angle and resting on it is placed a tray about 12-in. deep with the bottom of $\frac{1}{4}$ -in. wire netting; the netting rests on the 1-in. pipes. Under the coil is placed a screen of proper size for the sand used; this screen is sloped at the same angle as the pipe coil and under the screen is the receptacle for the cleaned and screened sand. In practice, the top tray is filled with the wet sand and as it dries, it falls through the meshes of the screen and between the pipes on to the screen below, where the fine sand falls through into the receptacle for it, while all stones, sticks, straws, etc., either remain on the screen or roll off into a box placed at the end to catch them. We have found no labor necessary except to fill up the top tray with the wet sand and occasionally shake the under screen. Such a drying apparatus, with pipe, coil and screens 2 x 4 ft. will cost less than \$15 complete, and will automatically dry and screen from one to one and one-half cubic yards of sand every 24 hours. The only nice point about it is to set the coil and screens at the right angle for the kind of sand used; this can be arranged only by actual experiment.

Every car is inspected on every trip before being allowed to go up the hill. A trained inspector is stationed at a point on the level near the foot of the hill, and is furnished with a box containing a few simple tools, such as hammer, wrenches, screw-driver, pliers and oil can; he also has a supply of such bolts, nuts, cotter pins, etc., as are found liable to be lost, broken or defective. He sounds the wheels, tests both brakes, examines all brake-chains and shoes and feels all bearings. This is done effectually inside of three minutes, the delay being allowed for in the schedule. Any car which is thought by him to be not safe to run up the hill and which has a defect that he cannot remedy is either run over a pit in the car house adjacent and the repair made or another car run out in its place. This inspection is not allowed to become perfunctory, but is made a bona fide inspection; no exigencies of traffic or schedule are permitted to interfere with it and the decision of this inspector as to the propriety of a car going up the hill is final. This inspection has proved of immense benefit from an operating standpoint as it has greatly lessened the number of small delays and break-downs in actual running; it has been the means of discovering defects that might have caused accidents; it has a strong moral effect on patrons of the road in that it enhances their feeling of safety; it tends to care and attention on the part of the operating employes, and, in the event of an accident, would be a strong point in favor of the company.

Notwithstanding the severity of the grades and the multiplicity of curves on them, the expense of actual repairs and renewals due to operating, will compare favorably with that of level roads, the mileage made by car wheels, gears and bearings is remarkably good and the absence of any abnormal number of flatted wheels, such as might be expected on a road of this character, especially during the winter season, is a feature of which the operatives feel proud. These points are due to a careful selection of the materials best adapted to the conditions, to careful employes trained to operate to the best advantage of the company and to a constant comparison, supervision and inspection of every detail of the system, no matter how small.

In an accompanying article by Mr. E. L. West, the technical details of our use of power are given and the curves show very plainly the conditions under which the road is operated.

An addition to the Cedar Ave. power station of the Cleveland Electric Ry. is under construction; the maximum capacity of the plant will be doubled.

CAR TESTS AT ITHACA, N. Y.

BY E. L. WEST.

A series of tests, extending from Oct. 14 to Nov. 12, 1899, were made on the line and cars of the Ithaca Street Railway Co. for the purpose of obtaining a general knowledge of the condition of the line and the behavior of the cars when in regular service. This road has such a variety of grades and combinations of curves and grades, that the motors are often put to the severest use, so it was of special interest to know the maximum stresses to which they were subjected as well as the average. The variety of conditions under which the feeder system was operated made it also a special subject for investigation.

Six cars were tested on several trips each, over the main line from the Lehigh Valley railroad station up the State St. hill to Cornell Heights, while they were running on schedule time and making stops for passengers.

Two cars were tested over the same portion of the road, while in regular service but running at different speeds, for the purpose of comparing the power required to propel the car at a moderate speed and that necessary to drive it as fast as possible up grade.

During the slow speed trials the controller was operated very carefully in starting, especially on the grade, and the car allowed to accelerate uniformly, the running position of the controller being such as to give maximum field strength to the motors. Then the cars were operated as is occasionally done when they are behind their schedule, every effort being made to gain time. The controllers were handled quite roughly, allowing often three times the normal current to be drawn upon starting. Cars Nos. 5 and 9 were selected for this comparative trial because they were of the same weight and construction, each being equipped with two 25-h. p. W. P.-50 motors, but the armatures in the motors of No. 5 were wound to give 25 per cent higher speed than those on No. 9. The second object of this comparison was to determine the difference in economy of the two when operated under the same conditions.

The cars tested over the main line were 16-ft. closed body cars, built by the Gilbert Manufacturing Co., of Troy, N. Y., and were mounted on Bemis trucks. Cars Nos. 5, 8 and 9 were equipped with two 25-h. p. W. P.-50 motors with G. E. K-2 controllers. No. 3 was driven by two 25-h. p. Wightman motors with Short controllers and car No. 19 had two 25-h. p. G. E. 800 motors and K-2 controllers. The motors were all single reduction geared and the total weight of each car was eight tons.

A few trials of a somewhat heavier car, No. 23, were made over a level portion of the road, known as the Renwick line, to determine the power required to haul trailers. Measurements were made of the electrical horse-power necessary to drive the car alone and when it hauled three trailers, first with them all loaded with passengers and second when they were empty. The results will be discussed presently.

In order to be out of the way of passengers the instruments were put in circuit and observations taken on the roofs of the cars. The electrical energy delivered to the car was measured by means of a recording wattmeter, especially constructed for this class of work, and by a voltmeter and an ammeter. Observations were taken as the trolley poles were passed and the readings recorded by separate observers.

A profile of the main line is shown in the graphical diagrams; the distances along the track are given at the bottom of the figure and the elevation in feet is indicated at the right. The road is nearly level for the first 3,000 ft. from the Lehigh Valley station and rises gradually for the next 3,000 ft. to the foot of State St. hill, which is quite long and steep. Its maximum grade, 11 per cent, occurs near the foot and is about 700 ft. in length, for the next 500 ft. it is a 6 per cent grade and then a 9 per cent grade and so on as indicated by the figures along the curve. The total length of the hill is nearly 7,000 ft. and the average grade 7.8 per cent.

The turnouts and curves have been shown diagrammatically at the bottom of Figs. 1 and 3, and the curvature in degrees and the radius of curvature in feet, indicated.

The road was divided into four sections and the line poles on the hill were numbered before the tests were commenced. Section No. 1 extended from the Lehigh Valley station to the foot of the hill, (see Fig. 1) sections Nos. 2 and 3 included the grade, No.

2 covering the steepest part of it and section No. 4 extended from the summit to the end of the line on the Heights.

RESULTS.

The average results of all the trials are shown in Table I for the separate sections of the road going from the Lehigh Valley station to the Heights, or from left to right as shown in the diagram, and are for cars operated in regular service.

On line 6 in the table is given the electrical horse-power as calculated from the volts and ampere readings and on line 7 is shown the electrical horse-power as calculated from the readings of the recording Thompson wattmeter, the latter having a value about 18 per cent lower than the former. This is no doubt due to the fact that the greatest amount of power is used on starting and the current increases more rapidly than it dies out. The inertia of the rotating parts of the wattmeter prevents it from recording as much power as is used, hence, all results have been computed on a basis of the ammeter and voltmeter readings.

TABLE I.
AVERAGE RESULTS—LEHIGH VALLEY STATION TO HEIGHTS.

	SECTION No.				Av. 1-4
	1	2	3	4	
1. Number of trials.....	7	10	7	7	8
2. Total time less stops, min. & secs.	7:49	6:30	3:43	6:31	24:33
3. Speed, miles per hour.....	8.9	7.3	9.5	11.6	9.3
4. Volts.....	399	427	451	461	435
5. Amperes.....	24	84	53	31	48
6. E. H. P., from amperes and volts.....	12.6	47.2	32.7	18.7	27.8
7. E. H. P., from wattmeter.....	11.6	44.1	24.9	19.7	22.8
8. KW. H., per car-mile.....	1.0	5.0	2.1	0.7	2.2
9. Number of stops.....	6	3	2	2	13

From the kilowatt-hours per car-mile it is seen that five times as much energy as was required to ascend the steepest portion of the grade, as was used on the level, and the speed on the hill decreased 18 per cent. The average for the entire route was 9.3 miles per hour and the average kilowatt-hours per car-mile 2.2.

Table II gives the average results of the trials of each car over section No. 2, the total distance being 4,000 ft., the maximum grade between line poles 11.6 per cent and the minimum 5.3 per cent, the average 7.8 per cent.

TABLE II.
AVERAGE RESULTS ON SECTION 2.

Car.	No. of Trials.	Speed, M.P.H.	Volts.	Amp.	H. P.	KW. H. per Car-Mile.	KW. H. per 10 Miles per Hour.	No. of Stops.	No. of Passengers.
5	2	8.0	447	78	47	3.79	4.74	2	10
9	2	7.2	447	76	49	4.51	6.26	3	17
8	2	6.4	440	74	39	4.90	7.65	2	18
19	1	7.0	340	103	54	7.88	8.40	2	15
3	1	5.4	449	83	43	7.23	13.40	2	25
Av.	8	6.8	419	80	46	5.26	8.09	2	17

The best figures for comparison in this table are the kilowatt-hours per car-mile, but as the cars ran at different average speeds the figures have been reduced to a basis of 10 miles per hour, by dividing 10 by the speed and multiplying by the kilowatt-hours per car-mile for each car.

By referring to the table it will be seen that car No. 5 required about 25 per cent of the power taken by No. 3 to ascend the grade, but allowance must be made for the lighter load of car No. 5, its passengers being only 6 per cent of the weight of the car, while in the case of No. 3 the weight of passengers amounted to 22 per cent. Car No. 5 was equipped with W. P. 50 motors having armatures wound for a higher speed than any of the others. Car 3 was driven by Wightman motors and the controllers were in very poor condition.

Cars Nos. 8 and 9 were similarly equipped and in fair working condition. Car No. 19 had G. E. 800 motors and its being longer and somewhat heavier than the others, accounts for its higher figures.

The results all show that No. 5 was the most economical under the conditions existing during the tests, but its motors were wound for too high a speed for the hill when the rails were wet or slippery, the wheels spinning around without driving the car, while the slower speed motors of the other cars seldom failed to drive them.

The increased loss by friction when the cars were ascending the grade has been calculated as follows:

The average power per car, at a speed of 10 miles per hour on the level was found to be 14.15 e. h. p. and on the 7.8 per cent grade 64.5 e. h. p. The horse power required to simply lift the car, while on the grade, is approximately equal to the weight of car in pounds times the per cent of grade times the speed in feet per second divided by 550, which in this case amounts to 38.6 lift horse-power and by deducting this from the total it leaves 25.9 e. h. p. to propel the car on the grade as compared with 14.15 e. h. p. necessary to drive it on the level. The difference, 11.75 e. h. p., is due mainly to the increased friction caused by the heavier stresses on the gears. Reducing this to a unit basis by dividing by the weight of car and per cent grade, we get 0.16 e. h. p. as the friction loss for each ton for each one per cent grade.

TESTS OF CARS RUN AT DIFFERENT SPEEDS.

Cars Nos. 5 and 9 were run at three different speeds, slow, regular service and high speed. The first trips were made in the morning when the cars were on their way to the Heights, and there being no cars to meet it was not necessary to make schedule time, so they were started very gradually each time and handled as carefully as possible. The second trips were made on schedule time and during the third, the cars were handled very roughly and every effort made to gain time; the time thus gained was lost by waiting on the turnouts.

In Table III are given the average results for the round trips between the Lehigh Valley station and the Heights.

TABLE III.

Speed.....	SLOW.		REGULAR.		FAST.	
	5	9	5	9	5	9
Car No.....						
Total time, less stops.....	46:33	55:39	42:15	52:14	30:10	43:52
Average speed, M. P. H.....	9.0	8.4	10.1	8.5	12.0	10.4
E. H. P. from Wattmeter.....	15.5	14.4	15.6	15.5	17.0	21.1
Total, KW. H.....	8.2	9.6	8.2	9.1	8.7	11.9
Total stops.....	17	21	18	22	25	32

The figures show that there was not much difference between the slow speed and schedule time. In the latter case the time was shortened by about four minutes, the horse-power slightly increased and the total kilowatt-hours remained nearly the same. For high speed as compared with slow speed, the total time was decreased about 35 per cent for car No. 5 and 22 per cent for car No. 9, while the total kilowatt-hours increased 6 per cent for car No. 5 and 19 per cent for No. 9.

In order to show plainly the difference between careful and rough manipulation of the controller, the data taken from car No. 9 have been plotted to a distance base in Fig. 1. The short vertical lines at the base of the diagram indicate the points at which readings were taken and the current, electrical horse-power and speed in miles per hour, for the trials at high and slow speeds were plotted, and the scale for each has been shown at the left. To distinguish between the two sets of curves those for the high speed trial are marked "X" at various points. By referring to the diagram it will be seen that there was a great difference in current and horse-power, especially on the hill, between moderate and forced speed.

Some comparative tests were made over the Renwick line which extends from the main line to Renwick Park, a distance of nearly two miles, and has practically no grades.

An open car (No. 8) equipped with two 25-h. p. W. P. 50 motors and weighing 8 tons, was run over the line while carrying a load of 40 passengers from State St. to Renwick, at a speed of 12 miles per hour, using an average of 11 h. p. On the return trip there were no passengers, the speed was 15 miles per hour and an average of 15 h. p. was used.

A closed car (No. 23) equipped with two 30-h. p. Westinghouse motors and weighing 10 tons was tested over this line while hauling three long trailers, carrying a total load of 258 passengers at a speed of 8.5 miles per hour. It used an average of 56.2 h. p. Then the trailers were pushed empty back over the same route at a speed of 12 miles per hour which required an average of 9.7 h. p. When the motor car alone was tested over the road in the same direction in which the three loaded trailers had been hauled, it consumed 19.7 h. p. at a speed of 15.4 miles per hour and when run in the opposite direction 9.9 h. p. were used at a speed of 14.2 miles per hour.

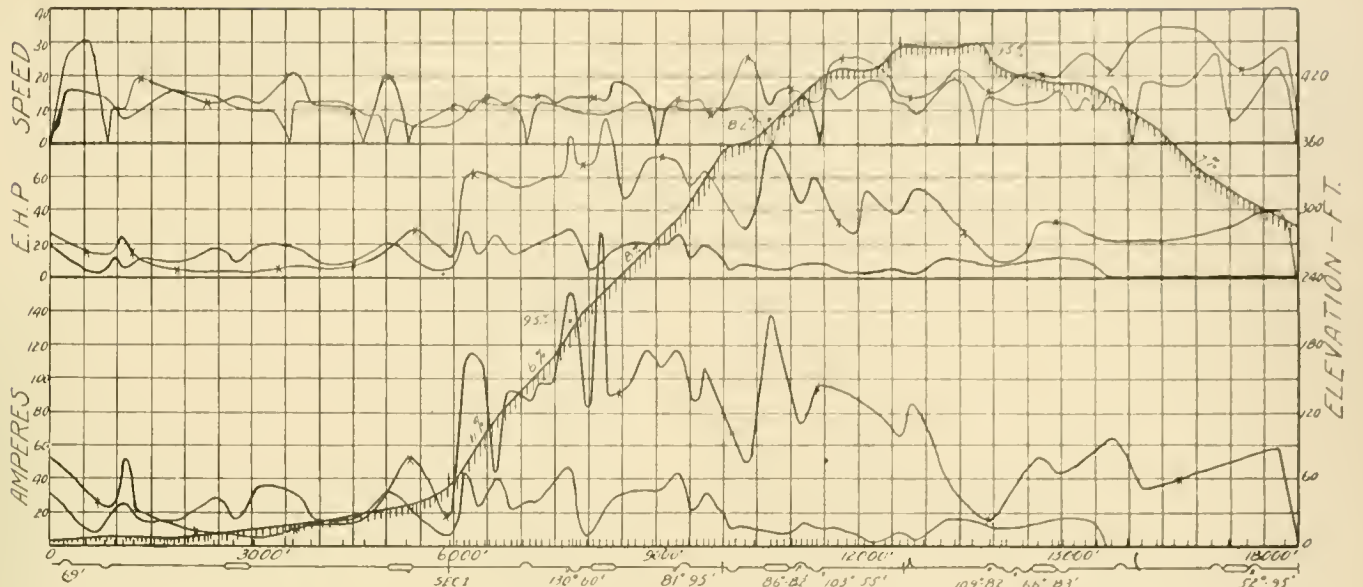


FIG. 1 RESULTS OF TESTS AT DIFFERENT SPEEDS.

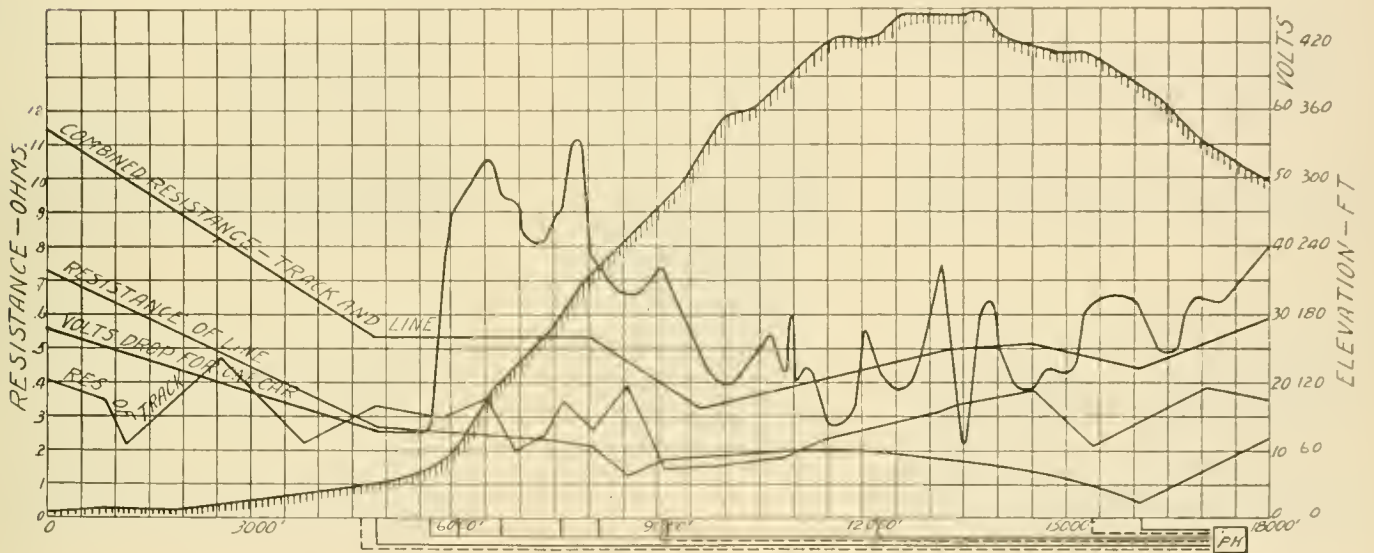


FIG. 2—RESULTS OF LINE TESTS.

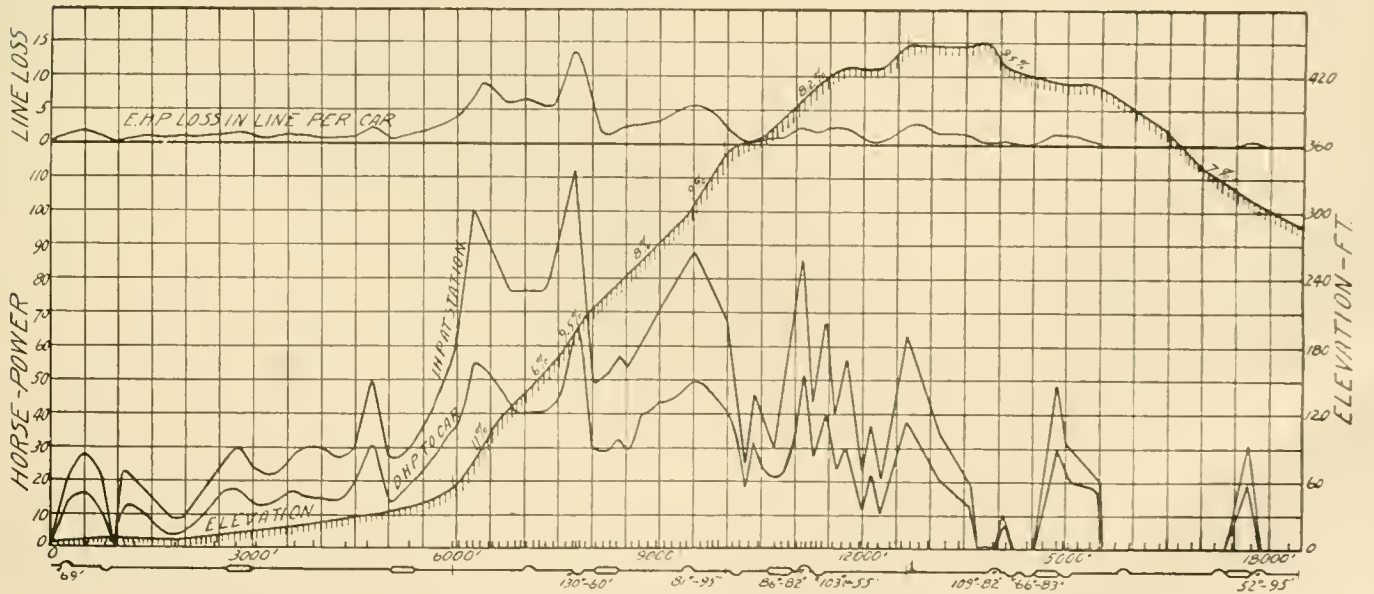


FIG. 3—I. H. P., D. H. P. AND LINE LOSS.

By reducing the kilowatt-hours per car-mile to a speed of 10 miles per hour the following figures were obtained and will serve as a fair basis for comparison. Car No. 23 drawing three loaded trailers required 3.28 kw. h. per car-mile and when run without load 0.94 kw. h. per car-mile. No. 8 when run empty over the same route used 0.70 kw. h. per car-mile. These figures show that 2.5 times as much power was required to draw the three trailers as was required to run the car alone and that No. 8 ran somewhat easier than No. 23, the figures being in the ratio of 7 to 9.

LINE TEST.

In order to obtain the resistance of the feeder system from different points to the station, two line tests were made during the night when there was none but the test car on the road. First the total resistance of track and trolley was measured and from the results of the second set of measurements, we were able to separate the resistance of the trolley from that of the track.

The tests were conducted in the following manner: A water rheostat was placed on the platform of the test car and connected through an ammeter, to the trolley pole and truck of the car. The car was then run from point to point on the road and all circuits between track and trolley opened except the one through the water rheostat. Before each set of observations a signal was given by making and breaking the circuit in such a manner that it would be plainly indicated by the ammeter at the station, then simultaneous readings were taken of the pressure and current at the car, and the voltage at the station.

The resistance of the trolley was separated from that of the track by opening the section insulators and drawing current from the station from one side of the insulator, at the same time measuring the pressure of the station from the other side. This gave the drop over that portion of the feeder system through which current was drawn. To obtain the trolley resistance at points between section insulators an arc circuit that was not in use was connected to the railway circuit at the station and used as a pressure wire.

The results are shown graphically in Fig. 2. The resistances of track, trolley and total resistance in ohms have each been plotted to a distance base for the entire route. The drop in pressure, calculated from the total resistance and current taken by one car,

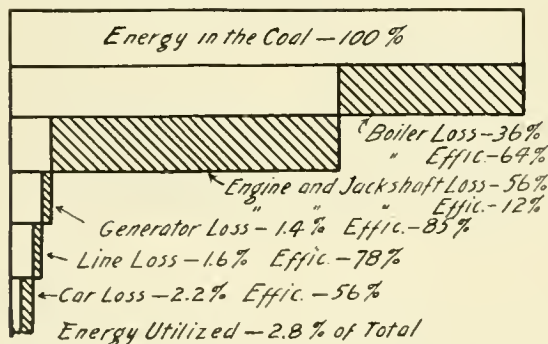


FIG. 4.

is shown and the scale of volts for the latter curve is given at the right.

The feeder system is shown diagrammatically at the base of the figure, the solid lines representing No. 00 B. & S. feeders and the broken lines No. 00 return wires. For the first 5,000 ft. from the Lehigh Valley station the trolley wire alone is used as a feeder and the same is true for the last 2,000 ft. on the Heights.

By combining the results of these tests with those of previous ones made on the cars and power house it was possible to trace the losses of energy from the coal pile to the car wheels.

In Fig. 3 is shown the loss of power in the line, as calculated from the resistance and current, for a car operating under normal conditions in regular service. By making use of the combined efficiencies of the line and generating machinery, curves have been plotted on the same diagram which show the relation between the indicated horse-power at the station and the electrical horse-power delivered to one car. Fig. 4 shows the distribution of energy for the entire system. The energy in the coal is taken as 100 per cent and the sectioned portions of the diagram represent the various losses. At the right of each sectioned block are given

the loss in per cent of the total energy and the efficiency of that part of the system. The energy utilized in propelling the car under average working conditions is 2.8 per cent of the total energy in the coal.

These tests were made under the direction of Prof. R. C. Carpenter, and General Manager Cooper, by Messrs. Gordon, R. B. Blakeslee, C. D. Gray, C. S. West and the writer, E. L. West, fellow in Sibley College.

ELECTRIC RAILWAY IN HAVANA.

Mr. William Doull, who is interested in the Cuban Electric Ry. syndicate having franchises in Havana, has recently returned from Cuba and has unbounded faith in the future of the island. In the course of an interview he said:

"The wonderful manner in which the country has recovered from the effects of the war shows that the possibilities of the country under a stable government are great. The Cuban Electric Ry., an enterprise in which Boston, New York and Montreal men are interested, was formally opened on April 20. The road owns the ferry between Havana and Regla. The latter has about 11,000 population, and is destined to be to Havana what Jersey City is to New York. From Regla the company has constructed an electric railway three miles to the city of Guanabacoa, which has a population of about 25,000.

"A large number of Havana people have residences at Guanabacoa, and the company is laying out a pleasure park there. This park will be electrically lighted, and will contain all possible attractions, the purpose being to make it a popular pleasure resort for the evenings.

"Midway between Regla and Guanabacoa baseball grounds and a cinder path are under construction. This will be the first well equipped athletic ground in Cuba."

MR. VREELAND ON MUNICIPAL OWNERSHIP.

A man may ride eight miles in Glasgow for 2 pence; here he may ride for the same price 50 miles by means of our system of transfers. In Glasgow there are no transfers; here last year we gave away 148,000,000 of them. Therefore, when a man changes cars in Glasgow he pays a new fare, and travel there is quite likely to be dearer than here. It is true that one may ride half a mile for a half penny, but I don't see that that is any advantage, for if one only wants to go half a mile it is healthier to walk—and in Glasgow quicker.

There is small trackage in Glasgow, only a few miles on the most densely crowded streets. They know nothing there of that enterprise which is so familiar among railroad men here, and which causes them to push their lines out into new districts to build them up, operating those lines for years at a loss to themselves and building up sections of the city where there were formerly no houses—thus benefiting the home seeker and the city as well, giving the former cheaper rents and the latter a new area for taxation.

There is another point about this Glasgow comparison which must be taken into consideration if we would be fully cognizant of our own advantages—that is the relative value of money here and there. The purchasing power of 2 pence is more in Glasgow than that of 5 cents in New York, and yet 5 cents will carry one 50 miles here and only eight miles in Glasgow. Wages paid to the employes of the Glasgow road are only two-thirds of what we pay. In England, where they have had much experience with municipal ownership, there is now a decided reaction.

It is the increase of local indebtedness and taxation since the inauguration of municipal trading that has caused the alarm and dissatisfaction now noted in Great Britain. Between 1878 and 1897 the local debt of England and Wales more than doubled, and now represents the enormous sum of \$1,260,000,000, over half of which represents various trading plants, which may or may not be worth the original capital invested therein.

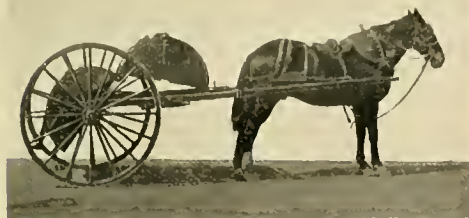
To return to matters nearer home, I notice that last month Mayor Hart, of Boston, discontinued several municipal undertakings, particularly the electrical construction division and the repair division, for the reason, as he states, that in his opinion, "it is cheaper for Boston to buy repairs and electrical construction in the open market than in the offices the members of which owe their appointments to politics."—H. H. Vreeland, in the Independent.

COMBINED CONCRETE MIXER AND TRANSPORTER.

The accompanying illustrations show a concrete mixer that has been in successful use since last summer on street railway construction work in Washington, D. C. From 6 to 15 of the machines have been in use making so far more than 20,000 cu. yd. of concrete.

The mixer is known locally as the "Dromedary." It consists of a one-horse two-wheeled vehicle having a split drum or cylinder mounted to turn on the axle and provided with a pawl and ratchet device so that when in gear the drum is rotated in the same direction as the wheel and at the same speed. The wheels are mounted loose on the axle arms so that they can revolve independently in turning from a straight course. The drum is made of oak which has been treated with "Woodiline" and certain pieces of the lagging are made of steel channels filled with oak, to strengthen the drum. For loading a hinged trap door is provided; this is shown open in Fig. 1, in which position brackets on the door rest on a tail bar and the drum is steadied in the position shown. As the drum is automatically thrown out of gear when the loading door is open the mixer can be moved about at will while loading.

On the way to the dumping place the drum revolves with the wheels and a very moderate haul suffices for mixing the cement



2—Loaded
3—Dumping.

THE "DROMEDARY" CONCRETE MIXER
1—Ready to Load.

4—Dumped.
5—Closing.

thoroughly. In the operation of mixing the charge is not pitched about but the materials are simply carried up a little way by the climbing side of the cylinder to curl over and slide down in thin sheets toward the front, with the effect that the stones appear to have been rubbed into a perfectly mixed mortar. Each load is about 1/2 cu. yd. On reaching the dumping place the driver moves a small lever that can be operated from either side and an unlatching bar thereby released dumps the mixer as shown in Figs. 3 and 4. In the process of dumping, the drum is automatically thrown out of gear at the very end of the movement so that the mixer delivers the load and moves on out of the way without stopping. It should be noted that the dumping is not done through the trap door but that the cylinder splits open, the door remaining closed as in Fig. 3. After dumping the drum is easily closed by a pull backwards on cleats or grab-handles conveniently located as seen in Fig. 5. In closing, the drum automatically locks itself out of gear.

The mixer is adapted for mixing concrete for conduit railways, duct lines, curb and pole setting, paving base, and especially where a thin ribbon of concrete is required with much incidental moving about. Its use dispenses with mixing platforms, wheel barrows, planks, and many of the accessories commonly employed and saves the labor of hand mixing. The device is the invention of I. H. Fisher, of Washington, and is being used on the contract work of E. Saxton, in that city.

EFFICIENCY OF A RAILWAY POWER SYSTEM.

Mr. Edward P. Burch, of Minneapolis, formerly electrical engineer for the Twin City Rapid Transit Co., in a paper recently read before the North West Railway Club on the "Utilization of Water Power for the Electric Railway System of Minneapolis and St. Paul," gave the following data concerning the efficiency of the power system. (This installation was described at length in the "Review" for February, 1899.)

Efficiency of	Maximum.	Ordinary.
Falls (5 per cent loss due to friction in booms, racks, eddies in water, etc.)	.95	.95
Turbines	.80	.78
Generators	.95	.94
Station	.92	.90
Conversion to direct current	.94	.91
Local distribution	.92	.90
Railway motors	.80	.70
Total (exclusive of loss in falls)	.48	.43

Of 10,000 h. p. developed by the turbines the motors could not receive over 6,000 h. p. at highest efficiency, and about 5,400 h. p. ordinarily.

NO PASSES, NO POLICEMAN.

Because the Consolidated Traction Co., of Pittsburg, has cut off a number of city employes' passes, the Department of Public Safety, it is alleged, has notified the various traction companies entering Pittsburg, that hereafter no policemen will be supplied at street crossings to regulate the vehicular traffic and in other ways facilitate the movement of cars. President Magee, of the Consolidated company, has issued a statement declaring that police officers heretofore stationed at crossings were not located there as a matter of favor to the traction company, as they are to be found in the congested districts of nearly every city in the civilized world, for the protection of the traveling public. He adds that his company has issued no free transportation, nor does its management intend to issue any such transportation to secure any favor from any public officials which would reduce in the slightest degree the operating expenses of the company.

Mr. William B. Parsons in Scribner's Magazine states the total number of paying passengers carried on all the surface and elevated railroads in New York City in 1871 was 138,867,000; in 1882, 252,800,000; in 1892, 453,200,000; in 1899, 528,228,437. The total number of passengers carried on all steam roads in the United States for 1898 was 501,066,681, or 5 per cent less than were carried in New York City alone.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

OPERATING ECONOMIES IN CENTRAL STATION PRACTICE.

Read before the National Electric Light Association by W. L. Abbott, chief operating engineer of the Chicago Edison Co.

In every central station there grows up a characteristic system of practices, good, bad or indifferent, due partially to peculiar environments and partially to the ability of the operating force. Through natural selection the best of these practices are gradually crystallized and become the unwritten code of rules for the direction of the internal affairs of the station.

Some of these practices, while the very best for that station in which they originate, may prove very unsatisfactory when transplanted into other stations, yet it is largely due to the cordiality with which central-station managers impart to, and adopt on trial from, each other new methods, that the present rapid improvements in operating details are being made.

It is in the hope that some of the methods hereinafter outlined may be new and feasible in other places that these suggestions are offered.

OIL AND WASTE.

The saving and renovating of waste and oil is an ever-present and variously handled question in all stations. Some simply use the waste until it is oil-soaked and then burn it under the boilers; others go to the other extreme and use wiping towels, which are carefully saved, washed and used over again. We favor a middle course, using a good quality of waste, first on the finer parts of the machinery, and then for coarser work, after which it is put through a washer consisting of a train of rolls, over which hot water is running. This extracts nearly all of the oil and much of the dirt. The

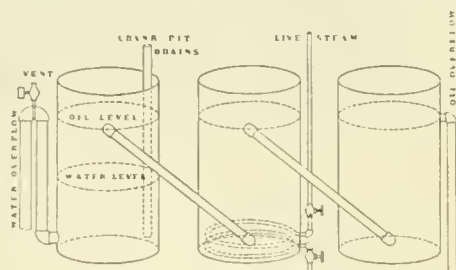


FIG. 1.

oil and water are caught in a receptacle, the oil separated and passed to the oil purifier, and the waste is put into the drier. This drier consists of a sheetiron box 30 in. square and 6 ft. high, filled with shelves, one above another, made of wire netting and spaced about 10 in. apart, for the reception of waste to be dried. The case stands a few inches from the floor, and in the bottom, which is open, is a steam coil. A door occupies one full side, and to the top is connected an 8-in. galvanized iron pipe leading to the boiler breeching, for the purpose of inducing a draft. The whole thing is quite simple and inexpensive, yet it will thoroughly dry a charge of 200 lb. of damp waste in a few hours. This dry waste is somewhat harsh and knotty, but has better absorbing qualities than new waste, and we use and wash it over and over again.

In practice the oilers are allowed but three-quarters of a pound of new waste on a shift, to keep a 1,200-l. p. engine clean, but they are allowed all of the washed waste they want.

In separating oil from waste it is difficult to say which is the by-product and which the direct product, as from 100 lb. of oily waste we get 40 lb. each of oil and waste, and one product is about as valuable as the other.

The amount of engine oil used at our Harrison St. station has been reduced to the lowest possible minimum, I think, as it amounts to only about 50 gallons of new oil each month. This is obtained by catching and re-refining all the lubricating oil used on our machinery, which is quite readily possible on vertical engines. The drains from our crank-pits are carried down into the oil refiners, and the oil from the waste is all saved and put through a process which makes it better than new oil. This may sound like an exaggerated statement, but I will explain later on why it is better than new oil. I have spoken of oil refiners and of refining the oil, instead of filters and filtering the oil, for the reason that we have no filters and do no filtering, but purify the oil by settling and boiling. Our filters consist, essentially, of three tanks, as shown in Fig. 1, the first of which receives the oil from the engines mixed with cylinder drips and water from journals, etc. When this enters the first tank, which is, say, half-full of water and half-full of oil, the water and oil separate; the water goes to the bottom, where it is drawn off through a trap; the oil goes to the top and is drawn off through an overflow. From the first tank the oil flows to a second tank, in which is a steam coil under a pressure of, approximately, 100 lb. This is for the purpose of heating the oil up to about 250° F., at which temperature the water is driven off in the form of steam. Owing to the surface tension of the oil around the small globules of water which is held in suspension with it, the water will not vaporize at a lower temperature. This tank is of such a capacity that the oil is about two days in passing through it. From the second tank, the oil goes into the third tank, where it is allowed to stand about the same length of time, and where any sediment it may contain will be deposited. From the third tank the oil overflows into a large storage tank, where it is kept until it is drawn off to be used. Few of those who have not looked into the matter would realize how much water will be absorbed and held in suspension by oil which contains a small trace of animal matter, and how difficult it is to break up the combination, once it is formed. Those of you who operate oil filters may have sometimes wondered at the accumulation of grease in them; this grease being a soft, jelly-like substance of the consistency of warm lard, or perhaps even thicker. This grease is no more than a combination of mineral oil, a small trace of animal oil and about 40 per cent water, and if it were placed in a vessel and heated up to about 250°, the water would be driven off, perhaps with explosive force if heated too rapidly, but if the work is carefully done the water can be separated, and what is left would be the best kind of lubricating oil, containing a small trace of animal oil, and in our case all the cylinder oil from which the animal oil is derived; and it is this mixture of the cylinder oil with the engine oil which gives it its heavier body and better lubricating qualities. The oil which is expressed or washed out from the waste apparently contains more cylinder oil than that which comes from the engine drains, and on this account, those who throw away their waste not only lose the waste, but the richest part of the oil, which is contained in it.

CYLINDER LUBRICATION.

The question of cylinder lubrication was once a very perplexing one for us, but after studying and experimenting, we settled the question in such a way that it has not been open for several years. We had great trouble with cylinder oil, and had difficulty in finding an oil which would lubricate all of the cylinders of our triple-expansion engines from one lubricator. We have not found such an oil and do not expect to. We could find an oil which would lubricate the high-pressure cylinder, and we could find an oil that would lubricate the low-pressure, but we could not find a combination which would lubricate all of the cylinders perfectly. We have, therefore, adopted an oil which will lubricate the high-pressure cylinder excellently, the intermediate moderately well,

while the low-pressure shows only a slight trace of oil, but as there is no cutting or scratching in the low-pressure while it runs dry, and as the high-pressure cylinder makes a prompt and vigorous protest if allowed to run dry for a few moments only, we have adopted the oil which will give the best results in the high and let the low be content with what it gets.

The results of our experiments have convinced us that the only oil to use in a non-jacketed cylinder, where it would come in contact with very wet steam, is one which is very highly compounded. It must also be an oil of a high fire test, and the reason why it does not lubricate the low pressure cylinder as well as the high, in our opinion, is that the temperature of the steam in the low-pressure cylinder is so low that the oil will not remain atomized in the steam, but washes down and combines with the water of condensation which has formed in the other two cylinders, and passes through the low in an emulsion with the water. To prove this theory I have tried the plan of mixing a cylinder oil of a high grade and high flash test with a light oil of low flash test, and feeding it through one lubricator through all three of the cylinders. The result shows a fair trace of oil on the walls of the low-pressure cylinder, and we ran our engine with this kind of cylinder lubrication for several months, but finally decided that the best results for the entire engine were obtained with that oil which gave the best lubrication in the first cylinder. We now use a heavily compounded high fire-test oil, fed into the steam pipe near the throttle. We find that a gallon of oil so fed will give good lubrication for a 1,200-h. p. engine for 12 hours. I have seen a compound engine of this capacity fed at the rate of nearly a gallon an hour without obtaining satisfactory lubrication, the whole trouble lying in the fact that the oil was not adapted to the particular conditions under which the engine was working, and I think this may account for the unmeasured praise or unstinted abuse which different brands of good oil receive from different engineers, and I think, furthermore, that the difference between a good oil and a poor oil made from high fire-test stock lies almost wholly in the amount and kind of compounding.

HOURS OF WORK.

In arranging an operating force and the payroll of the central station the superintendent should aim, as in all other matters, to get the maximum of results, and still keep everything harmonious, with the least expenditure of money. To do this he should carefully arrange his force so that he will at all times have men enough to take care of the work on hand, and at no time have a surplus of help over what is required to take care of the work to be done. Also his scale of wages should be carefully graded so that the operatives doing the same class of work should receive the same pay, and that the rate of pay to the different classes of workmen should be in proportion to the skill, responsibility or manual labor required. Further than this, a considerable saving in money can be made by paying the operatives partially in hopes and promises. By this I mean to have a well-defined and well known line of promotion, and each one know his position in that line, and that his chances for promotion depend upon his ability, fidelity and length of time in the service. Any really good, ambitious young man is ready to begin work at the bottom of the ladder, and will work along contentedly on small wages if he is assured that the promotions to come will be awarded upon the above terms, and not by favoritism. The most demoralizing and disorganizing practice that can be introduced into a central station is to put a new man, the relative of some official, or the friend of some politician, into a desirable position over the heads of equally good men who have borne the drudgery and hard work of inferior positions, hoping and expecting that when there was a vacancy in a better position they would have the preference.

In many stations the force is divided into a night gang and a day gang, the day gang going off as the night gang comes on, and vice versa. I do not know that this practice is as general now as it was formerly, but I never thought it was well adapted in central-station work. In the first place, the hours are too long, and in the next place, it does not give the best distribution of labor. The number of men in the station does not vary according to the load. The practice which we instituted several years ago, of bringing the men on one or more at a time an hour or so apart, and letting them off in the same way, we find can be made to exactly meet the requirements of an uneven load, and enables us to rotate the different men of the same class through all the different shifts during the course of one or two months, thus making the work and the hours

of all exactly alike in the cycle. At the end of each week the schedule is made up for the week to come, for each of the different classes of operative interested, and then posted on Saturday night, so that as the men go off work on the following Sunday it is known what shift each will have during the coming week. These schedules are altered from week to week, increased or diminished as regards the number of men, and changed in form to conform to the varying conditions of the load curve.

To illustrate by a set of December schedules: The problem to be solved is to arrange the schedule so that there will be at any time enough men for the work, without having too many men around at other times, and, furthermore, to arrange the shifts so that none will be obliged to go home between the hours of one and six in the morning.

As we are not sure what the load will be from day to day, or a week ahead, we are obliged to provide men enough to take care of what we assume will be the reasonable maximum. It is, of course, impossible to meet the requirements exactly without breaking a man in two and using the pieces in non-consecutive times of the day, but with a little care and study, it is possible to arrange the schedule to very nearly meet the exact requirements. Take, for example, the firemen's schedule for the week commencing December 18, 1899, as shown in Fig. 2. We start at midnight with five firemen; two of these are relieved at one o'clock by two other men who come on at that time. As the load from midnight until six o'clock is quite irregular, owing to the variable amount of charge required by the battery from day to day, we have rather more firemen on during this period for the amount of work done than we have during other times of the day. At six o'clock in the morning

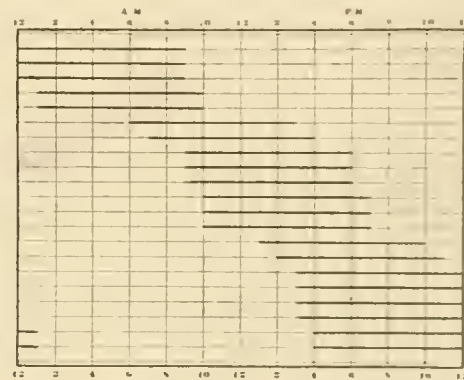


FIG. 2.

the load begins to pick up, and has nearly reached its morning maximum by nine o'clock. To take care of this, our force of firemen is increased by one man each, at six and seven and another at ten o'clock, there being by that time eight men on, and the force is held at that number until one o'clock in the afternoon. During this time several men come on and others leave, but the number at work remains the same. The slight drop of the load at noon is not followed by a corresponding change in the number of men, but it is taken advantage of as a slight breathing spell, and gives the men an opportunity to clean fires and eat their dinners. After the mid-day drop in the load there follows a gradual rise until four o'clock, which we anticipate by bringing a man on at one and another on at two; at four o'clock the load rises abruptly to the maximum shortly before five. We provide for this by bringing three men out at three o'clock to get their fires in good shape ready for this hard pull, and, finally, at four o'clock the last man comes, which brings the total number of firemen on at this time of the day up to 14 men. After five o'clock the load gradually declines, until midnight, when it is only about one-fourth as high as it was at five. Owing to the way in which the men have been brought out, their shifts are finished so that the force is automatically decreased in proportion as the load decreases, and we have during the day worked 21 firemen, who have altogether burned about 210 tons of coal, and have been so distributed that we have at all times had an excess of one or more men for the work, and none have been over-worked. Fig. 3 shows the load curve for December 21st and also what we may term the firemen curve for the same day, which shows at a glance how nearly the size of the firing crew was adapted to the requirements.

Fig. 4 shows the oilers' schedule for the same week, and Fig. 5 shows how nearly the number of oilers were proportioned to the amount of work to be done on December 21st.

THE FUEL QUESTION.

The greatest possibilities for saving or wasting about a steam plant are undoubtedly in the coal pile, but as it is a dirty proposition and many of its features not well understood, the subject does not receive the consideration to which it is entitled.

The average ambitious engineer will spend much time and care on his engine to be sure that the indicator cards are perfectly symmetrical, that the points of cut-off are equal, that the release is in time and that the compression rises to meet the admission in a smooth, rounded curve. This is proper and commendable, yet the same time spent in studying the conditions of combustion in his furnace might show him a way to make a saving in fuel fourfold

qualities the cheapest screenings cost about half as much as the high-grade coal.

Having selected the coal, the next problem is how to burn it properly. It is commonly understood that 12 lb. of air are needed to properly burn one pound of coal. It is also commonly supposed that in practice about twice this amount of air passes through the fire, but just how much actually passes and under what conditions are the best results obtained are impossible to determine without making analyses of the flue gases. Fortunately, this has now become a very simple operation and one which can be performed and understood by anyone competent to take charge of a large boiler room. These tests often show the most surprising and disappointing results. The analyses are made to determine the percentage of carbon dioxide in the flue gases. Under perfect conditions it can run as high as 20 per cent, but it is not unusual to find samples running as low as 2 per cent of dioxide. This brings down

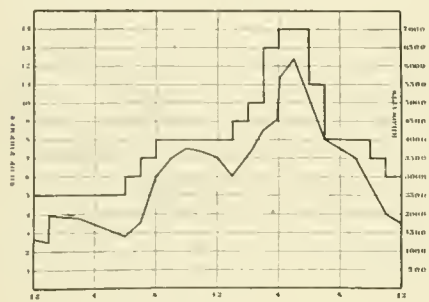


Fig. 3.

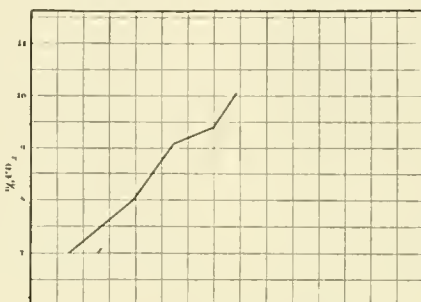


Fig. 6.

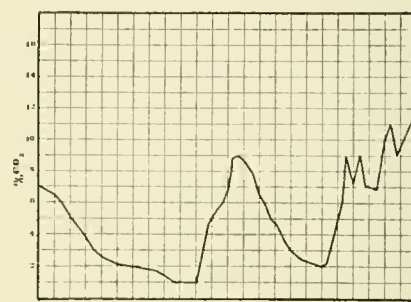


Fig. 9.

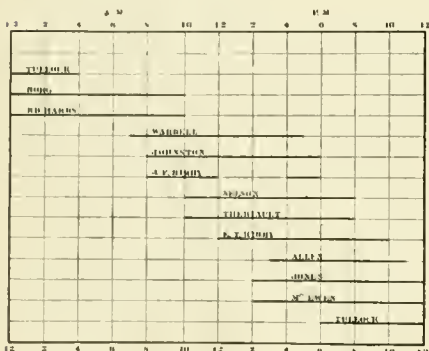


Fig. 4.

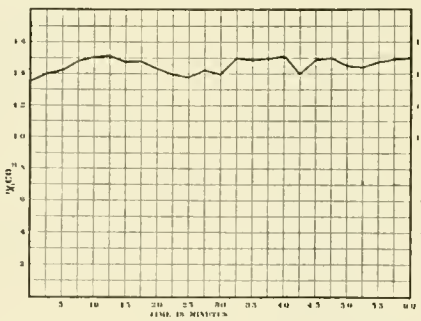


Fig. 7.

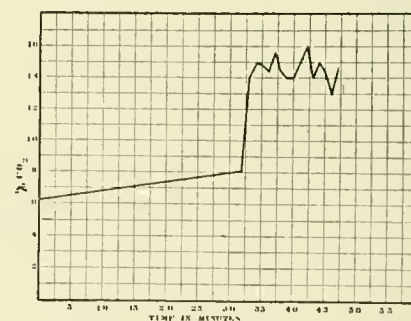


Fig. 10.



Fig. 5.

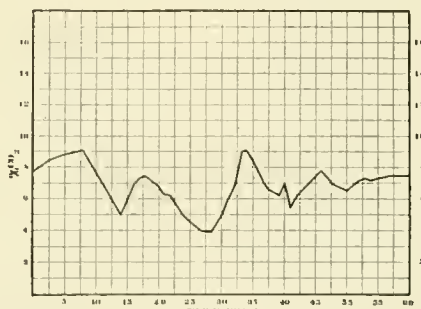


Fig. 8.

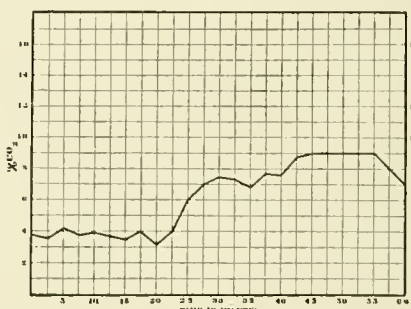


Fig. 11.

greater than is possible in the final refinements of the indicator cards.

A fireman whose wages amount to, say, 20 cents an hour will burn during that time fuel costing 10 or 15 times as much as his wages. It would not be possible by any sort of driving to save half of the wages, but it is readily possible, by properly watching and instructing the fireman, to save double his wages in coal. In the first place, great care should be exercised in the selection of the coal to be used. I believe that the cheapest coal is that kind which has the greatest amount of combustible for the least amount of money, provided the furnaces are of the proper kind and ample in capacity to make the required amount of steam from them. The very cheapest kind of Illinois screenings, costing less than \$1.50 a ton, will not have less than 10,000 B. t. u. per pound, and the very best of eastern lump, costing \$4 a ton, will not have more than 14,000 B. t. u. per pound. This means, then, that for equivalent heating

the economy, for two reasons: First, the gas in the firebox is diluted with an excess of cold air and cooled down, and, secondly, the amount of gas, being increased in volume, passes through the boiler more rapidly and does not give up so much of its heat. It is almost a paradox that within reasonable limits the more the gases are cooled down in the furnace by the admission of excess of air the hotter they will pass away from the boiler. The two causes of excess of air in the flue gases are, first, running boilers on too light loads, and, secondly, careless firing.

In a station where the load is much higher for a few hours than during the rest of the day, the tendency is to have too many boilers in service during the period of light load. The natural result is that the fires are run thin; the grates get bare in places and a great volume of air is drawn in, and only a small portion of it comes in contact with the fuel.

Careless firing is always a flagrant waste of fuel. An engineer

may be aware that he is not getting the results which his tests lead him to believe he should have, and yet, in a boiler room where several men are working, it is exceedingly difficult to fasten the blame on any one of them unless one can examine the chips the men make, or, in other words, the flue gases.

To follow intelligently the work of the individual fireman, we have installed in our boiler room a device called the econometer, through which is induced a small current of gas from a boiler breeching. The weight of this gas, changing with its composition, moves a pointer across a dial, thereby indicating continuously the varying percentage of carbon dioxide in the flue gas. From this device are run individual pipes to the breeching of each boiler, and all is so arranged that samples may be drawn from several boilers and tested in a few minutes, or a continuous test may be made of the performance of any one boiler.

Readings taken from this instrument at regular and short intervals, when plotted, form a curve which is a very comprehensive record of the conditions of combustion during the time of observation. A few of such curves I submit herewith: Fig. 6 shows the results of a test made to determine the relation between boiler efficiency and percentage of carbon dioxide. The results show that within the limits tested the two are almost directly proportional. Fig. 7 shows the results of skillful and even firing. Fig. 8 shows the result of careless and uneven firing. Fig. 9 shows, first, what occurs when a fire is cleaned in a leisurely manner, the dioxide dropping to one per cent; then followed a charge of coal, which got the furnace in good working condition; but as the fire was not replenished during the next 15 minutes, it burned so thin that it is doubtful if the boiler was making steam at all. The latter part of the curve shows the automatic improvement in the fireman as soon as he observed that he was under surveillance. Figs. 10 and 11 show how the work of a fireman may be improved by giving him intelligent instruction.

The above are a few of the methods we have adopted for reducing operating costs.

Some of them may appear trivial, but when we consider that \$100 saved is \$100 added to the surplus, which is as good as a \$500 increase in the gross earnings, and that to add \$500 monthly to the gross earnings would require an investment of, say \$25,000—when we consider this we may realize what a valuable asset is an engineer who is prolific in methods for keeping costs down or is ready to adopt such methods from others.

FLY-WHEELS.

Fly-wheel accidents and fly-wheel design were discussed in a paper before the Civil and Mechanical Engineers' Society (England) in April last, and after giving a resume of the various articles presented before similar societies in recent years the author, Professor Sharp, reaches the following conclusions:

"From Mr. Longridge's statistics, as given in the annual report of the Engine Boiler & Employers' Liability Insurance Co., it appears that of the engine break-downs coming to his notice 1 in 50 was a fly-wheel accident. This proportion may not seem greater than might be expected. But if it be remembered that a fly-wheel is merely a rigid body, none of its parts possessing relative motion, while the other engine details, such as valve gear, governor gear, pump gear, etc., are much more complex, the proportion of fly-wheel accidents must be regarded as a large one. My opinions on the subject may be briefly summarized thus: When a fly-wheel is small enough to be made in one piece, and when its normal rim speed is not above 40 or 50 ft. per second, cast iron is a suitable material if ordinary precautions are taken in cooling. But when the wheel is so large that for convenience of erection it has to be made in two or more pieces, an element of insecurity is introduced. Built-up fly-wheels of mild steel plate are too costly. Cast iron may be safely employed for the rim and nave. But for the arms of the fly-wheel I consider cast iron a totally unsuitable material. The arms are subjected to bending stresses in opposite directions, and owing to the want of ductility of cast iron the margin of safety may be dangerously small when the normal speed is exceeded from any accidental cause. I submit that a fly-wheel built with cast-iron rim, and tangent spokes of mild steel, offers a perfectly satisfactory mechanical solution of the problem of the design of a safe fly-wheel, and at a price that is little if anything greater than the prevalent design of fly-wheel with cast iron arms fitted to the nave and rim segments.

"I may conveniently finish this paper with a sentence from Benjamin's paper: 'The more the subject is agitated, the less shall we have occasion to mourn the destruction of life and property on account of faults in the design of this most necessary element of the steam engine.'"

REHEATERS IN MULTIPLE-CYLINDER ENGINES.

Dr. R. H. Thurston discussed the results obtained with reheaters in multiple-cylinder engines in a paper presented at Cincinnati meeting of the American Society of Mechanical Engineers, and in closing, says:

Conclusions, probably definite, and sufficiently accurate for practical application, may be drawn from what is already known of this subject, although we are obliged to admit that direct experiment has done little to aid us in their deduction. It is tolerably certain that a reheater, wherever and however employed, can be of little if any value in improving the thermodynamic action of the engine if it has not sufficient power to produce some superheating, and it is no less certain that a properly proportioned and placed reheater will be of comparatively small importance if supplied with wet steam, and its value will be less as the amount of the moisture in the steam entering it is the greater, up to the point at which it ceases to produce superheating of the steam entering the succeeding cylinder.

1. A reheater should be given such area of heating surface as will insure, under the circumstances of its operation, at least moderate superheating.

2. The reheater must, to insure proper action, be supplied with perfectly dry steam, and must usually be accompanied by a separator out of which it may take such steam, or it must itself act as a separator.

3. To be thoroughly effective, the reheater should take steam immediately from a separator, and should deliver its own charge directly into the succeeding cylinder, thus permitting no opportunity for loss of heat and production of saturation before the charge is fairly introduced into the next steam cylinder. The separator may probably often be constructed in one piece with the reheater, with advantage in this respect.

4. Those conditions which control in the application of the superheater apply equally well to the case of the reheater. The latter is properly a superheater placed between cylinders in series; otherwise it becomes simply a separator.

5. With properly proportioned and adjusted superheating and reheating apparatus, multiple-cylinder engines should gain quite considerable economy, and even enough, where high efficiency is demanded, to make their employment financially desirable.

SETTLING BASINS AT NEWPORT.

The Cincinnati, Newport & Covington Railway Co. draws its water supply from the Licking River, a very turbid stream, which made it necessary to build settling basins where a portion of the suspended matter could be deposited before the water was taken to the condensers and heaters. The settling basins are two in number, placed side by side; they are 75 x 60 ft. on top and 11 ft. deep, the sides having a slope of 5 vertical to 4 horizontal. The bottom of each basin is of concrete 8 in. thick and the sides are of well tamped clay 4 ft. thick backed up by earth filling; the side walls are lined with two layers of 1-in. planks. These basins have given no trouble because of leaks.

The pumping station is on the bluff near the settling basins and not far from the power house. A well 20 ft. in diameter and 50 ft. deep with brick and cement walls was sunk and connected with a second or intake well 20 ft. deep near the water's edge. In this station are three Stilwell & Bierce duplex pumps with an aggregate capacity of 1,750,000 gallons per day. Water is drawn from the settling basins through intakes 18 in. from the bottom and delivered either to the power house or to an elevated tank just outside the station.

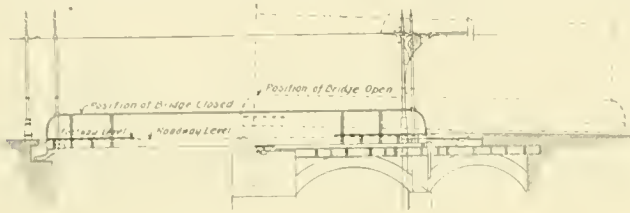
The total cost of the pumping station, basins, etc., was about \$17,000, but the settling basins and the portion of the pumps and plant necessary to permit the river water to be used for feeding the boilers instead of city water is estimated at \$3,000. The use of river water in the boiler has reduced the water bills from \$200 per month to 60 cents.

TROLLEY WIRES OVER MOVABLE BRIDGES.

When an electric railway lays its tracks over a movable bridge, one of the problems the engineer has to solve is that of designing a suitable arrangement for the trolley wires. In our issue of January, 1897, page 11, we illustrated the trolley connection devised by Mr. J. R. Chapman, for the rolling lift bridge over the Chicago River at Van Buren St., which was occupied by the West Chicago Street R. R., now the Chicago Union Traction.

Another interesting trolley construction is that designed for a movable bridge crossed by the electric tramway at Hull, England, and illustrated in the *Electrical Engineer*, of London. This bridge is carried on wheels and is opened by rolling it back over the west approach.

The trolley wires are suspended from brackets attached to side poles. The line east of the draw span terminates in a pole set at



WIRE OVER BRIDGE, HULL, ENG.

the curb near the opening; two poles fastened to the main girders of the bridge carry the wires on the movable portion, and the last pole for the wires on the west approach is set on top of a pile and braced to a neighboring building.

At the east end of the draw span the stationary and movable sections of the trolley wires are electrically connected by switches consisting of tapered tongues sliding into spring jaws. At the west end the bridge wires are at a slightly higher level than are those on the west approach and there is no electrical connection between them; inclined bars are attached to the terminal bracket to guide the trolley from one wire to the other.

As the bridge when moved back is raised to a slight extent, the bridge wires occupy a position just above the trolley lines on the approach and there is no interference.

CONVENTION OF RAILROAD COMMISSIONERS.

The annual meeting of the National Convention of Railroad Commissioners was held at Milwaukee the last week of May; the business sessions occupied the 28th and 29th and were followed by an excursion to various points in Wisconsin.

The secretary of the Convention had very courteously extended an official invitation to the Street Railway Accountants' Association, and three members of the committee on the standard system of accounts, together with Mr. F. E. Smith, auditor of the Chicago Union Traction Co. had made arrangements to attend. Mr. J. F. Calderwood was unable to be present because called to Columbus, O., by the death of a friend, and the Accountants' Association was represented by Messrs. C. N. Duffy, F. E. Smith and H. C. Mackay. It should be stated that the roll of the Accountants' Association was called as part of the routine business.

In his annual address the president, Cicero J. Lindly, strongly recommended that electric railways be brought under the jurisdiction of the state commissioners. He said in part:

"Electric railroads are becoming an important factor in every state in the Union. Within a few years these railroads will cross and recross almost every state and territory in the United States. There can be no good reason assigned why a railroad carrying passengers, traversing the country and in many instances carrying mail and freight, should not be amenable to the law the same as steam railways, no matter by what power they are propelled, and I believe it to be the duty of every commissioner here to make an effort in his state to see that the railroads propelled by electricity and the street railways in his state should be placed under the jurisdiction of his commission or under the jurisdiction of a commission that will force them to make the same character of reports to the people of the state that steam railways do, so that those investing their money in the stocks, bonds and mortgages of the various street railways in the state may know what those roads

earn, what their capital stock is, the gross earnings of the road, the net income, and for what other purposes his money invested in these enterprises is being expended. There is naught but justice in this, and it appeals to every fair-minded man in the state in which we live."

The Railroad Commissioners have a standing committee to consider the "Classification of Expenses for Electric Railways" and in its behalf Mr. A. W. Cole, chairman of the New York Railroad Commission, said that the committee had little to report since the adoption of the "Standard System", at the Denver meeting in August last. The New York Commissioners, however, had prepared their blanks and the reports of the New York street railways beginning July 1, 1900, would be made in accordance with the requirements of the "Standard System." It will be remembered that Mr. W. O. Seymour, of the Connecticut Railroad Commissioners, last fall made a similar announcement for his state.

The recognition and courtesy extended the street railway accountants by so important a body as this association of Railroad Commissioners, is naturally gratifying in the extreme to those who have worked so hard to make the Accountants' Association what it is. Very few associations have come into as important a position and so readily settled down to earnest work in so short a time, as it. And fewer still have accomplished as good results in 10 years as the Accountants have in three. The excellent work already done will be better realized and appreciated each year, in proportion as it is understood.

AN ENDLESS CHAIN SWINDLE.

An "endless chain" scheme whereby the public may secure street railway tickets at greatly reduced rates has been worked during the past two months at Atlanta, Ga.; Baltimore, Washington, Pittsburg, Kansas City, Mo., and Chicago with the result, as with all something-for-nothing projects, the would-be gainers have suffered considerable loss. At several of these places the promoters of the chain were arrested and forced to leave town.

The plan is not a new one although we do not remember of its having been used in connection with street railway tickets before. In fact the tickets only serve as a blind; people would be more suspicious were \$3.00 cash offered.

The promoters rent a small office for a short term and commence the sale of books of coupons. As the scheme was worked in Chicago the books contained four coupons each and were sold for \$2. The purchaser was to sell three of these four coupons to three different people for 50 cents each, the purchaser of a coupon taking it to the promoters and on turning it in with \$1.50 in cash receiving in exchange a book of four coupons, three of which were to be in turn sold to other parties. When the three persons to whom the original purchaser of a book had sold his extra coupons, had each paid \$1.50 and taken out a new book, the original purchaser received \$3 worth of street car tickets from the promoters; these tickets would cost the recipient but 50 cents, since he retained the \$1.50 for which his three coupons sold. The promoters on the other hand would also have a good thing since they did not issue any tickets to the purchaser of a book of coupons until \$4.50 had been received and three new books of coupons issued. Thus the promoters would make \$1.50 and the purchaser \$2.50 on each \$3.00 worth of street car tickets. On original sales the promoters receive \$2 more per book. The details of the schemes as tried in other cities varied only as to the number of coupons and the price.

The chain is supposed to go on indefinitely, the last set of purchasers of coupons supplying the money to pay the street railway for the tickets and also to pay the 133 1-3 per cent profit divided between the promoters and the preceding purchasers. Unfortunately, however, the progression is a geometrical one and the time very quickly comes when the last purchasers must lose the money invested because of the impossibility of finding new sets of purchasers for the coupons. Estimates of the total wealth of the world place it at less than \$300,000,000,000, yet starting with a single book of coupons and assuming each set of purchasers to dispose of the three coupons as required, the 24th set of purchasers would have to invest even more than this sum.

The element of fraud in the transaction is that since the commodity dealt in has a fixed value and the promoters and early purchasers make a profit, the loss is certain to be borne by the later purchasers.

The Indianapolis, Greenwood & Franklin Interurban.

BY CLOYD MARSHALL.

The promise of Indianapolis being the center of a number of extensive interurban systems seems near fulfillment. For several years Irvington, the seat of Butler College and a fine residence district, has been connected to the city by one of the lines of the Indianapolis Street Railway Co. The Indianapolis & Broad Ripple line has been a favorite route for pleasure seekers during the summer and fall seasons. On Jan. 1, 1900, the Indianapolis, Greenwood & Franklin Electric Railway Co. ran the first interurban car over its tracks. The lines of the Indianapolis & Greenfield Rapid Transit Co. are practically completed and will be opened for traffic

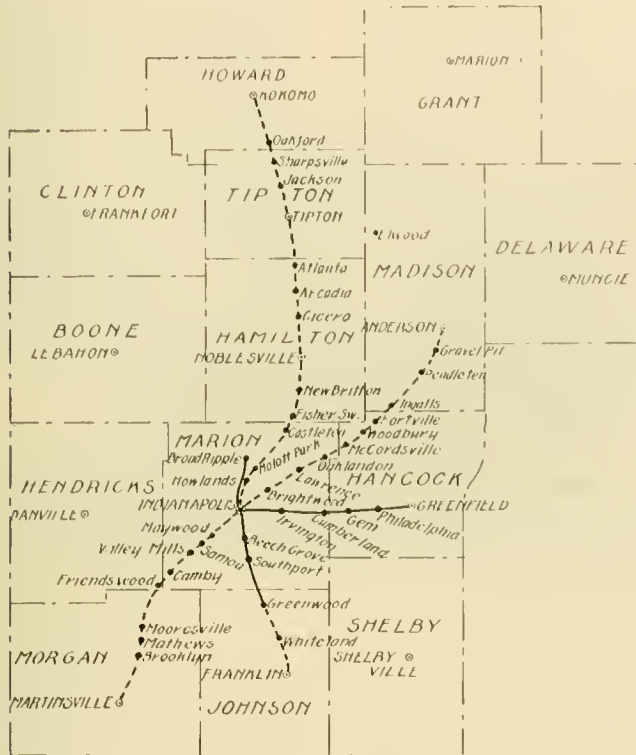
Indianapolis in a southeasterly direction through Southport and Greenwood to Franklin. Franchises for 50 years permitting the company to carry passengers, baggage and freight were secured through the towns, but the line for the rest of the route is over a private right of way, paralleling the Jefferson, Madison & Indianapolis R. R. At one point about five miles south of the city it was necessary to make a deep cut to avoid a heavy grade. A farm of 30 acres was purchased by the company and a pit of fine gravel opened. An excellent roadbed has been constructed at little expense and the company still has a valuable and almost inexhaustible gravel pit. There are no grades or curves of any consequence on the entire line. The route is through a good farming district for which Indianapolis furnishes a splendid market.

There will be a large amount of pleasure riding over the line this summer. When the road is extended to Franklin, the county seat of Johnson County, the contributory population outside of Indianapolis will be large and a regular business traffic of good proportions will result. The map shows the towns and cities connected and the part yet to be constructed. This map also indicates the electric lines running out of Indianapolis, and by the dotted lines, those projected.

TRACK AND OVERHEAD CONSTRUCTION.

An agreement has been made between the Indianapolis Street Ry. and the Indianapolis, Greenwood & Franklin company whereby the cars of the latter company can run over the tracks of the Shelby St. line from the city limits to the business center, with a terminus on Meridian, near Washington St.

Last October the first rail was laid and in less than three



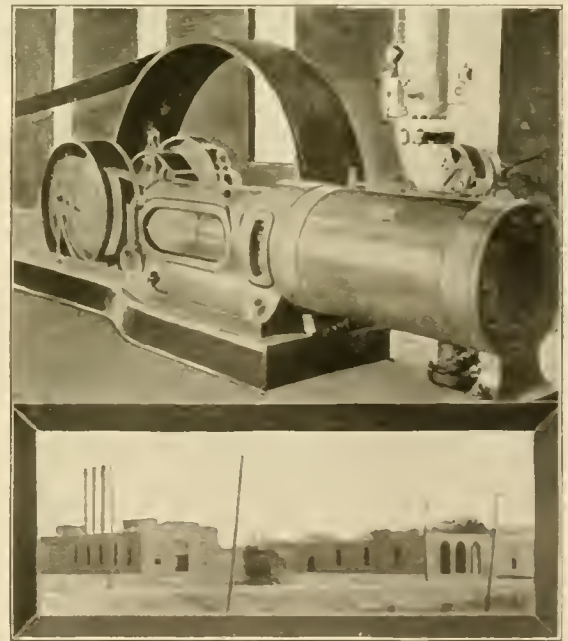
INTERURBANS ABOUT INDIANAPOLIS, IND.

in the immediate future. Interurbans have been projected, franchises and rights of way secured for roads connecting the capital city with Kokomo, Martinsville and other cities in central Indiana, and the electric railway work of greatest magnitude now developing in Indiana is the extension of the lines of the Union Traction Co., which will soon connect with Indianapolis.

During the past decade the Indiana gas belt, comprising Grant, Madison and Delaware Counties, has been the scene of great industrial activity; Anderson, Muncie, Marion and Elwood have grown from country towns to manufacturing centers. The lines of the Union Traction Co. connect these cities with over 100 miles of track and the mileage will be almost doubled with the extension to Indianapolis and elsewhere. A power station to cost \$750,000 is in the process of erection at Anderson to furnish current for this great system. This, together with the dearth of materials, has occasioned some delay in the construction of the Indianapolis branch. It will thus be seen that the electric interurbans, already past the paper period, will make the capital of Indiana the hub, with many of the secondary cities of the state directly contributory to it.

The experience of the Indianapolis, Greenwood & Franklin Electric Railway Co. is indicative of success for the other roads, as the traffic this spring has taxed the capacity of the equipment to the utmost. After some six years of fruitless litigation, last July the company came into the control of Charles F. Coffin, a prominent lawyer of Indianapolis, and W. G. Irwin, a banker of Franklin, and it was reorganized on a working basis and the construction of the road pushed with vigor.

The line was surveyed from Garfield Park at the city limits of



250-H. P. BUCKEYE ENGINE.

STATION BUILDINGS.

months a single track extended from Indianapolis nine miles south to Greenwood, with turn-outs at four different points equidistant along the line. A 60-lb. rail is laid on oak and cedar ties, 6 in. x 7 in. x 8 ft., spaced from 15 in. to 2 ft. apart. The rails are electrically connected by No. 0000 Washburn & Moen bonds. The line crosses a number of streams which are substantially bridged.

Two No. 00 trolley wires are strung over the track, these acting as feeders and avoiding frogs and switches. Aluminum wire of 300,000 c. m. section has been supplied by the Pittsburg Reduction Co. and will serve as a feeder from the power station six miles towards Indianapolis.

Span wire construction, suspended from 30-ft. cedar poles with 7-in. tops, is used along the public highway, but along the private right-of-way Craghead brackets hold the trolley wire. The Ohio Brass Co. furnished the rest of the overhead material except the wire which came from Washburn & Moen."

A private telephone line parallels the track, with instruments in the superintendent's office and in telephone stations located at each of the turn-outs. If a car is off schedule time the conductor unlocks the box and calls up the office to receive running orders, or should any accident or break-down occur, the superintendent is notified.

Outside the towns points at which the cars can be hailed are indicated by stop signals, of which there are 30 along the line.

CARS.

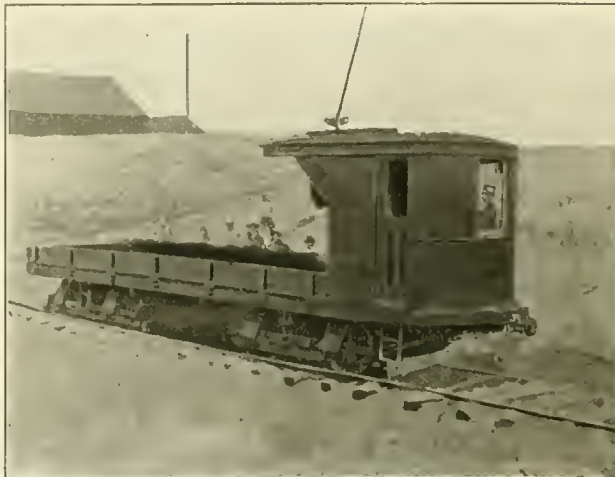
As may be seen from the illustrations, the cars of this company are large, handsome and well equipped for fast interurban operation. They were made by the Laeledge Car Co., of St. Louis, and are of the open type with tightly fitting windows so that they can

style of ticket is shown herewith, the fare, direction and destination being indicated by punches. Commutation tickets of 50 rides, good for one family for one month, are sold for \$6.25. Account of the local fares collected in Indianapolis is kept on a fare register.

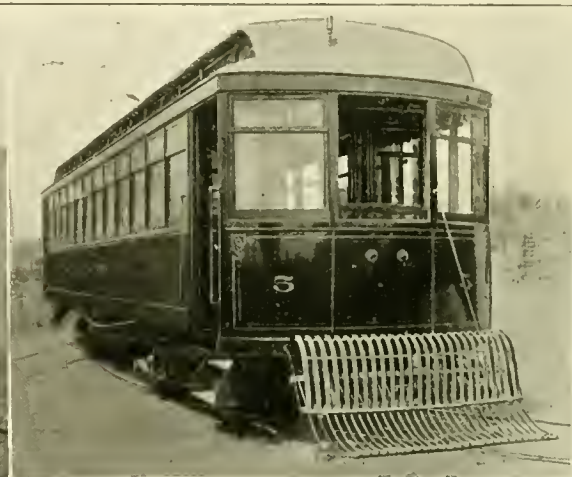
The large freight car shown in one of the illustrations is home made, and is used for construction work and hauling gravel. In ballasting the roadbed the gravel was costing 50 cents per cu. yd. for transportation by teams. This car was designed and constructed for this purpose, and the cost of transportation has been reduced to one-sixth. It has a capacity of 15 cu. yd. of gravel and averages 10 trips a day. The car body is 8 ft. 4 in. wide and 36 ft. long, with side beams 10 x 10 in. and a center beam 6 x 8 in. In the middle of the platform there is a trap door for dumping the gravel between the rails. The car is mounted on Peckham trucks with two Steel motors, each of 50 h. p.

POWER PLANT.

A general view is given in the illustration of the office, power station and car barn located at Greenwood, midway between In-



GRAVEL CAR.



PASSENGER CAR.

be comfortably heated in winter, but the window space is so large that with the window down the effect is the same as a summer car. Electric heaters made by the Consolidated Car Heating Co. are placed under the seats. On either side of the center aisle are double, reversible, rattan-covered seats and above are package racks. The interior is handsomely finished in cherry.

Three of the cars are mounted on Brill double trucks and three on Peckham 14 A trucks with a 6-ft. wheel case. Each truck carries a 50-h. p. steel motor made by the Johnson Co. The Christensen air brake system is used with a small motor-compressor in the front vestibule. An air whistle is on the car roof above the vestibule and a warning is sounded by the motorman just before each cross road is reached.

As will be seen from the illustration, the cars are equipped with "Providence" fenders, made by the Consolidated Car Fender Co.

Each car is equipped with a Wagenhals arc headlight. This throws a remarkably brilliant light along the track for several hundred feet, and in Indianapolis the contrast is very marked between the Greenwood and the city cars with their little incandescent headlights. The carbons are fed by hand and will burn in one position for about one and a half hours. At the end of each trip at night the motorman releases the clutch, which allows the upper carbon to drop down to the lower one.

Two of the cars have baggage compartments for carrying parcels and light freight. At present the freight traffic consists chiefly of dairy products, and each morning on the early run 300 gallons of milk are delivered into the city. The freight business is as yet undeveloped, but will receive attention as soon as the passenger traffic can be taken care of.

On week days an hourly schedule is maintained from 5 a. m. to 12:15 at night, and on Sundays the cars run every 35 minutes. Tickets are on sale at Greenwood, Southport and several stores in Indianapolis, as well as on the cars. The fare one way from terminus to terminus is 20 cents, and for the round trip 30 cents. The

dianapolis and Franklin. The power house is a brick building 47 x 94 ft., of which the engine room occupies 56 and the boiler room 38 ft. of its length. A 250-h. p simple Buckeye engine is belted to a 600-volt, 333-ampere Westinghouse generator. The fact that there has not been a shut-down of sufficient duration to throw the cars off schedule time speaks well for the engine and generator as well as for the careful attention given them. The Buckeye Engine Co. has built a 350-h. p. engine for this station which will be belted to a 300-kw. Siemens & Halske generator. The Siemens & Halske Electric Co. made the white marble switchboard upon which the mounted Weston ammeters and voltmeters.

There are three 100-h. p. horizontal tubular boilers, made by

Indianapolis, Greenwood & Franklin R. R. Co.

CASH FARE RECEIPT

Retain this for Return Trip.

Fare Collected.	
Good for One Round Trip Ride between Station where Fare Collected is Punched.	This is Your Return Ticket. Keep it.
5	20
10	25
15	

Chas. F. Coffey, Secy.

No. **15257**

NORTH	
INDIANAPOLIS	30
25	SOUTHPORT 25
30	GREENWOOD
SOUTH	

SAMPLE ROUND TRIP TICKET.

Chandler & Taylor, carrying steam at 95 lb. pressure. A Hoppes exhaust feed water heater is mounted on top of the boiler setting. One hot water pump and one cold water pump, each 6 x 4 x 6 in., made by Dean Bros., of Indianapolis, keep the boilers supplied from a deep well and maintain the pressure on a system of water works. The boiler room equipment is to be duplicated in the im-

mediate future. Indiana slack coal is used and the daily consumption is about 12,800 lb.

Three tracks enter the car barn, which is a brick building 50 x 100 ft., with a repair and inspection pit under one of the tracks. With the arrival of the cars now ordered the building will be of inadequate size, and plans are ready for an extension of 75 ft. in length. Water plugs with about 100 ft. of 3-in. hose are located at convenient points about the plant for fire protection.

Mr. A. B. Hogue, superintendent of the company, is a man of long and varied experience in electric railway work. Previous to his engagement in Indianapolis he was superintendent of construction on the Cleveland & Chagrin Falls Electric R. R., and had charge of its operation for 15 months. He superintended the



C. F. COFFIN.



A. B. HOGUE.

electrical construction of the Niagara Falls & Suspension Bridge Ry., when it was rebuilt to use current from the water power. Later he was superintendent of construction of the London (Ont.) Street Railway Co., until called to a similar position with the Canton-Massillon Electric Railway Co. For a year he was superintendent of the Worthington, Clintonville & Columbus Street Railway Co. The results of his experience are apparent in the operation of the present line; everything is in first-class working order, and not a stop of 15 minutes has been occasioned since the cars began running.

The company is capitalized at \$150,000 and has no indebtedness. Charles F. Coffin is president and secretary; W. G. Irwin, general manager, and A. B. Hogue, superintendent. The office of the president and counsel is at 525 Lemcke Building, Indianapolis.

STREET RAILWAYS AND THEATRICAL ATTRACTIONS.

In our May issue, page 259, was published Mr. H. F. MacGregor's paper on the "Operation and Maintenance of Street Railways," read before the Southwestern Gas, Electric & Street Railway Association, and we give here a portion of the discussion which this paper elicited:

Mr. Jenkins: I am interested in the question of summer theatricals, and I am inclined to think that Mr. MacGregor has set the proper pace, 10 cents admission and 10 cents for reserved seats. I have had numerous applications every week from big aggregations who want to come and show us how much money they can make, but as a rule the making of money is on the other side. I have found so far that the money it takes to run a thing of that kind has more than taken up the gross receipts.

Mr. MacGregor: As to the amusement business, if there are those who would like to get into the circuit there is no reason why they should not do so, if they are willing to guarantee what the railway towns are willing to guarantee. The trouble I see about these associations there is no agreement of sentiment on any proposition.

Mr. Boyd: I don't know a thing about the entertainment business, but I have my office in the store of the manager of the local theatre, and I have asked him leading questions, and what I find is that they never get a guarantee from any street railway men who are not entirely novices in the line of entertainments; they get a percentage of the receipts, to 50, 60 or 70 per cent.

Mr. MacGregor: Here in Waco they prefer to hire troupes outright and take all the money and pay them so much for their services. At San Antonio they haven't any building where they could make a charge. What they did there was to run free on a concert basis. At Laredo there was a charge for entertainments and a charge for reserved seats, and a percentage, and a guarantee only of board and transportation. That is all the guarantee we propose to make; to allow \$5 for each person and their transportation around the circuit. Whatever loss there was on that would have to come out of the 5-cent-fares if they failed, and sometimes we would have a profit on our percentage of 10 and 10. For instance, in railroad towns we would be willing to give them as much as 80 per cent; we would have our profit, but then we might lose it on the next show. One wants it one way because he has educated his people to have something for nothing. What I would like to do is to agree on some plan. If we could all adopt it I think we could do something in the way of summer amusements.

Mr. Yeager: I started in this business last year. I engaged a troupe on the lines that we talked of last year at Austin. After two weeks I found that we were getting it in the neck. They were asking everything; just simply laid themselves down, and I had to get everything, so I went through the season with other troupes and wound up with a big opera troupe in which I charged 50 cents admission and 15 cents reserved seats and had my house full; played two weeks. I corresponded with theatrical agencies throughout the country and managers, and in that way got a good deal of information which changed my ideas in regard to running summer entertainments so as to make it profitable to the company. After playing the troupes two weeks on the admission plan, I noticed that there were certain nights people went out and I had larger crowds than other nights, and it was always the same way. After playing these people two weeks the third week I gave three nights free; in fact gave a better show than I had before. I didn't have half as many people as I did the nights I charged 25 cents to get in to see the same thing, including car fare, because the society people which make up the big crowd would not go. They had the idea that as it was free everybody would be there. In Houston that would be the negroes and others. With us it is the Mexicans and negroes. And I didn't make enough to pay the musicians and expenses. I guarantee nothing. I say to them that I have a place on which I have spent \$4,000 to make it first-class, that I will do everything to bring crowds and can do it better even than they can if they came on their own responsibility. I give them the place. They have no license to pay. I do the advertising and pay the expenses. I will give you all the gate receipts and all the reserved seats excepting 10 or 15 per cent, according to your attraction. I reserve that much to pay the expenses of the door-keeper, stage hands and to clean up after the performances. They take the risk. They give a good show, because they are on their metal, and if they do not give a good show people will not patronize them.

Mr. Strickland: Mr. Yeager bears out my position that the people of Texas, at least those who patronize the street railway and lighting plants, do not want something for nothing. I would like to ask Mr. MacGregor as to the legality of street railways conducting those summer entertainments.

Mr. MacGregor: We have a right to do anything that promotes our business.

Mr. Yeager: I had this matter investigated by some attorneys at Austin, and I found there was a way of getting around it so not to have any risk, so I didn't charge admission. I have nothing in my franchise to say whether I should charge 5 cents or any other sum, so I have no entertainment at which I sell tickets at the gate. Whatever we have there is included in the car fare. You buy car tickets which entitles you to a coupon to go and see what you can. After you get in if you want a good, comfortable seat you can pay additional for it. We take out a license, pay \$10.50 a year. I don't think there are any legal objections, but I took this course in order to be on the safe side.

The United States District Court at Galveston, Tex., has allowed the claim for \$30,000 brought by the city of Galveston against the Galveston City Street Railroad Co., for the value of the company's stock held by the city and has decreed this to be a prior lien to that of the bondholders, and it must be paid out of the proceeds of the sale of the road.

SOME EARLY ELECTRIC RAILWAY INSTALLATIONS.

When and where the first successful electric railway was built in this country is a matter of considerable dispute, several cities claiming the honor of having been the first to prove the mechanical and commercial feasibility of applying electric traction to street railway transportation problems. Prior to 1880 there is no record of an electric railway embodying the essential features as we know them today, that is an electric motor on a moving car taking current from a central station through electric conductors by means of a sliding or rolling contact, although models had been built and experiments carried on along this line by Thomas Davenport at Springfield, Mass., in 1835-37, Thomas Hall at Boston in 1860, Van Depoele at Detroit in 1874, Stephen D. Field at San Francisco in 1877, and others. Experiments had also been made with battery cars propelled by current taken from Grove battery cells carried under the seats, and in Europe several models of electric railways had been built, employing a third rail or an overhead wire, but in this country no practical demonstration of electric traction principles as now generally applied had been attempted.

Thomas A Edison can probably claim on good grounds to have constructed the first mechanically successful road in America, although his was purely an experimental line. This was built in 1880 near his laboratory in Menlo Park, N. J., and on it cars were run, drawn by a locomotive taking and returning the current through the rails.

In 1882 Joseph R. Finney exhibited in Allegheny, Pa., an electric car for which current was supplied by an overhead copper wire. A small trolley fitted with grooved wheels running on the wire as on a track and connected with the car by a flexible conducting cord served to convey the current to the motor. It was not, however, until 1887-88 that a road was actually built on Finney's plan.

In 1883 Leo Daft equipped and operated successfully an electric system on the Saratoga & Mt. McGregor R. R. at Saratoga, N. Y. This line was about 15 miles long with several severe grades. A locomotive receiving current from a third rail between the track rails drew several trail cars, often attaining, it is said, a speed of eight miles an hour. In the same year Chas. J. Van Depoele placed in operation in Chicago an experimental track about 400 ft. long having a 5 per cent grade. The rails were used for one side of the circuit, while the other consisted of a copper wire supported in a wooden trough in the center of the track and passing over two brass wheels suspended from the bottom of the car. As the car passed it lifted the cable and then allowed it to again drop into the trough. The car was fitted up with a 3-h. p. motor and could ac-



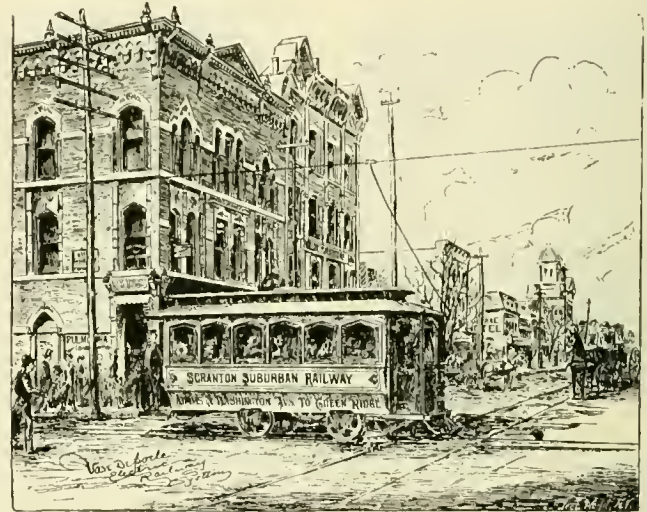
ONE OF THE EARLY INSTALLATIONS.

commodate about 25 people. During this year Field also exhibited at Chicago an electric locomotive that successfully drew one car and took its current from a conductor laid on the ground.

On July 27, 1884, an electric car made scheduled trips over a mile track in Cleveland, and this is probably the first electric car in regular operation on a street railway track in the United States. The motor was placed between the wheels and supported from the car body, and geared to the axles by belts or spring wire cables.

The current was conveyed to the car by conductors supported on insulators in a small wooden conduit, and connections made with the conductors by means of a plow extending through the slot in the conduit. This was the initial installation of the Bentley & Knight system. The road was abandoned in 1885.

In the same month, July, 1884, Van Depoele made arrangements to run an electric railway at the Toronto (Ont.) Annual Exhibition, using an underground conduit. This road was a complete success mechanically and financially. The conduit was built as follows: A wooden box was fixed in the center of the track and kept in place by means of iron brackets screwed fast to the cross ties. A narrow opening ran the entire length of the box, both sides of this opening or slot being protected by iron strips to prevent the wood from wearing. The inside and outside of the



VAN DEPOELE SYSTEM AT SCRANTON, PA.

box was painted with asphaltum. Two copper strips placed on opposite sides of the box were used as conductors, one positive and the other negative, and from the under side of the car extended two insulated conducting brushes for collecting the current. An electric locomotive equipped with a 30 h. p. motor was used, and drew three heavy cars carrying about 200 people each trip. The speed attained ranged from 20 to 30 miles an hour—a noteworthy achievement.

All of these lines had used a conductor either under or on the ground. The years 1885 and 1886 marked the beginning of installations employing an overhead conductor, and in these years roads were built on this system at Minneapolis, Minn., Montgomery, Ala., Detroit, Mich., Windsor, Ont., Appleton, Wis., Scranton, Pa., and other cities by Van Depoele; and at Kansas City, Mo., by John C. Henry. The following description of these early Van Depoele systems is taken from an old catalog, of which there are probably only two or three in existence, published by the Van Depoele Electric Co., in 1887, and loaned us through the courtesy of Mr. Chas. Flynn, general manager of the Easton (Pa.) Consolidated Electric Co.

At Minneapolis a portion of the Minneapolis, Lyndale & Minnetonka R. R. was equipped electrically. A 3-10 in. copper wire was used for the overhead conductor and the return current was made through the rails. A 6-ton motor car equipped with a 50-h. p. motor weighing 3,500 lb., was used and drew at regular intervals three loaded cars, up a 6 per cent grade 1,500 ft. long. For several months it made 47 trips per day, working 18 hours, the coal consumption for this period averaging 3,500 lb. per day of 18 hours. A slide valve engine belted to a 60-h. p. generator, and a boiler without heater or economical arrangement for fuel supplied the power.

The Montgomery, Ala., installation included an overhead wire from which current was taken by means of a flexible cable suspended from a traveler. The return circuit was made through the rails. The weight of the cars was 3,500 lb. and of the motors about 700 lb. The grade for a long distance was over 7 per cent.

The Detroit road was 1¾ miles long and owned one motor and one generator. The motor car pulled a train of three trailers, and it is said attained a speed of 27 miles per hour.

At the Appleton installation current was generated by water

power, a 60 h. p. generator being driven by a turbine water wheel. Double overhead conductors were used and no current was carried on the rails. The rolling stock consisted of five 12 ft. motor cars built by the Pullman Co., equipped with 6 h. p. motors, and these made regular trips over a 4½ mile line, on which all curves were 45 to 50 ft. radius, with grades running as high as 9 per cent.

The line at Scranton was two miles long, laid with Johnson steel rails and three Pullman cars, each equipped with a 15 h. p. motor, were operated. Steam power was furnished by a lighting station for driving the 60 h. p. generator that supplied the street railway line.

In the early Van Depoele system the motor was carried on the front platform, and horse cars were often re-equipped for this service by running two strong beams through the whole length of the car below the floor, and in addition extra cross beams were put into the floor framing to sustain the added weight. The motor was connected with the front axle by a chain and sprocket wheel gear.

The following table of costs, with the explanation is taken from the early Van Depoele catalog mentioned above, and will be of interest in this connection.

Approximate cost of running 50 street car motors of 6 h. p. each for a period of 16 hours per day:

400-h. p. steam engine at \$.02 per hour per h. p.	\$128 00
Two engineers at \$3.00 each per day.....	6 00
Two firemen at \$1.50 per day.....	3 00
Oil and waste per day.....	2 00
Interest on capital invested.....	8 00
Depreciation and sundry items.....	3 00

Total cost of 50 cars running 16 hours per day...\$150 00

Cost per car per day of 16 hours.....\$ 3 00

The above gives cost of running up to full power at all times, but it can safely be estimated that never more than two-thirds of the power is used on an average through the day, which will reduce the cost of steam power by one-third, making \$85.34, instead of \$128.00, as figured above, or \$2.06, instead of \$3.00 per car per day. With horses it is estimated the cost per car per day of 16 hours would be \$5.60.

These figures are for a road having 14-ft. cars and grades of 3 per cent.

In order to show that electricity is economical, even with a small plant the following figures are given for a four-car plant, each car equipped with a 5 h. p. electric motor, running 14 hours per day:

30-h. p. steam engine at \$.03 per hour per h. p.	\$12 60
Engineer and fireman.....	3 00
Oil and waste.....	25
Interest on capital	80
Depreciation	25

Total cost of running four cars per day of 14 hours.\$16 90

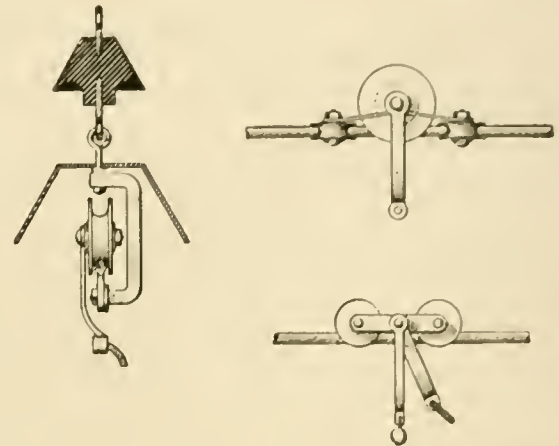
Or \$4.22 per day per car if full power is used all the time. Taking two-thirds of the power as the average requirement the expenses for steam would be reduced to \$8.40, instead of \$12.60, making \$3.17 per day per car.

The Kansas City road designed by Mr. Henry had double overhead conductors and current was supplied by compound wound dynamos. The motor fields were wound with a multiplicity of parallel wires, and the resistance was varied by connecting more or less of these in parallel by a switch. The armatures ran constantly and the connection to the car axle was made by a combined differential gear and clutch running in oil. The trolley wheels which were 3 in. in diameter, engaged the sides and bottom of the trolley wire, running in a horizontal position, and were held to the wire by strong springs. Connection was made to the car by flexible wires, enabling a traveling contact to be kept up at all times with the wire, which in some places was 15 ft. to the side of the track.

The years 1887-88 saw the real awakening of promoters and capitalists to the possibilities of the new method of traction and electric railways were built within twelve months in many sections of the country, notably at Richmond by Sprague, at Allegheny City by

Bentley and Knight, and at Washington, D. C., by the Thomson-Houston Co. In 1888 the officials of the West End road at Boston decided in favor of electricity to the exclusion of cable and horses.

On Jan. 1, 1888, as nearly as can be ascertained, there were in the United States and Canada 13 electric roads, with 48.25 miles of



EARLY VAN DEPOELE INSULATOR AND TROLLEY HEADS.

track and 95 cars. It seems hard to realize that in 12 years this number has increased to nearly a thousand roads, operating about 19,000 miles, and more than 50,000 cars, and whose capital liabilities aggregate \$1,500,000,000.

AIR AS A LUBRICANT.

An interesting experiment to show the practicability of air for lubricating journal bearings has been made by Professor Albert Kingsbury, of the Worcester Polytechnic Institute. A steel shaft 6¼ in. long and 6 in. diameter, weighing 50½ lb. was placed in a cast iron bearing about 1-2000 in. larger than the shaft; the shaft was provided with a handle at one end for turning it.

It is said that at starting the shaft can be turned with difficulty at first, and the harsh grating sound of metal rubbing on metal will be heard. With an increase of speed, however, this grating ceases, and the force required to turn the shaft is materially decreased until, after a few revolutions, the shaft becomes entirely free from the cylinder, and rotates on the film of air between. Set rotating at, say, 500 r. p. m., it will continue to rotate four or five minutes. If allowed to run, the speed gradually decreases from the start until suddenly the piston breaks through the intervening layer of air, and a few more revolutions suffice to bring it to a sudden stop.

The center of the shaft when in motion is below, and in advance of the center of the bearing, and the inclination of plane passing through the center lines of shaft and bearing will vary slightly with the speed of rotation.

The pressure existing in the film of air between the shaft and bearing varies. For the upper half of the bearing it is below atmospheric pressure, the minimum being at a point about 20° above the left end of a horizontal diameter when looking at the shaft revolving in a clockwise direction; the point of maximum pressure (in one case as much as 3 lb. above the atmosphere) is about 50° below the left end of a horizontal diameter, the rotation being clockwise. At the ends of the bearing the pressure is of course atmospheric and varies as the middle of the bearing is approached. If both ends are left open, it is found practically impossible to level the cylinder with sufficient precision to prevent the piston traveling axially when rotating on its air lubricant—another proof of the small amount of friction. A few drops of oil allowed to run into the bearing will cause sufficient friction to stop the shaft in a very few revolutions, likewise a little rust or slight abrasion on one of the surfaces will cause the experiment to fail.

The three street railway companies at Youngstown, O., of which Mr. A. A. Anderson is manager offer to give better schedules on certain of their lines, and issue interchangeable transfers at a number of points if the authorities will repeal the slow speed ordinance and grant the extension of franchises for the three roads for 25 years.

PRESERVATIVE TREATMENT OF TIMBER.

Abstract of a paper read before the Western Society of Engineers by Octave Chanute.

A report presented to the American Society of Civil Engineers in 1885 gave data concerning 147 experiments in the preservative treatment of timber; of these 16 were in kyanizing (corrosive sublimate); 30 in burnettizing (chloride of zinc); 39 in creosoting (dead oil of tar); 18 in the Boucherie process (sulphate of copper); 44 miscellaneous.

The great timber users are the railroads, the principal consumption being for cross ties; it is generally estimated that about 100,000,000 ties are required annually. A number of railroads began experimenting with processes for preserving cheap woods in 1885 and 1886, and all of them (save one whose plant was burned) are continuing the process. The Atchison, Topeka & Santa Fe has two plants using the zinc-tannin process. The Southern Pacific has two burnettizing plants, and the Chicago, Burlington & Quincy recently built a tie treating plant at Edgemont, S. D., using the burnettizing process. The Chicago, Rock Island & Pacific in 1886 contracted with Card & Chanute, now the Chicago Tie Preserving Co., to erect works at Chicago and treat 100,000 to 200,000 ties annually; this contract was in 1891 extended for three years and the number of ties increased to 300,000 and in 1894 contracted for 10 years more for an output of from 400,000 to 500,000 ties annually. The Chicago Tie Preserving Co. is also operating a movable plant at Mt. Vernon, Ill., treating ties for the Chicago & Eastern Illinois R. R.

Mr. W. W. Curtis, in a paper on the use of zinc chloride for tie preserving, read before the American Society of Civil Engineers in 1899, stated that the Santa Fe road was getting 11 to 12 years' service from mountain pine, which had a natural life of about 4 years, while getting but 6 years from natural white oak in heavy main line service and 10 years from cedar under light service. The Southern Pacific, with ties having a natural life of only 3 years, had 93 per cent of ties treated in 1889 in service after 8 years; of ties treated in 1888, 63 per cent were in use after 9 years, and those treated in 1887 gave 10 years' service. Other roads had satisfactory results from the treated ties.

The writer acknowledges that the average life in the track of ties treated at his own works prior to 1895 has not been satisfactory to himself. He expected these ties to last 12 to 15 years, and they have averaged but 9 to 11 years. In 1896, after a great many experiments, he modified the mode of treatment by using three solutions instead of two, and he now injects 2½ times as much chloride of zinc as was done in 1886, so that he anticipates that his original expectations will be realized. He has found, however, a great many anomalies in the injection of various woods. Some of the ties take two or three times as much solution as others; various kinds of wood behave differently; ties cut in summer average far less absorption than those winter cut; modifications in the period of steaming, in the time and amount of vacuum, as well as in the strength of the solution and the duration of the pressure, produce different results, some of which were puzzling; so that after 14 years of experience the writer felt the need of going to Europe, where the preservation of wood has been carried on since 1835, in order to study "the state of the art," and to avail himself of the best methods of carrying on a work which did not prove to be as simple as was at first imagined.

The countries visited were England, France and Germany, these being the regions where wood preserving is done upon the largest scale, and the following account of the information obtained will be confined to the preservation of cross ties, as this is the principal application of processes abroad.

The Europeans are obtaining much more service out of their wooden ties than we do in this country. In England the average life is at least 15 years under very intense traffic. For instance, the London & Northwestern Railway Co. reports an average service of 16 to 20 years for its sleepers, all of which are creosoted at a cost of about 25 cents each. The London, Tilbury & Southend Railway Co. says that its sleepers last 25 to 30 years, but this is a road with very light traffic. Other lines report the life at 12 to 15 years, one road alone, the Southeastern, reporting the service at 8 to 9 years, and the cause of failure to be "wear." All ties laid in England, or practically all, are creosoted with varying quantities of tar-oil, but

generally with 28 to 30 lb. per tie. The sleepers are of imported Baltic red-wood, procured in Russia, Sweden and Norway, are generally 8 ft. 11 in. long, 5 in. thick and 10 in. face, and cost from 90 cents to \$1.12 apiece delivered at the dock, so that it is good economy to treat them with creosote to lengthen their life.

In France, speaking generally, still better work is done than in England, and better results are obtained. Formerly chloride of zinc and sulphate of copper were injected, but now practically all the ties are creosoted (except by one road) and they last from 15 to 20 years. One road, the "Ligne de l'Est," obtains 25 to 30 years service out of beech ties, and there is no question as to the fact, for accurate records for 27 years prove it, but then this road injects 60 lb. of tar-oil per tie, after long seasoning and further drying in ovens, at a total cost of 64 cents each. Other roads inject lesser quantities and obtain inferior results. The increased life of the wood seems to be nearly in direct ratio to the amounts of creosote injected. The French ties are of oak, beech and pine, about three-quarters of them being produced in the country, and about one-quarter imported. The average renewal upon the French railways is now about 4½ per cent annually of all the ties in the tracks, so that the yearly depreciation in the United States is about twice and a half as much as in France. In the latter country one railway system, that owned by the State itself, employs the "zinc-creosote" process, which will be further mentioned when giving the data for Germany; all the other roads have practically gone over to creosoting, with some modifications as to the mode of injection.

In Germany three processes have been in vogue until recently. These consisted, first, in straight burnettizing, or the injection of chloride of zinc alone, such as is now practiced at some of the works in the United States, which have been mentioned; second, in the "zinc-creosote" process in which both substances are simultaneously injected in an emulsion; and, third, in straight creosoting, in which tar-oil alone is injected by one of several methods. In 1897 straight burnettizing was abandoned, it having been abundantly recognized that the chloride of zinc leaked out of the wood in time, and at present only the other two processes remain in practical application upon an extended scale. There are other methods still lingering of very limited application, and there are some new processes now coming forward which will be noticed further on.

The reason why burnettizing continued so much longer in Germany than in England or in France appears to be mainly climatic. Not only is the rainfall less in Germany, but its character is different, consisting, as the writer was informed, mainly of long drizzling rains, which do not wash the ground and the ties like the heavy downpours in the other countries, which are so often followed by fierce evaporating suns. Be this as it may, the service hitherto obtained from burnettized ties in Germany has been from 9 to 12 years in the track; the timber injected has chiefly been pine and beech, and the cost of injection for first class ties, 8 ft. 10 in. long, 10.2 in. wide and 6.3 in. thick, has been 15.6 cents each for pine and 18.8 cents for beech, which latter wood absorbs more solution. These woods are obtained locally, as the State owns some 31 per cent of the forest area of Germany, makes this a source of profit, and discourages importation.

The price paid for the injection with "zinc-creosote" of first class ties is 19.2 cents for pine, 20.4 cents for beech, and 15.6 cents each for oak, inasmuch as this last wood is very refractory and absorbs much less of the solution. The service obtained has been from 12 to 18 years in the track, but the most convincing evidence of the value of the process consists in the guarantee which the contractor, Mr. Julius Rutgers (who first introduced this method), has given in some cases. He first excludes 5 per cent of all the ties treated, as damaged by hidden defects and rotten spots which cannot be detected in inspection, and guarantees that of the remainder 95 per cent shall still be fit for service in 10 years, 80 per cent in 11 years, and 70 per cent in 12 years. If less than the above remain, and are proved to have been properly taken out for decay, he makes the deficit good by refunding the price paid for treatment or treating another tie gratis, at his option. In point of fact, inasmuch as a premium of 2.4 cents a tie is charged for this guarantee, the Prussian State Railways prefer to pay the regular price above mentioned for treatment, and to protect themselves by the issue of elaborate specifications, which have been revised several times, making them more and more stringent, and by placing inspectors at the works.

In Germany, as elsewhere, straight creosoting gives the best results, but it is expensive. The price paid for the impregnation of

first class ties is 53.76 cents each for pine, 56.64 cents for beech and 26.88 cents for oak, the latter being in consequence of the smaller absorption, if the creosoting is done after drying in special ovens. The price is 56.64 cents each for pine, 59.28 cents for beech, and 28.80 cents for oak, if boiled and impregnated in heated tar oil. The service obtained is 20 to 23 years for pine, 30 to 34 years for beech, and 24 to 28 years for oak; these figures as to life being taken from the report of the Union of German Railways for 1896, published in organ of railroad progress, Weisbaden, 1897. The results must seem astonishing to our American railroad managers, but then, very great care is taken of the ties after they get into the track, the mode of fastening to the rail is superior to our own, and all the inspections are rigid.

Nothing impressed the writer more forcibly than the extreme care, and the particular precautions enforced, in Europe in order to do the best kind of work. The ties are minutely inspected when first received, and the German specification would appal an American tie contractor; the amount of waney is elaborately specified, and a single rotten spot, or red heart, in beech, condemns a stick. If there are incipient cracks at the ends, sharpened straps of heavy tapering hoop iron, bent into the shape of an S, are driven in, or a hole is bored with an auger, and an iron bolt is inserted and screwed up against washers. The ties are then seasoned from 6 to 12 months before they are impregnated. They are cribbed up in isolated square piles of about 100 ties, with some 4 in. air spaces between the sticks, so that they may dry thoroughly in the yards adjacent to the treating works. Some of these yards can contain 600,000 ties, and the writer saw one in which 250,000 ties were piled up for this year's treatment. The piles are examined from time to time to determine when the wood reaches the best condition; if more cracks are developed, more S-straps are driven in. This careful seasoning, the result of long experience, constitutes one of the principal differences from American practice, in which the ties are treated within three or four months from the time of their cutting, and it accounts in a great degree for the inferior results which we have hitherto obtained. After the ties are treated they are again piled up and allowed to dry before being put into the track, although this precaution is less strenuously insisted upon, and emergencies are met by laying freshly treated ties.

It is the work of impregnation which is subjected to the greatest care. It is carried on by experts, and to elaborate specifications. While carrying on the work inspectors are in attendance to test the strength and purity of the substances injected, and for this purpose a chemical laboratory is attached to each treating plant; the ties are weighed by buggy loads before and after treatment, and the amounts absorbed are thus checked. If a buggy load proves deficient it is treated over again. To ensure uniform work, automatic gages with clock-work attachment register the amounts of vacuum and pressure obtained in the treating cylinder, as well as their duration, and a record diagram is taken and preserved of each treatment. Thus is obtained a uniform absorption of the chemicals in the prescribed quantities, and thus are produced the satisfactory results in service which have already been mentioned.

Much of the credit for the careful work done in Germany is due to Mr. Julius Rutgers, a contractor, who has been in the business for just 50 years. He is a man 70 years of age, and now controls some 20 plants which do most of the tie treating for Germany. The Royal Prussian State Railways, which comprise practically all in Prussia, have four tie treating plants of their own, but several of the state officials told the writer that Mr. Rutgers was so thoroughly equipped and through his long experience enabled to do so much better work than the state itself, that the latter preferred to contract with him rather than to enlarge the present railway plants. He is in no wise protected by patents, but simply by his known skill and honest work.

Further care is exercised in laying the ties in the track, and the mode of fastening to the rail is decidedly superior to our own. In Europe ties are generally adzed and bored for spikes by machinery before being treated. The adzing provides a smooth seat for the chair, tie plate or rail, which latter is generally laid on a "cant," and the boring not only obviates the crushing of the fibres of the wood by a spike, were such a primitive mode of fastening still generally used, but it also assures thorough chemical treatment at this dangerous spot. In point of fact it may be said that the spike has now been abandoned in the three countries which have been above named. In England, the standard is the "bull-head" rail, a rail

with two heads, and it is laid in cast iron chairs, which are fastened to the tie by round iron dowel pins and wooden tree-nails, driven into bored holes. In France and in Germany the foot rail is generally used, together with tie plates, and the latter are fastened to the tie by lag screws of various designs. In some cases spikes are used on the outside, and the spike is used on both sides in side tracks, but the lag screw, which the French call "tirefond," is considered the standard. In France holes for these are bored by machinery, but the Germans now generally bore for these by hand when laying in the track. They admit that it would be cheaper and better to bore before treatment, so as to impregnate thoroughly around the hole, but they are now experimenting with so many patterns of tie plates and rails that they cannot tell before treatment to which pattern the tie is to be fitted. The French have been using not only iron tie plates, but also some of felt, and claim that the latter last 6 to 10 years, at a cost of 1.6 cents each, but these are now being superseded by creosoted poplar tie plates, cut from the lower gnarly portion of the tree, to about the thickness of a shingle, which are said to be more economical than either iron or felt tie plates. The argument made is that the iron tie plate wears both the rail and the tie, while the poplar tie plate takes all the wear to itself, and, as it costs but about .8 cent, proves most economical.

But the great, the radical improvement in tie fastening consists in the discarding of the barbaric spike, which when driven, crushes the wood into a spongy mass, collects moisture to rot the tie, gets loose and allows the rail to flap up and down so as to cut the tie at each stroke. The sooner we set about to supersede this with some form of lag screw appropriate to our rails, the better it will be for track economy. In Europe the lag screw is conceded to be as much of an improvement upon the spike, as the fish plate proved to be upon the old fashioned chair.

It will be realized from the foregoing that great care is exercised in the preservative treatment of timber in Europe. The timber is closely inspected, it is thoroughly seasoned, it is impregnated upon scientific principles, and it is laid in well drained ballast with track fastenings superior to our own. It is, therefore, not surprising that much better results as to service are obtained than in this country.

The question which now occurs is how much of the European practice can profitably be adopted in the United States? It has been abundantly proved by over fifty years of experience that creosoting is the best preservative of timber, but also that it is the most expensive, and it is now yearly growing more expensive, as the price of tar-oil is advancing year by year with the recognition of its merits. In consequence of the high price paid for stumpage the Europeans start with a much more expensive tie than we do. In England, for instance, a pine tie untreated cost 90 cents to \$1.12, in France it cost about \$1.00 and in Germany from 82 to 90 cents; hence more money can be spent upon it profitably to prolong its service. It would cost, at the present price of creosote, about 45 cents each to impregnate ties according to the English practice, and about 85 cents to inject it with the quantity prescribed by the "Chemin de Fer de l'Est" in France, where the process involves the baking of the tie for 72 hours in a drying oven before injection. It is hardly to be expected that our railroad managers will feel justified in incurring this expense to preserve a tie which costs but 20 to 40 cents in the first place. We must, therefore, resort to cheaper processes, recognizing them as inferior, and yet more appropriate to the cheaper timber which we are still so fortunate as to possess.

Now what shall that process be? Opportunely for us European experience has made the choice of the substance to be used more limited than it was a few years ago. Sulphate of copper and bichloride of mercury, although excellent antiseptics, have proved to be, on the whole, less available for timber preserving than chloride of zinc, and although the latter when injected alone, has now been abandoned in all the three countries mentioned, some modifications of burnettizing may profitably be employed in this country. Indeed, in the more arid regions of the United States chloride of zinc alone will probably give satisfactory results, but there must be plenty of it injected, certainly more than is the practice at present at some of the works; for it has been well established that it leaches out during the alternate soaking and drying which the ties undergo.

The German specifications require that a pine tie, for instance, which contains 3.96 cu. ft. absorbs 35 kilograms, or 77 lb. of the solution; as this solution is specified to be at 3.5 degrees Beaume,

which contains 2.63 per cent of dry zinc-chloride, it follows that the amount of the latter substance carried in by the aqueous solution is 1.92 lb. per tie, or at the rate of .49 lb. to the cubic foot of wood. This corresponds to the present practice of the writer, who has been injecting, as closely as possible, .50 lb. to the cubic foot for the last three or four years, with what practical results we shall not know to an absolute certainty for 8 or 10 years to come. As the ties reach him much worse seasoned than is the practice in Germany, and as he cannot inject as many pounds of solution, he is making the latter 5 degrees Beaume strong, containing 3.9 per cent of zinc chloride, and he thus puts in as much dry chloride as the Germans. This refers to the first solution employed, which is followed by two others. The second consists of gelatine or glue, and the third of tannin, the peculiarity being that these two latter substances, which are both soluble, form, when brought into contact with each other, an insoluble compound, an artificial leather in fact, the pellicles of which lodge in the sap cells of the wood and obstruct the ingress and egress of moisture, but not of vapor. The wood being already nearly filled by the first solution, the last two do not penetrate very far, say about three-quarters of an inch, but this is sufficient to act as a rough plug, and it has been proved to retard materially the leaching out of the zinc. It has, moreover, been found important to allow the ties so treated to dry somewhat before being put into the track, in order to allow the pellicles of artificial leather to harden. It has also been found that the ties last better in some soils than in others; limestone ballast and coal mine refuse, or culm, being seemingly the most injurious. For regions of considerable rainfall, the writer entertains no doubt that this "zinc-tannin" process is superior to straight burnettizing when equal amounts are injected.

The German method of retarding the leaching out of the chloride of zinc (for they say that it washes out even then), has been to mix therewith a certain quantity of tar-oil, which by lining the sap cells of the wood and hardening therein shall prevent the intrusion and the exit of moisture. The measure of success which they have accomplished has already been given, and this success seemed, by report, to be so much greater than that with ties treated by the "zinc-tannin" process, from 1886 to 1896, at the works of the writer, that he devoted great scrutiny while abroad to the "zinc creosote" process, with a view to adopting it should it clearly be superior. As a result of that scrutiny he believes it to be very good, but he is not now certain that the results will warrant the increased expense, which will be 3 or 4 cents a tie, inasmuch as a part of the increased service in Germany, as compared with the United States, is attributable to other causes, such as the more thorough seasoning of the wood, the better track fastenings, the character of the rainfalls, etc. It is a significant fact that the Germans report a life for untreated white oak of 10 to 16 years, with an average of 13.6 years, while we can only obtain a life of 8 to 10 years for that wood in this country. Moreover, while for straight creosoting only 10 per cent of tar-acids are required in the tar-oil, for the "zinc-creosote" process a peculiar quality of tar-oil, containing 20 to 25 per cent of tar-acids is required, which quality is not now produced in the United States. The introduction of this process therefore requires material changes in the distillation of coal tar in this country, or the importation of foreign tar-oils, which are just now very scarce and high.

Be this as it may, the writer deems it desirable that the "zinc-creosote" process shall be introduced in the United States, and it is his intention to do so, but it will require some time to investigate the best sources of supply, and to make chemical analysis of the products, and it will perhaps be necessary to erect a tar-oil refinery, as the process has to be carried on with great nicety, and some of the foreign plants are found to do much better work than others.

The question also occurs whether there are not other cheap processes which might be profitably introduced in this country. The writer learned of three new methods now being promoted in Europe. One is the "Hasselmann" process, which consists in boiling the wood in a solution of the sulphates of copper and iron, with alumina and "kañit," a salt mined at Stassfurt, Germany, consisting chiefly of sulphate of potassa and magnesia, and the chloride of magnesia. The process has been experimented with about three years in various parts of Germany, but of course the time is too short to be sure as to the results. Another process, now being experimented upon by a Berlin chemist, may be termed the "water-creosote" process. It consists in mixing intimately tar-oil with water in varying proportions; the rationale of which is that the tar-oil will be thereby

much more uniformly distributed throughout the wood, and hence a less quantity will suffice. The writer saw a number of specimens prepared by this process in Berlin, and they seemed to be quite uniformly impregnated. Still another process is being worked up in Russia, where some skillful chemists say that they have obtained an antiseptic element from the refinement of petroleum, and are studying its practical application to the preservation of timber.

In the discussion following the paper Mr. Chanute stated that he had examined side tracks at Titusville, Pa., used for loading crude petroleum, and found the ties well preserved after 10 or 11 years' service; in tracks laid at the same time, but not used for some years the ties were badly decayed, indicating that petroleum is a preservative only as long as it continues liquid. In tropical countries creosote is the only preservative that has proved effective; in India ties cut in Russia and creosoted in England are used almost exclusively, where any wood is used.

Mr. Chanute would not recommend mineral salts for bridge timbers subjected to tensile or shearing stresses; Burnettizing if overdone makes the ties very brittle. Mr. W. W. Curtis said that while this was the general opinion, he was very doubtful whether the chemicals injured the wood, and the heat was no higher than in the creosoting process; there have been few tests made on the strength of burnettized timber, and the matter should be investigated.

In further description of the three solution zinc tannin process Mr. Chanute said: "There is a fact well established from hundreds of experiments with an experimental plant which we have, that the addition of gelatine to the chloride of zinc solution made the latter less fluid, rather viscid, and that the solution therefore did not enter into the wood in the same quantities, nor penetrate as far; therefore I changed the process, which was still, however, under the original patent, as the specification covered fully the change I made. This was to inject first a solution of chloride of zinc, and that we make just as limpid as water, so that when held up in a glass it is as clear as the Chicago water is now. That is injected as a first solution, after the wood has been prepared first by steaming and then by vacuum in order to clear the pores of the dead air as far as possible. The injection is done under a pressure of 100 lb. and a temperature of 150° F. I would say that we find we can extract more sap from a partially seasoned tie than from one fresh cut; the one fresh cut has three times as much sap, but we cannot get it out, and I attribute that to the fact that when the tie is fresh cut, it is impracticable to heat the interior of it sufficiently to change the watery portions of the sap into steam. We are therefore not placing motive power behind to push the sap out of the sap duct; while, after it is partially seasoned, air has flown in, and by heating that air it acts in expansion and pushes the sap out, so that after a period of steaming (in order to heat the timber and the air inside of it) we create a vacuum, during which steaming and vacuum we find that the sap comes off abundantly."

TRADE JOURNALS AND BOOKS.

Tecumseh Swift, writing in the American Machinist, makes the following comparisons between trade papers and technical books: The book writer deals mostly with what has been, while the trade journal has to do much more with what is and what is coming. The trade journal cannot be made by one writer, as the book can, but needs the active co-operation of the many, and it must be in touch with many more. I can understand much better how a live mechanic can get along without many technical books than I can his living and thinking he can know what he ought to know without his trade paper. I have an idea that the trade papers are to become more important and useful and necessary as the years roll on, and that no one can keep the run of progressive development and attainment without them.

The United Traction Co., of Albany, N. Y., has secured a fine fireproof building at Broadway and Columbia St., Albany, where it has located all its business offices.

Thirty horses were required to haul a new cable for the Metropolitan Street Railway Co., of New York, from the depot to the power station. The truck on which it was carried had wheels with 8-in. tires.

POINTS FOR THE MANAGER.

In discussing Mr. A. E. Judge's paper before the Southwestern Gas, Electric & Street Railway Association, Mr. E. H. Jenkins, president of the San Antonio Traction Co., said in part:

"Mr. Judge says in regard to the manager, 'he should intelligently study the men under him and employ those who are trustworthy and capable of performing well the specified duties assigned them.' I have a little fellow in the office in San Antonio only fit for one thing, and that is to collect bad bills. He is an expert on that. In that particular he is almost invaluable to us. That same thing can be looked after all the way through the plant. You will find somebody just a little bit better suited for a certain position than anybody else, and you can well afford to pay him a salary to keep in that particular place.

"I think every laboring man you have that has any intelligence at all and employed in any particular office where intelligence is required, should understand that he is in the line of promotion. It is an incentive to him that will redound to the company's benefit. It will create a kindly feeling between the management and the man.

"In regard to the question of employes. I try to impress upon the employes that the reputation of the company is made by the men who come in contact with the public. The meter reader, the

I have had the question raised that it took too much time. After you have once gotten into it it don't take any more time than it did a year ago to make out your monthly report, and you can get out by the 5th of the month a detailed statement, and you can see any little difference as to where your expenses are increasing or decreasing."

RUSTIC THEATER AT MERRYMEETING PARK.

Merrymeeting Park is situated near Brunswick, Me., on the Lewiston, Brunswick & Bath Street Ry. It is well equipped with the usual attractions for resorts of this nature, including a casino, and an open-air theatre. The basement of the casino is devoted to a kitchen and storeroom, the ground floor to a general waiting room and a large ball room. On the second story are ladies' parlors, a smoking room and private and public dining rooms.

The rustic "theater" consists simply of a strong, but cheaply constructed stage placed in the center of a natural amphitheater formed by a ridge of ground, the sides of which were smoothed off and seats and stairways placed in position. This economy in construction brings up an interesting point. We do not believe that, with the possible exception of a few of the larger systems, conditions justify the erection of a street railway park of an expensive building exclusively for theatrical purposes, for the money can be invested



AFTERNOON AUDIENCE AT MERRYMEETING PARK.

service man, the meter man, the collector, all of these make the reputation of the company. If they are courteous and gentlemanly in their treatment of your customers you will have a reputation of being a gentlemanly manager, and if they are not it will be the hardest work in the world to prove to your community that your manager is anything but the same class of man that his representatives are.

"The manager of a public service industry has a great deal of prejudice to contend with. He has got to be a man that is commonly called a mixer. He has got to be a man that can go to a Sunday school and be at home. And on the other hand, if there happens to be a German picnic on a Sunday afternoon it won't hurt him to go out and let them know he is living. He has got to be a man to adapt himself to almost any situation.

"The point of a comprehensive set of accounts to be kept so that the condition of business can at all times be understood is a great deal more important than we imagine until we go into it, and the more you get into it, the more information you will get. I spent a year in San Antonio in just getting into that work, or getting the San Antonio people into it, and after six months, a man who had never attempted to do any detail work before said that it was the most interesting work he ever got into. And we are trying to be able to tell the details of the cost of producing a kilowatt-hour all the way from the time the coal leaves the car until the consumer pays for it, and in that we have something like thirty different departments or places that we find what the cost is. That looks at first as if it was uncalled for, and

with very much better results in raising the standard of the performances than in the building itself. For instance, instead of putting up a theater costing from \$10,000 to \$15,000, as has frequently been done, an outdoor stage surrounded by chairs, the entire affair costing from \$500 to \$800 would have afforded all the accommodations the public could desire, and the owners could then have the interest, say \$400 to \$600 a season, on what an elaborate theater would have cost, to apply toward securing talent of a higher grade for the performances.

The one objection to this arrangement, that is the danger of sudden showers, may easily be met by building an inexpensive pavilion near the stage, where the audience can find shelter in emergencies. This pavilion should soon pay for itself by the renting of a portion of the floor for refreshment privileges. It has been argued that an enclosed theater enables performances to be given on rainy days as well as fair, but experience has shown that people will not seek pleasure at a park, whatever the attraction, if it is raining, or even threatening, so it is not probable the fact that the entertainment was to be given in an enclosed building would have much influence, and when the weather is pleasant, there is no question about the outdoor stage proving more agreeable to the public than an enclosed building, no matter how well ventilated.

The accompanying engraving shows a typical afternoon audience at the open-air theater at Merrymeeting Park, for which all the attractions are furnished by the J. W. Gorman Amusement Co., of Boston.

REPORT OF MASSACHUSETTS STREET RAILWAYS.

The Massachusetts Railroad Commissioners' report for the year ending Sept. 30, 1899, has just been issued and contains the returns from 116 companies, 13 more than for the previous years. Of these 116 reporting companies, 81 were operating their own railways; the properties of 13 companies were operated by other companies under lease or contract; 10 companies had organized and were constructing their lines; 3 had paid in a portion of their capital stock, but not yet commenced construction work; 9 had been consolidated with other companies during the year.

During the year the additions to the street railways aggregated 201.05 miles measured as single track; 162.43 miles of main line, 35.13 miles of second main track and 3.49 miles of side track. The total owned by Massachusetts companies is 1,845.71 miles; 1,401.80 of main line, 243.65 miles of second track and 110.17 miles of side track. All of this, except 21.06 miles (in Rhode Island) is in the state. Of the 1,735.54 miles of main track 4.76 miles are operated by horse power only, and on 2.60 miles additional horse power is used as an auxiliary. In 1889 there were 46 companies operating 574.17 miles of main track, of which 50.52 miles were equipped for electricity.

The average cost of the street railways of the state per mile (including the cost but not the length of side track) was \$22,863 for construction, \$8,518 for equipment, \$11,598 for lands and buildings; total, \$42,979. The average capital investment per mile was \$45,040; for the ten largest companies of the state the total cost per mile averages \$64,507 and the capital investment \$65,479.

The gross assets were \$85,764,845, an increase for the year of \$8,157,519; the gross liabilities were \$83,279,891, an increase of \$7,390,266; the surplus was \$2,484,954, an increase of \$767,253; the sinking and other special funds were \$942,221, an increase of \$556,572. The percentage of the surplus to capital in 1899 was 6.01 as against 4.41 for 1898 and 3.60 for the last 10 years.

The gross earnings from operation were \$18,151,550; income

Capital Stock, Net Income and Dividends, 1890-1899.

YEARS.	Capital Stock.	Net Divisible Income.	Cash Dividends Declared.	Percentage on Total Capital Stock.
1890,	\$14,879,130	\$1,430,116	\$963,154	6.47
1891,	19,553,952	1,299,153	1,100,015	5.63
1892,	23,590,536	1,905,680	1,582,697	6.71
1893,	25,883,575	1,993,399	1,716,637	6.63
1894,	26,971,275	1,812,668	1,610,856	5.97
1895,	27,906,685	2,257,355	1,606,196	5.76
1896,	80,727,818	2,280,776	1,802,847	5.87
1897,	32,670,273	2,593,147	1,965,243	6.02
1898,	38,933,917	2,534,002	2,076,233	5.31
1899,	41,380,143	2,502,942	2,318,398	5.60
Averages,	\$28,249,730	\$2,660,923	\$1,674,231	5.93

from other sources brought the total income up to \$19,519,338. Operating expenses were \$12,378,487; interest, \$1,622,688; taxes, \$1,188,735; rentals of leased lines and other charges on incomes, \$521,809; dividends, \$2,318,398; surplus for the year, \$184,544.

The total of cash dividends for the year was \$242,165 more than in the preceding year, and the surplus for the year was \$273,225 less than in 1898. Only 54 of the 116 companies paid dividends; 17 paid 8 per cent; 1 paid 8 per cent on preferred and 7 per cent on common stock; 1 paid 7 per cent; 11 paid 6 per cent; 1 paid 5½ per cent; 5 paid 5 per cent; 3 paid 4½ per cent; 4 paid 4 per cent; 2 paid 3¾ per cent; 1 paid 3½ per cent; 3 paid 3 per cent; 3 paid 2½ per cent; 1 paid 2 per cent; 1 paid 1½ per cent. These 54 companies paid an average rate of 6.68 per cent on \$34,704,100, as against a corresponding rate of 6.17 per cent the preceding year.

Gross and Net Earnings from Operation per Mile of Main Track Owned and per Round Trip Run, 1890-1899.

YEARS.	AVERAGE PER MILE OF TRACK.			AVERAGE PER ROUND TRIP.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1890,	\$13,632	\$10,197	\$3,435	\$2 22	\$1 66	\$0 56
1891,	13,178	10,032	3,146	2 24	1 70	0 54
1892,	12,980	9,312	3,668	2 35	1 69	0 66
1893,	12,392	8,582	3,810	2 41	1 67	0 74
1894,	11,972	8,321	3,651	2 39	1 66	0 73
1895,	12,127	8,359	3,768	2 55	1 75	0 80
1896,	11,627	8,274	3,353	2 47	1 76	0 71
1897,	11,187	7,713	3,474	2 41	1 66	0 75
1898,	10,998	7,589	3,409	2 45	1 69	0 76
1899,	10,459	7,132	3,327	2 55	1 74	0 81
Averages,	\$11,748	\$8,255	\$3,493	\$2 42	\$1 70	\$0 72

Percentage of Operating Expenses to Gross Earnings, 1890-1899.

YEARS.	Gross Earnings from Operation.	Operating Expenses.	Percentage of Expenses to Earnings.	Net Earnings.
1890,	\$8,348,285	\$6,244,208	74.80	\$2,104,077
1891,	8,861,841	6,746,301	76.13	2,115,537
1892,	9,798,060	7,029,479	71.74	2,768,581
1893,	10,832,174	7,501,845	69.26	3,330,329
1894,	11,119,846	7,729,059	69.51	3,390,787
1895,	13,184,342	9,088,086	68.93	4,096,256
1896,	14,844,262	10,563,371	71.16	4,280,891
1897,	15,815,267	10,904,040	68.95	4,911,227
1898,	16,915,405	11,672,731	69.01	5,242,674
1899,	18,151,550	12,378,488	68.20	5,773,062
Averages,	\$12,787,103	\$8,985,761	70.27	\$3,801,342

Operating Expenses and Net Earnings (Ten Railways) in 1899.

RAILWAYS	Percent- age of Operating Expenses to Gross Earnings	NET EARNINGS PER			
		Mile of Track Operated.	Round Trip Run.	Car Mile Run.	Passen- ger Carried.
Brockton,	55.35	\$3,630	\$0 89	10.87	2.23
Globe (Fall River),	58.87	4,762	0 67	10.66	1.93
Holyoke,	66.51	2,495	0 60	6.66	1.75
Lowell, Lawrence & Haverhill,	57.83	3,283	1 23	11.64	2.11
Lowell & Suburban,	56.74	2,899	0 72	9.22	2.18
Lynn & Boston,	54.93	4,581	1 25	11.68	2.33
Springfield,	69.24	3,007	0 60	5.77	1.56
Union (New Bedford, etc.),	58.09	4,638	0 57	9.70	2.24
West End (Boston, etc.),	70.59	9,725	0 90	8.22	1.49
Worcester Consolidated,	71.98	3,255	0 48	7.26	1.40
Averages,	67.16	\$5,864	\$0 87	8.68	1.66

Gross and Net Earnings from Operation per Car Mile Run and per Passenger Carried, 1890-1899.

YEARS.	AVERAGE PER CAR MILE.			AVERAGE PER PASSENGER.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1890,	Cents. 31.48	Cents. 23.87	Cents. 7.61	Cents. 5.06	Cents. 3.79	Cents. 1.27
1891,	32.03	24.38	7.65	5.03	3.83	1.20
1892,	33.01	23.69	9.32	5.05	3.62	1.43
1893,	31.39	21.74	9.65	5.07	3.51	1.56
1894,	30.28	21.05	9.23	5.04	3.50	1.54
1895,	30.20	20.82	9.38	5.07	3.50	1.57
1896,	27.69	19.70	7.99	5.08	3.61	1.47
1897,	25.68	17.71	7.97	5.12	3.53	1.59
1898,	24.80	17.11	7.69	5.11	3.52	1.59
1899,	24.74	16.87	7.87	5.09	3.47	1.62
Averages,	28.07	19.73	8.34	5.08	3.57	1.51

Employees and Equipment, 1890-1899.

YEARS.	Employees	Cars.	Other Vehicles.	Horses.	Electric Motors
1890,	6,216	3,247	567	11,211	-
1891,	6,449	3,494	577	10,640	-
1892,	7,185	3,679	552	6,734	-
1893,	8,070	4,040	681	3,531	3,013
1894,	7,451	4,058	1,790	2,911	3,906
1895,	8,048	4,426	1,755	1,436	4,704
1896,	9,130	4,913	1,876	878	5,958
1897,	9,716	5,344	1,953	683	6,908
1898,	10,416	5,734	1,997	605	7,643
1899,	11,944	6,042	2,076	455	8,530

The total number of passengers carried was 356,724,213, an increase of 25,834,584 over the preceding year; the car-miles run were 73,367,235, an increase of 5,160,817; the length of the average round trip was 9.9 miles in 1898 and 10.3 miles in 1899; the number of passengers per round trip increased from 48 in 1898 to 50 in 1899.

Ratio of Accidents to Number of Passengers, Employees, etc., in 1888, 1898, and 1899.

PASSENGERS CARRIED, ETC.	1888.*	1898.	1899.
Total Number of			
Passengers carried,	131,478,319	330,889,629	356,724,213
Employees,	5,531	10,416	11,944
Miles of track operated,	533.59	1,590.95	1,739.29
Round trips run,	3,220,578	6,887,976	7,104,843
Car miles run,	23,244,767	68,206,448	73,367,235
Passengers Killed, 4 9 11			
Ratio to all passengers,	1 to 33,619,580	1 to 36,765,514	1 to 32,429,474
Ratio to miles of track,	1 to 133.40	1 to 176.77	1 to 158.12
Ratio to round trips,	1 to 805,145	1 to 765,331	1 to 645,895
Ratio to car miles,	1 to 5,811,192	1 to 7,578,491	1 to 6,669,749
Passengers Injured, 140 1,389 1,605			
Ratio to all passengers,	1 to 960,559	1 to 238,221	1 to 222,258
Ratio to miles of track,	1 to 3.81	1 to 1.15	1 to 1.05
Ratio to round trips,	1 to 23,004	1 to 4,959	1 to 4,427
Ratio to car miles,	1 to 166,034	1 to 49,105	1 to 45,712
Employees Killed, 1 2 5			
Ratio to all employees,	1 to 5,531	1 to 5,208	1 to 2,389
Ratio to miles of track,	1 to 533.59	1 to 795.47	1 to 347.86
Ratio to round trips,	1 to 3,220,578	1 to 3,443,988	1 to 1,420,969
Ratio to car miles,	1 to 23,244,767	1 to 34,103,209	1 to 14,673,447
Employees Injured, 11 46 67			
Ratio to all employees,	1 to 503	1 to 226	1 to 178
Ratio to miles of track,	1 to 48.51	1 to 34.59	1 to 25.96
Ratio to round trips,	1 to 292,780	1 to 149,739	1 to 106,042
Ratio to car miles,	1 to 2,113,161	1 to 1,482,748	1 to 1,095,033
Other Persons Killed, 6 27 32			
Ratio to miles of track,	1 to 88.93	1 to 58.92	1 to 54.35
Ratio to round trips,	1 to 536,763	1 to 255,110	1 to 222,026
Ratio to car miles,	1 to 3,874,128	1 to 2,526,164	1 to 2,292,726
Other Persons Injured, 76 740 768			
Ratio to miles of track,	1 to 7.02	1 to 2.15	1 to 2.26
Ratio to round trips,	1 to 42,376	1 to 9,308	1 to 9,251
Ratio to car miles,	1 to 305,852	1 to 92,171	1 to 95,530
Total Killed, 11 38 48			
Ratio to miles of track,	1 to 48.51	1 to 41.87	1 to 36.21
Ratio to round trips,	1 to 292,780	1 to 181,263	1 to 148,018
Ratio to car miles,	1 to 2,113,161	1 to 1,794,906	1 to 1,528,481
Total Injured, 227 2,175 2,440			
Ratio to miles of track,	1 to 2.35	1 to .73	1 to .71
Ratio to round trips,	1 to 14,188	1 to 3,167	1 to 2,912
Ratio to car miles,	1 to 102,400	1 to 31,339	1 to 30,069
Total Killed and Injured, 238 2,213 2,488			
Ratio to miles of track,	1 to 2.24	1 to .72	1 to .70
Ratio to round trips,	1 to 13,532	1 to 3,113	1 to 2,856
Ratio to car miles,	1 to 97,667	1 to 30,821	1 to 29,488

* Operation wholly by horse power.

Ten railways of the state have 65 per cent of the entire capital, operate 47 per cent of the total mileage and carry 81 per cent of the whole number of passengers.

Data as to earnings, expenses, employes, equipment and accidents are given in the tables.

SINGLE TRACK ROADS VS. BELT LINES.

"How shall we lay out our system to secure the best results under the conditions before us?" is one of the first questions that presents itself to the promoters of a new street railway enterprise, and also oftentimes to older companies contemplating new extensions to a neighboring suburb, or into a different section of the city. The point is one that should be considered even before attempt is made to secure franchises, for the entire success or failure of the project will often turn on the way in which it is decided.

In our opinion there is no doubt about two things, i. e., a tributary population of less than 30,000 to 45,000 population will not ordinarily support a double track road, with both tracks in the same street, and for a population of less than 25,000, a single track line with turnouts will secure the best results. The relative advantages of the belt system, by which cars go up one street and down another a short distance away, over the single track line for places having from 25,000 to 45,000 inhabitants, are to be decided by the distribution of population and the layout of the streets.

We print herewith several opinions on this question, received in response to a letter of inquiry sent to managers in a few of the smaller cities, ranging from 10,000 to 25,000 population.

Mr. A. P. Southworth, president and general manager of the Adrian Street Railway Co., of Adrian, Mich. (population, 12,000): "Our line is to be re-constructed this season and re-equipped and looped on each end, with one turnout between loops. I do not believe a city of 12,000 inhabitants will justify a belt line unless exceptional conditions exist. For certain reasons, such as exist here, it may be policy to loop either one or both ends to bring your road in touch with certain manufacturing, railway or park districts, but I do not think the local resident traffic justifies the building of any line in a city of this size. By looping the east end of our line, it brings us in touch with two freight houses, two depots, several large manufacturing plants and car shops. By looping the west end we pass in front of the Adrian College and gain the advantage of having the cars run in the same direction all the time."

Mr. W. M. Roberts, jr., superintendent of the Cumberland Electric Railway Co., of Cumberland, Md. (population, 16,000): "Our road is single track with turnouts. The question, in my opinion, depends upon local surroundings or the layout of streets. In this town, I think a belt line to the suburbs just half-way to our park, and single track with turnouts the rest of the way, would have been to our advantage, as the only two streets running through in that direction are nearly parallel, and are not over 300 ft. apart at beginning, gradually coming together and meeting about half way out on our line. The line to South Cumberland is all right with single track and turnouts, although there is a possibility that another single track road in another direction and connecting at Cumberland with the one now built would be of advantage."

The Menominee Electric Railway & Power Co., of Menominee, Mich., (population, 15,000): "We believe a single track road with turnouts the best for a small town. The difference in cost between a belt line and a single track road is more than would be gained by the advantages of the former."

Mr. W. A. Foote, receiver of the Jackson Street Ry., of Jackson, Mich., (population 25,000): "The cost of a belt line is more than for a double track road, and in so small a town as ours no one could afford to put down a double track. If you want and can afford a double track, then the belt line is best, if you do not separate the tracks more than a block."

Mr. J. C. Hubinger, president of the Keokuk Railway & Power Co., of Keokuk, Ia., (population 18,000): "In reply to your letter would say, in building a street car line, you cannot always adopt the same method in one place that you could in another, and I believe that one plan will work better in one town than it will in another. In this city, our line is a single track road with turnouts. On one portion of our line at one time, we found that it would only require us to extend our line three blocks in order to connect with another track, which would give us a circuit from our city park back to Main St., but we only operated that portion of the track a very short time, as we found that we received no more revenue than we did on the old plan and therefore we are now operating our line with turnouts. The manner in which a city is built would in my judgment have a great deal to do with the laying of track, and if a city was scattered out a great deal, so that the distances were such that it was necessary for people to ride, I

would think that the belt principle would be the better, but where a city is compactly built, as is Keokuk, we find the single track with turnouts serves our purpose better."

Mr. H. F. MacGregor, vice-president and general manager of the Houston Electric Street Railway Co., of Houston, Tex., (population 45,000), in a paper presented at the recent meeting of the Southwestern Gas, Electric & Street Railway Association, favors the belt system for cities in the class with Houston, giving as his reasons that it covers greater territory for the same operating expenses and affords greater protection against accident over a double track system, and is less liable to delays and annoyances than a single track with switches.

ELECTRIC RAILWAYS OF SAXONY.

(From the U. S. Consular Reports.)

The statistics of the electric railroads of Saxony, compiled by the royal bureau of electric railroads at Dresden, show a large increase in travel, as well as very considerable growth in the number of electric-power plants in this Kingdom.

Besides the network of city roads, the Lossnitz line, the road to the "Weissen Hirsch" and Buhlau, the Meissen street railroad, and the Niedersedlitz-Leuben-Laubegaster road have been built.

The following table explains itself:

Names of lines	Length of lines		Passengers carried	Motor cars	Trailers
	Kilometers	Miles			
Dresdner Strassenbahn (including leased Lossnitz road of 8 kilometers)	46.638	28.981	25,472,755	219	81
Deutsche Strassenbahngesellschaft in Dresden	29	18.021	16,351,759	139	43
Grosse Leipziger Strassenbahn	53.166	33.056	42,187,543	121	60
Leipziger Electriche Strassenbahn	52.914	32.881	17,763,102	119	59
Allgem-Local & Strassenbahngesellschaft Chemnitz	23	14.277	8,574,966	60	47
Zwickauer Strassenbahn-Actiengesellschaft	5.96	3.704	1,295,887	16	2
Sächsische Strassenbahngesellschaft Plauen	1.861	1.156	1,334,766	15	15
Schandauer Electriche Strassenbahn	8.3	5.158	144,611	6	6
Meissner Strassenbahn	4.655	2.893	51,958	4	4
Total in 1899	239.226	147.441	113,564,399	731	289
Total in 1898	177.457	110.272	90,576,266	591	238

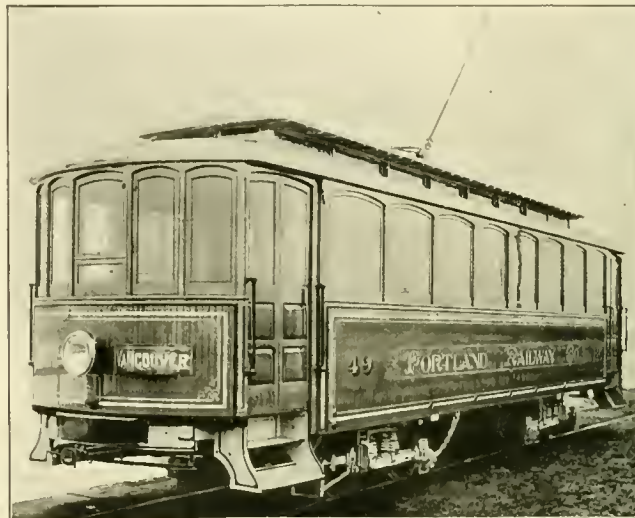
Many new contrivances and equipments have been introduced upon the roads of Saxony during the past year. Among them are the triple brake on the cars of the Weissen Hirsch line, as an extra precaution on heavy grades; the heating of the cars by electricity on the Weissen Hirsch and the Lossnitz lines, and the introduction of a device for preventing the strong acid smell in the accumulator cars. The magnetic brake which operates simultaneously on any number of cars, which was first introduced in Dresden at the instigation of the commissioner of electric roads, has been generally adopted throughout Saxony and introduced upon some of the roads, of the neighboring states.

AN OPINION ON ELECTROLYSIS.

The members of the city council at Kalamazoo, Mich., are greatly agitated over the question of electrolysis. Franchises were some time ago granted for a new interurban line from Battle Creek to Kalamazoo and the rails were being laid in the latter city when someone suddenly discovered that stray currents from the new road would probably cause the destruction of all the water and gas pipes in the city within a few months. The question was referred to a committee, which now has it under discussion. The opinion expressed in an interview by Mr. H. C. Hoagland, superintendent of the Kalamazoo Valley Electric Co., which owns the electric light plant is of interest. He says: "Whenever a city has some old rusty pipes give out, the city officials immediately begin to talk electrolysis. Of course there is more or less of electrolysis. There can be no doubt of that, but it is not responsible for much that is laid to it. As a matter of fact the soil in Kalamazoo is strongly impregnated with sulphuric acid, an analysis of water from a drive well showing that there are about 2½ grains of the acid to a gallon of water, and that is strong enough in itself to do considerable damage to pipes. The injury from electrolysis has been greatly exaggerated and the Battle Creek line will not affect the pipes at all."

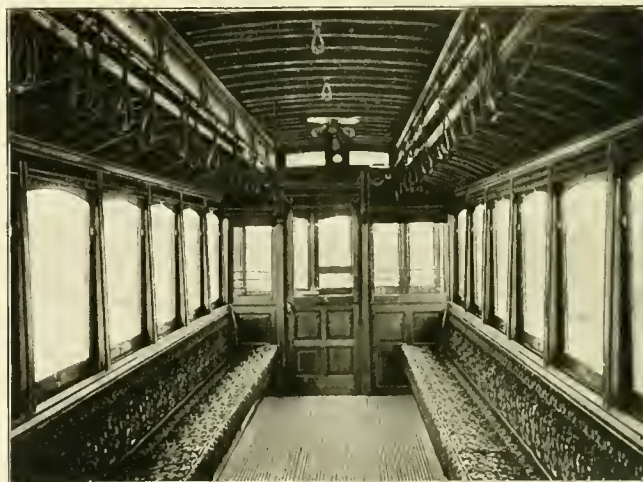
A WESTERN CAR.

The Portland Railway Co., of Portland, Ore., has recently built in its own shops the double-truck vestibuled car shown in the accompanying illustrations, for which we are indebted to Mr. J. F. Batchelder, secretary of the company. The car was designed by Mr. J. E. Thielsen, general superintendent, and Mr. Hugo Von der Werth, master mechanic.



CAR BUILT BY PORTLAND RY.

The car is 34 ft. 4 in. long over all, the body being 25 ft. long, and is mounted on "Eureka" maximum traction double trucks with G. E. 800 motors. It is finished in quarter-sawed oak, has accelerator doors as shown in the interior view, and is provided with the Gold street car heaters, electric bells for stopping the car and the Meaker



INTERIOR VIEW.

stationary register. Curtains are provided for all the windows, including the end windows and glass in the door in order to cut the light of the car off from the motorman's end of the car.

The car is strictly up-to-date, and is very much appreciated by the patrons of the company.

ONE MORE 100-MILE LINE PROPOSED.

We are informed by Mr. J. T. McNary, of Logansport, Ind., that the recently organized Logansport, Rochester & Northern Traction Co. intends to build an electric line, 101 miles in length, with Logansport and Kendallville as terminals, via Rochester, Ind., Warsaw and Albion, touching at Winona and Wawasee lakes.

The officers are: President, J. T. McNary; vice-president, L. W. Welker, Albion, Ind.; secretary and general counsel, G. W. Holman, Rochester, Ind.; treasurer, B. F. Keesling, Logansport.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

CARE REQUIRED OF PEDESTRIANS.

Killen v. Brooklyn Heights Railroad Co. (N. Y.), 62 N. Y. Supp. 927. Mar. 6, 1900.

Persons walking upon or across highways, the appellate division, second department, of the supreme court of New York holds, are not bound to exercise the highest possible degree of care. They meet all of the requirements if they exercise a reasonable degree of care, such as persons of ordinary prudence would exercise under the same circumstances.

INJURY TO PERSON STANDING NEAR TRACK AND SUDDENLY ATTEMPTING TO CROSS IT.

Knoker v. Canal & Claiborne Railroad Co. (La.), 27 So. Rep. 279. Feb. 5, 1900.

Where a pedestrian is standing near a car track at night, upon a frequented thoroughfare, giving no indication of an intention to cross, and attempts to cross only when a rapidly moving car is so near him as to render it practically impossible for the motorist to prevent its striking him, the supreme court of Louisiana holds that there can be no recovery of damages for the injuries sustained.

INCIDENTAL SIGNIFICANCE OF OMISSION TO SOUND GONG.

Kleiner v. Third Avenue Railroad Co. (N. Y.), 56 N. E. Rep. 497. Feb. 27, 1900.

Evidence of omission to sound gong, the court of appeals of New York holds, is admissible as a part of the history of the transaction, and as bearing upon the degree of care exercised by the defendant's employes, and upon the question of the plaintiff's contributory negligence, in an action brought to recover damages for injuries caused by an alleged negligent collision of a street car with a coach, and this although the law may not have required the gong to be sounded at that place.

SHOULD HAVE OPPORTUNITY TO TAKE THE TWO STEPS ON TO CAR IN SAFETY.

Baltimore City Passenger Railway Co. v. Baer (Md.), 44 Atl. Rep. 992. Nov. 24, 1899.

The court of appeals of Maryland says that it is desirable, in order to facilitate rapid transit in large cities, that passengers should be prompt in entering and departing from street cars, but those operating the cars must take every reasonable precaution for the protection of the passengers. It is a well-known fact, it goes on to state, that the footboard running along the side of the ordinary open trolley car is narrow, and that both the step from the pavement to the footboard and the one from the latter to the floor of the car are high. A fair opportunity of taking these two steps in safety, it then declares, should always be afforded to the passengers before starting the car.

JUDGMENT FOR PASSENGER ATTRIBUTING INJURIES TO BELL ROPE BEING IN WAY.

Sweeny v. Union Railway Co. of New York (N. Y.), 62 N. Y. Supp. 1034. Mar. 2, 1900.

In this case, where the plaintiff alone testified in her own behalf as to the circumstances of the accident, it being conceded that in attempting to board an open car that was stationary she had a fall, receiving injuries, and her contention was that the bell rope interfered with her ingress to such an extent as to cause her to slip and fall backward and off the car, the general term of the city court of New York affirms a judgment in her favor, notwithstanding that her narrative of how the accident occurred was not in accord with the statements in that behalf of any of the witnesses produced by the company, the case having been properly submitted

to the jury, and the latter having found, apparently without prejudice, in her favor.

MUST SHOW PERMISSION OF ALL THE BOROUGHES TO HAVE RIGHT TO DO ANY WORK.

Wheeler v. Pennsylvania Railroad Co. (Pa.), 45 Atl. Rep. 338. Feb. 5, 1900.

Under the Pennsylvania act of 1889, which provides that, before the railroad to be built by any trolley company incorporated thereunder shall be begun, the permission of all the boroughs and townships through which the road passes must be obtained, the supreme court of Pennsylvania holds that authority to build the road must be shown by showing compliance with this condition in order to give the company or contractors under it the right to so much as dig a trench, and that the latter could not maintain an action of trespass for the filling up of a trench by an abutting owner on the mere showing of having the permission of the borough within which the trench was dug, as on that showing alone they would simply make themselves out trespassers in digging the trench.

INJUNCTION TO PREVENT CONSTRUCTION UNDER ALLEGED INVALID ORDINANCE.

General Electric Railway Co. v. Chicago, Indianapolis & Louisville Railway Co. (C. C. A.), 98 Fed. Rep. 907. Jan. 2, 1900.

The doctrine of the supreme court of Illinois to the effect that a court of equity will not enjoin the construction of a railroad at the suit of an abutting property owner alleging that the ordinance claimed to authorize it is illegal, the United States circuit court of appeals, seventh circuit, holds applies only when the remedy at law is clearly adequate, and that when full protection of all property rights is not possible in an action at law, and irreparable injury will otherwise result, an injunction may be had to prevent the construction of the road under an ordinance void, for example, because passed without the requisite petition of the owners of one-half of the abutting properties.

WHEN DRIVER OF VEHICLE HAS RIGHT TO CROSS TRACK, THOUGH CAR IS APPROACHING.

Piercy v. Metropolitan Street Railway Co. (N. Y.), 62 N. Y. Supp. 867. Feb. 23, 1900.

From the authorities, the appellate term of the supreme court of New York deduces this rule, which it applies here, that, at the intersection of two streets the driver of a vehicle has a right to cross the tracks of a street surface railroad, notwithstanding a car is in sight, provided there is a reasonable opportunity so to do; and if, for that purpose, it is necessary for the person having charge of the motive power of the car to check its speed, or even to entirely stop such car for a short period, it is his duty to do so, and the person crossing the track has the right, without being necessarily chargeable with contributory negligence, to assume that that duty will be performed; that the rights of the driver of the vehicle and of the person in charge of the motive power of such car, under these circumstances, are reciprocal; and that the question whether it is negligence on the part of the driver of a vehicle to cross the track when a car is approaching is dependent upon the circumstances of each case.

EXCESSIVE SPEED CANNOT BE PROVED FROM PRIOR INSTANCES OF IT.

Wade v. City & Suburban Railway Co. (Ore.), 59 Pac. Rep. 875. Feb. 5, 1900.

Without stating its view on the admissibility of evidence of the customary or habitual rate of speed that cars were operated at a certain place prior to the occurrence of an accident there made the basis of an action for damages, a question upon which the authorities are in conflict, the supreme court of Oregon holds that,

whatever the rule with regard to that may be, there can be no doubt that proof of particular instances in which the cars were operated at a given speed is not admissible to prove speed in an action charging negligence in the operation of a car at a dangerous and reckless rate of speed at a certain time, for from such detached cases it declares no inference whatever could be drawn as to the speed of the car at the time of the accident.

GETTING CHARTER LIMIT OF FARE REMOVED AFTER SECURING CONTRACTS FOR BONUS.

Jasper County Electric Railway Co. v. Curtis (Mo.), 55 S. W. Rep. 222. Feb. 5, 1900.

Where the original charter of an electric railway company limited the fare which might be charged, and the city council was afterwards prevailed upon to change it by striking out the limitation in the franchise, leaving it optional with the company, how much it would charge, the supreme court of Missouri, division No. 1, holds that, if the change in the franchise was made after the execution of contracts for right of way and bonus, it would have no effect upon the rights of the persons making such contracts, even if the latter as drawn up were silent on the fare to be charged, where that was a material and essential element in the benefit the people were to get in return for their gifts to further the enterprise. For, says the court, it could not be tolerated that a company could procure rights of way and bonus from the people for its road upon the faith of a charter which limited the rate of fare which the company could charge, and then procure a repeal of the limitation on the fare, and hold on to the benefits it had received from the people, and at the same time charge whatever fare it saw fit.

TRANSFERS CAN BE USED ONLY ON CARS OF LINES DESIGNATED.

Keen v. Detroit Electric Railway Co. (Mich.), 81 N. W. Rep. 1084. Mar. 6, 1900.

Where it would appear that a street railway company had cars running on a certain street, some of which turned off at a certain cross street, and some did not, and the company changed its regulations so as not to give transfers from the cars that did not turn off to those which did, but to give transfers from the cars that did not turn off only to cars running on said cross street only, or to cross town cars, as they were called, the supreme court of Michigan holds that a passenger could not maintain any action for damages for being ejected from the car when he got from the conductor of a car that did not turn on the cross street a transfer punched for a cross town car only, and, instead of taking the latter, boarded one of the cars that turned on the cross street and tried to ride on same on the transfer. It appearing from the evidence that his transfer, on its face, did not entitle him to ride on the car which he entered, but was good only on a cross town car, the court quotes from *Frederick v. Railroad Co.*, 37 Mich. 347: "There is but one rule that can safely be tolerated with any decent regard to the rights of railway companies and passengers generally. As between the conductor and passenger and the right of the latter to travel, the ticket produced must be conclusive evidence."

EXPENSE OF REBUILDING POWER HOUSE DOES NOT TAKE PRIORITY TO MORTGAGE.

Maryland Steel Co. v. Gettysburg Electric Railway Co. (U. S. C. C.), 99 Fed. Rep. 150. Jan. 27, 1900.

Whoever has dealings with a company whose property is mortgaged, the United States circuit court, eastern district of Pennsylvania, holds, must be assumed to have dealt with it on the faith of its personal responsibility, and not in expectation of subsequently displacing the priority of the mortgage liens through the interposition of a court of equity; and the necessity for the supplies furnished does not entitle to preferential payment, unless the supplies are for current expenses in the ordinary course of operation. More particularly does the court here hold that where an electric railway company's power house was destroyed by fire, after it had mortgaged its property, claims of creditors for materials furnished for the construction of a new power house could

not be awarded preferential payment from a fund produced by a sale of the mortgaged property under an order of court in a proceeding to foreclose the mortgage. In other words, it holds that the expense of rebuilding a power house is to be classed with one for a virtual reconstruction of the road, and not among current debts for operating expenses, made in the ordinary course of continuing business.

MAY PROVE BY BYSTANDERS INTOXICATION OF PASSENGER THROWN FROM CAR.

Donoho v. Metropolitan Street Railway Co. (N. Y.), 62 N. Y. Supp. 523. Feb. 8, 1900.

The party bringing this action claimed to have been injured by being thrown from a crowded car, while standing upon the rear platform. Upon the trial the street railway company attempted to show that at the time the accident was alleged to have occurred the party was in a state of intoxication. For that purpose it called several witnesses, who were present and saw him, and who were asked whether they would characterize his acts at the time of the accident as the acts of a man under the influence of intoxicating liquor, or as those of a sober man. These several questions were excluded, under objections taken thereto, upon the ground that such witnesses were not shown to be experts. But the rejection of such testimony, the appellate term of the supreme court of New York holds, was clearly error. It says that had it been shown that the party was intoxicated at the time he received the injuries he complained of, whether such intoxication contributed to the accident or not, would have been a question of fact for the jury to determine, and the company had a right to show, if it was possible to do so, that such was his condition. Neither, it continues, does it require the testimony of an expert to give an opinion upon that question. The evidence of a witness in characterizing the action of a person as that of an intoxicated person is admissible.

WHERE DRUNKEN PASSENGER MAY BE LEFT.

Bageard v. Consolidated Traction Co. (N. J.), 45 Atl. Rep. 620. Mar. 6, 1900.

A passenger on a street car, who, as he testified, was sick, but whom the carrier's servants supposed to be under the influence of liquor, was helped from the car at the terminus of the route, and by the conductor of the car was led to the front of the station, at or near to the public street, and left at a place where his way was open in the direction in which he wished to go; the conductor then leaving on his outward trip. The passenger turned and went back, and 20 minutes later slipped down between the front and rear wheels of a car moving on a track that lay between where he was then standing and the place where he was left. For the resulting injury, the court of errors and appeals of New Jersey holds, no cause of action was established, to recover damages from the street railway company, by this showing. It says that there should have been a nonsuit, or a direction of a verdict for the company.

Now, if a drunken man is accepted as a passenger, the court says that the carrier should not leave him in a place of danger; but it adds that it knows of no rule that requires the carrier to follow up the drunken man, if left in a place of safety, though on the carrier's premises, and see that in his wanderings he does not get into danger.

When one, by reason of his own voluntary intoxication, exposes himself to danger and receives injuries which he could, and by the exercise of ordinary prudence would, have avoided if sober, he is guilty, the court holds, of contributory negligence, and cannot recover for such injuries.

NOT REQUIRED TO GIVE TRANSFERS FROM FIRST-ACQUIRED TO LATER-ACQUIRED ROAD.

Mendoza v. Metropolitan Street Railway Co. (N. Y.), 62 N. Y. Supp. 580. Feb. 9, 1900.

The appellate division, first department, of the supreme court of New York says that the right of one road to enter into a contract for a lease and joint operation of another road is one given by statute, and is subject to the conditions upon which such right

is conferred. One of these conditions is that the road operating another road by lease shall carry passengers, who may have taken passage on the leased road, over the lines owned, controlled, or operated by the road to whom the lease is made at the date when it acquired by contract the leased road. In other words, the right of a passenger to a continuous trip for a single fare extends, not alone to the routes or lines of the leased road, but also to such routes which, at the time of the lease, were owned, controlled, or operated by the corporation to whom the lease was made. The language of section 104 of the railroad law is that every such corporation shall, upon demand, give to each passenger paying fare a transfer "entitling such passenger to one continuous trip to any point or portion of any railroad embraced in such contract." These words, the court maintains, necessarily exclude roads subsequently built or acquired, for they cannot be said to be "embraced in such contract" when they are not then in existence. Thus, for example, the court holds, in this case, that, under and pursuant to said section 104 of the railroad law a passenger on a road acquired by the defendant company by lease on a certain date was not entitled to be transferred over a road which that company acquired at a later date, or which it must be assumed on demurrer was so acquired, in the absence of any allegation to the contrary.

RELATIVE TO SETTLEMENT OF CROSSING QUESTION.

In re West Jersey Traction Co. (N. J.), 45 Atl. Rep. 282. Jan. 4, 1900.

It cannot be said that, because there is an element of danger in a grade crossing of a steam railroad by a trolley road, some other method is to be provided. The question, the court of chancery of New Jersey holds, is whether, taking into account the degree of such danger in the particular instance, and also the facility and economy with which such danger may be avoided by adopting some crossing other than at grade, the latter method should be required. For example, where there were 72 regular and sometimes 30 special trains running over the steam road, and an undergrade crossing could be built, 14 feet in width, for \$12,653, the slope of the street favoring an undergrade crossing, as there was a rise towards the steam railroad tracks from each side, the court holds it reasonably practicable to avoid a grade crossing, and that public safety required it. As to the map of the route filed by the petitioner asking the court to fix the manner of crossing the steam railroad, the court holds it sufficient that the map showed that its route ran across the right of way of the steam road at the point where the mode of crossing was to be defined, without exhibiting any indication of a crossing. And the petition being over the seal of the traction company, and signed by its secretary and solicitor, the court holds that this raised the presumption that the seal was affixed by proper authority. But whether it was or not, it holds that any defect in this regard was cured by a subsequently passed resolution that the act was done with the acquiescence of the directors, who ratified it.

INJURY TO PEDESTRIAN NOT "LOOKING" AND "LISTENING."

Farrar v. New Orleans & Carrollton Railroad Co. (La.), 26 So. Rep. 995. Jan. 9, 1900. Rehearing refused Jan. 22, 1900.

The supreme court of Louisiana says here that it is not inclined to give much importance to the rule that requires of the pedestrian that he should "stop, look, and listen." It is to be expected only exceptionally that a pedestrian should stop, and then look and listen. It would be, ordinarily, requiring too much of the pedestrian; i. e. to "stop, look and listen." But where a pedestrian heedlessly steps in front of a coming car without at all "looking" and "listening" and then stopping in case of danger, the court holds that he omits observing one of the rules laid down in a number of decisions which should be complied with by a pedestrian when he is about to cross a track; i. e. to "look" and "listen."

Moreover, while the failure to observe this rule does not relieve those in charge of the car from the necessity of being careful at all times, none the less, in order that a plaintiff may recover damages, the court insists that it must appear that the danger was not seen by the motorman at a time when he should have seen it, and that he did not make every exertion to avoid the accident.

And the court holds that a motoneer, while manning his car, has a right, to some extent at least, to be governed by the belief that a pedestrian, even of advanced age, will not seek to cross the track unless his strength is sufficient to enable him to cross before the arrival of the car, where there is nothing to show the motoneer that he cannot do it.

SMART MONEY ALLOWED FOR CAR TURNING INTO WRONG STREET AND VIOLENTLY COLLIDING WITH VEHICLE.

Nashville Street Railroad v. O'Bryan (Tenn.), 55 S. W. Rep. 300. Jan. 27, 1900.

This was an action for damages for personal injuries resulting from a collision of a street car with the vehicle in which the plaintiff in the lower court (O'Bryan) and a companion were riding. The collision occurred at or near the corner of Cherry and Cedar streets, in the city of Nashville, and in the nighttime. A bright light, however, was burning, which lit up all the surroundings. As the two approached Cedar street, going north on Cherry, they noticed coming towards them very rapidly a large, open street car labeled "South Cherry Street," which, the supreme court of Tennessee says, in this connection, was an indication of its proposed route.

Now at the point of collision there was a curve and switch to turn passing cars into Cedar street when desired, and, just as this vehicle was proceeding along the street at that point, the car was suddenly and violently turned out of Cherry street on to the curve leading into Cedar street, coming into collision with the vehicle with much violence, and throwing it against a post in the margin of the sidewalk, and throwing the occupants out over the dashboard, where they fell beneath the horses, which were frightened and plunging. It appears that the car at this point left the proper track and route, and turned into Cedar street, when it should have continued on Cherry, and, if it had gone its proper route, the accident would not have happened. There was a conflict of evidence as to what was the condition of the switch, but the testimony was very clear that the car was being run at a high rate of speed, and that the place of the accident was one unusually full of danger and peril.

For the company, it was insisted that the accident was one which could not be avoided, and was not due to carelessness or recklessness. But not only does the supreme court not agree with that, but it holds that, under the facts above detailed, it was a proper case for punitive or vindictive damages. It says that there was evidence of recklessness and gross negligence which would justify such damages.

Furthermore, the court holds that it was allowable on the theory of punitive damages, to allow testimony to show the wealth and assets of the defendant company.

AS TO DRIVER OF WAGON LOOKING BACK FOR CAR.

Schilling v. Metropolitan Street Railway Co. (N. Y.), 62 N. Y. Supp. 403. Feb. 2, 1900. Hill v. Metropolitan Street Railway Co. (N. Y.), 62 N. Y. Supp. 596. Feb. 8, 1900.

In the first of these cases, where it appeared that the driver of a covered delivery wagon, who had good eyesight and unimpaired hearing, had taken the precaution to look out for an approaching car before entering upon a street railway track, at midday, the appellate division, second department, of the supreme court of New York holds that it cannot be said as a matter of law that he was guilty of contributory negligence in not looking behind during the time that it would take to drive a single block, or that it was not negligence on the part of the street railway company to run him down. Both parties, it says, were charged with the duty of exercising reasonable care, and it was for the jury, taking all of the facts and surroundings into consideration, to determine whether, in the proof of these facts and that his wagon had been run into from behind by a car, he had sustained the burden of proof which the law demands in cases of this character; and that a nonsuit was improper.

Furthermore, the court holds that the conduct of the street railway company, unexplained, in running into the wagon from the rear, in broad daylight, at a street intersection, was sufficient to justify the jury in finding that the company was guilty of neg-

ligence; and it was proper that the jury should determine whether the driver of the wagon, after looking in both directions, was guilty of contributory negligence in driving one block without looking back to see if a car was approaching, and whether he was justified in assuming, under the circumstances, that the company would give him warning in time to allow him to get out of the way.

In the second case, where a man had driven some 300 feet along a track, between 10 and 11 o'clock at night, when he was overtaken by a car and his wagon was struck, the appellate term of the supreme court of New York holds that it was his duty not only to avoid collision, but also to cause no needless delay to the street railway company, and he might not wait to hear a signal of the approach of a car, but he had needs at intervals to look backward for it. And because he did not do this, it reverses a judgment rendered in his favor, and orders a new trial.

CASE WHERE CHILD WAS STRUCK BY CAR AND MOTORMAN WAS NOT CALLED AS WITNESS.

Hicks v. Nassau Electric Railroad Co. (N. Y.), 62 N. Y. Supp. 597. Feb. 3, 1900.

It is a familiar doctrine, says the appellate division, second department, of the supreme court of New York, that the failure of an employer to call a witness who was in his employ at the time of the accident, and is presumed to be friendly, and to have some knowledge of the accident, without any attempt to explain the reason of the failure, raises a strong presumption that the testimony of the employe would be damaging to such party. Wherefore, it declares that in this case, which was one of a child, a girl 9 years of age, attempting to cross a street at a walk, after seeing a swiftly approaching car, 127 feet distant, with no evidence that she again looked or paid any further attention to the approaching car, it must be assumed that the motorman made no effort to check the speed of the car until the moment the child was struck by the fender, no witnesses having been called by the company to show any effort having been made to stop the progress of the car before the accident occurred.

The child, the court holds, was *sui juris*, or capable of acting in her own right, she having testified on cross-examination that on stepping from the curbstone she looked up and down for the car, because she knew it was a dangerous thing, and that she might otherwise get run over, but thought that she could get across before it came, and walked "not too fast, and not too slow; just right."

But the court does not think that there was any error in refusing an instruction to the effect that there was nothing in the situation to justify her in the belief that the car, which was coming at a high and dangerous rate of speed, would be brought under control, when she was at a cross walk where she had a right to assume that especial care would be taken by those in charge of an approaching car to prevent injury to persons crossing, and when there was evidence that when the motorman saw her he actually did bring the car to a standstill within 10 or 15 feet of the cross walk where she was struck.

Nor does the court consider that it could be said, as a matter of law, that, under the evidence, the child was guilty of contributory negligence. While she was *sui juris*, she could only be held to such a degree of care as a child of her years and character would reasonably be expected to exercise. So it holds that the question of contributory negligence was properly submitted to the jury; and affirms a judgment for damages against the company.

BRAKEMEN MUST LOOK OUT FOR KNOWN SAGGING TROLLEY WIRES.

Danville Street Car Co. v. Watkins (Va.), 34 S. E. Rep. 884. Jan. 18, 1900.

This was an action instituted by a brakeman to recover damages for injuries sustained by being knocked from a railroad car by a sagging trolley wire. He knew the position of the wire, which was 4 feet 8 inches above the step upon which he stood. That he knew the position of the wire, is made a distinguishing point in the case. Moreover, in reversing the judgment which he obtained, the supreme court of appeals of Virginia says that it is indisposed to entertain at this day, when electricity is so generally applied as a motive power to machinery, a plea of ignorance of

its dangerous properties. It points out, too, that ignorance of the peculiar danger attending contact with an electric wire would not extenuate or excuse the brakeman's fault in failing to exercise that reasonable care which would have enabled him to pass beneath the wire with entire safety. It holds that it was his duty to exercise ordinary care to prevent any injury whatever to himself, and that he was guilty of contributory negligence if he was himself the author of any part of the injury of which he complained, or if, by the exercise of reasonable care upon his part, he could have avoided the consequences of the negligence ascribed to the street car company sued.

Furthermore, the court holds that it was error to refuse to give an instruction to the effect that, although the jury might believe from the evidence that the street car company was guilty of negligence in the manner of constructing or maintaining its electric wire over and above the track of the railroad on which this brakeman was employed, still the brakeman had no right to pass from one car to another while the cars were passing under the wire, if in so doing he increased the danger of an accident from the wire; and if, from the evidence, the jury believed that he did attempt to pass from one car to another while passing under the wire, and by so doing did increase the danger and chance of the accident, he could not recover in this case, and the jury must find for the street car company. This, the court maintains, correctly propounded the law.

True, the brakeman stated that he was in the performance of a necessary duty at the time of the accident. He had set one brake, and was passing to another, in order to facilitate the disposition of the train, and prevent the blocking of the street, which it seems would have subjected the railroad company to a fine. But this duty, the court insists, was not so urgent and imperative as to justify any unusual risk, and certainly was not sufficient to excuse the brakeman for his failure to take proper precaution for his own safety, or to warrant the assumption on his part of an additional hazard.

DUTY WHERE HUMAN BEING IS SEEN ON TRACK BUT IS NOT RECOGNIZED AS SUCH.

Stelk v. McNulta, receiver of Calumet Electric Street Railway Co. (C. C. A.), 99 Fed. Rep. 138. Jan. 18, 1900.

A locomotive driver has a right during the passage of his train upon the right of way of the company to assume that an object which he reasonably believes to be inanimate, if animate, will leave the track upon hearing the coming train. But the United States circuit court of appeals, seventh circuit, holds that it is quite a different matter where railway trains, whether propelled by steam or electricity, pass along the crowded thoroughfares of a populous city. The care to be exercised is relative, and must be proportionate to the dangers reasonably to be apprehended.

In this case, at about 10 o'clock at night, an electric car was proceeding on an open prairie, in the outskirts of the city of Chicago, where a street had been platted, but there was no roadway for teams nor street lights, and no houses on the westerly side of the railway, while along the easterly side there was a sidewalk of some sort and a few houses, besides which there was a ditch on either side of the railway. The motorman, on reaching the crest of an incline there, saw at a distance of 65 feet an object upon the track, which both he and a messenger boy standing with him upon the platform of the car took to be a dog. He immediately applied the brake, checking the speed of the car, and sounded the gong to arouse the supposed animal, and cause it to leave the track. When the car had gone a little further seeing that the object did not move, the motorman applied the reverse, but being on the down grade the reverse did not act, and the car struck the object, which, when the car had almost reached it, the motorman discovered to be a human being lying partly across the space between the rails.

Under these circumstances, the court pronounces certainly reasonable a stipulation of fact that the motorman had no reason to expect the presence of a human being upon the track. And such being the case, it does not think that the duty was imposed upon him, upon perceiving an object, to bring his car to a stop to discover the nature of the object. It says that he did no less than his duty required of him to check the speed of the car and sound his gong, and so soon as he perceived that the object did not respond to the signal to reverse to bring the car to a standstill. But having

done that, the court declares that it cannot perceive that the motorman was lacking in any degree in the exercise of that prudence and care which, under the circumstances, the law imposed upon him, and so it holds that with respect to this accident negligence could not properly be imputed to the motorman in charge of the car.



THE USE OF ALUMINUM LINE WIRE AND SOME CONSTANTS FOR TRANSMISSION LINES.

Abstract of a paper by F. A. C. Perrine and F. G. Baum read before the American Institute of Electrical Engineers, May 16, 1900.

The authors first describe the construction of the transmission line of the Standard Electric Company of California, which extends from the Blue Lakes plant on the Mokelumne River to Stockton, a distance of 43½ miles. The standard poles were of square sawn redwood 30 ft. long, 7 x 7 in. at the top and 12 x 12 in. at the butt. The poles were galled ¾ in. deep for three cross-arms spaced 20½ in. on centers; the arms were of Oregon pine, 4 x 4 in., the top and bottom arms being 3 ft. and the middle one 4 ft. long. The six wires of the two three-phase circuits would thus be at the vertices of a hexagon 24 in. on each side; the two circuits have their wires at the vertices of equilateral triangles 41 in. on the side. The insulators used were a flat topped glass triple petticoat type 5 in. high and 7 in. in diameter with a wire groove of .35 in. radius; the insulators were mounted on eucalyptus pins long enough to bring the bottom of the insulator 4 in. above the top of the cross-arm. The cross-arms were creosoted, 10 lb. of dead oil of tar to the cubic foot being injected; the pins were boiled for eight hours in a compound of coal tar and asphaltum at a temperature of 225° F. The arms were braced by a bent angle iron but this precaution is believed to be unnecessary for arms less than 5 ft. long. Also, for high potentials the braces should be of wood.

The line as erected carried only four wires arranged on the top and bottom cross-arms, thus taking their location at the corners of a rectangle 24 in. on the short side and 41 in. on the long side. This arrangement was adopted for the purpose of making temporary use of some two-phase machinery which was in place and underloaded, allowing certain new customers to be taken on quite a year in advance of the contemplated completion of a three-phase plant for which the pole line was really designed.

It was at first feared that this arrangement of the wires would result in inductive disturbances between the phases, as the wires took their positions in the diagonally opposite corners of a rectangle, in place of the corners of a square, as is necessary for complete absence of mutual induction, but the anticipated trouble was not found. Careful measurements were made with one phase short circuited, and the other carrying about 20 amperes with a periodicity of 60 cycles per second, both with a Weston 75-volt voltmeter and a Rowland electro-dynamometer, with the result that no deflection was observable on the voltmeter, while the current read on the electro-dynamometer amounted to only about .001 ampere, the resistance of the dynamometer being 25 ohms and of the line 90 ohms. Only one additional question of installation needs attention, which is the presence on the tops of the poles of a barbed wire stapled to the wood of the pole and grounded at every fourth pole by a galvanized iron wire leading down along the pole and soldered to an iron plate 18 in. square and ½ in. thick, set in the pole hole immediately under the foot of the pole itself. This wire was intended as a lightning guard, and it has apparently done very effective service in discharging the line in all weather.

The wire used was intended to be equal to No. 3 B & S copper wire in its electrical resistance, and the manufacturers were required to furnish this conductivity in a wire not weighing more than 420 lb. per mile. All the wire supplied was carefully inspected by Mr. A. E. Kennelly, and his reports give the following averages for the total quantity:

Diameter	293.9 mils.
Wt. per mile	419.4 lb.
Resistance per mil-ft.	17.6 ohms at 25° C.
Resistance per mile at 25° C.	1,007.73 ohms.
Conductivity compared with copper	50.0 per cent by dimension.
Tensile strength of wire	1549 lb.
No. of twists in 6 in. for fracture	17.9
Tensile strength per sq. in.	32898 lb.

Comparing this with copper it is seen that the wire is approximately the same as copper in the following sizes:

Size of aluminum wire equal No. 1 B&S copper.

Resistance of aluminum wire equal No. 3 B&S copper.

Tensile strength of aluminum wire equals No. 5 B&S copper.

Weight of aluminum wire equals No. 6 B&S copper.

Therefore, on the basis of the same conductivity the aluminum compares with copper as follows:

Diameter for the same conductivity 1.27 times copper.

Area for the same conductivity 1.64 times copper.

Tensile strength for the same conductivity .629 times copper.

Weight for the same conductivity .501 times copper.

The mechanical properties of this wire present some well marked characteristics. In the first place, the number of twists necessary for fracture varies considerably, although the ductility test of wrapping six times around its own diameter, unwrapping and wrapping again is well sustained. This irregularity in the twisting test is generally a mark of impurity in wire, but we know so little as yet of the exact characteristics of aluminum in particular, and the twisting test is in general so unreliable that it is unsafe to base any exact statement on this one test, particularly as the same after erection proved reliable. In carefully performing the test for tensile strength no exact point could be assigned for the elastic limit, as the metal seemed to take a permanent set almost from the first, but at a stress of from 14,500 lb. to 17,000 lb. per sq. in., there is a marked increase in the permanent set which indicates that the safe working load lies somewhere in this region. In this the characteristics of the aluminum do not differ materially from those of copper or other similar metals, and while this is a disadvantage it is not a singularity.

The fact that the wire will permanently elongate if seriously strained makes it necessary to use the utmost care in the erection of lines, and also the known high coefficient of expansion with temperature changes taken in conjunction with this property renders care in line stringing especially important and difficult.

Instructions to line foreman in stringing wires:

1. All spans are to be strung with deflections and tensions as specified.
2. Up and down hill spans to be sprung to correspond with level spans. In case level spans cannot be used, then employ dynamometer, and ease all wires over cross-arms.
3. All ties are to be made at one time by signal.
4. All ties are to be made crossing wires around insulator serving three times around wire, and twisting behind insulators; the ends of the tie-wires are not to be cut but bent back toward insulators.
5. Tie all wires on the outside of the insulators, except at corners where all are to be tied so that the strain is against the insulator.
6. Joints are to be made by means of sleeves twisted two and a half times, the ends of the wires being given one turn by hand around the wire, no tools being used, except in twisting the sleeves, and cutting off the ends of the wires. Before inserting the wire in the sleeve, the ends of the wire must be roughened by draw filing.
7. Barb wire is to be laid along the roof of the pole and held by three staples driven in tightly, but without kinking the wire. Ground wires are to be soldered to the barb wire, and at the bottom of the pole to the wire leading from the ground plate. All soldering acids must be carefully washed away after the soldering is done.
8. Beginning between poles 1 and 2, all wires are to be barreled by shifting one pin, and same to be repeated between poles 21 and 22 and 41 and 42, and so on. Barreling always in the same direction of twist every 20 poles. A record must be kept of the location of every wire and every pole.

The greatest care must at all times be taken against kinking or scarring the wire; wherever the wire is accidentally kinked or scarred it must be cut and spliced.

The targets consisted of light sheet iron strips about 2 ft. long and 2 in. wide, with an aluminum hoop bent into an eye at the top, by means of which they could be hung from the line wire. These targets were painted in three or four colors, with bands 1 in. wide. In use the captain of the linemen would hang his target on the wire to which a man on the next pole had also hung a target; then, as the wire was being pulled into place, he would sight from a band on his target to the same band on the adjacent target, and when the wire came into line with these two bands the signal would be given for all the linemen to tie at once. As a result of this method of

stringing, an exceedingly uniform line, and one strong in accordance with the temperature was obtained.

One of the most serious problems in connection with the use of aluminum is in the choice of a proper joint. This metal is so highly electro-positive that it is unsafe to expose it to the elements in contact with any other material, as electrolytic corrosion is almost sure to follow such construction. Many of the failures which have been reported of this metal have been due to a neglect of this fact, as notably in the case of the plates on the yacht *Defender*, where the plates have been corroded at the contact with the bronze rivets used in fastening them to the frame. Whenever this metal is soldered or used in contact with any other metal, the joint should be thoroughly water-proofed to prevent such action. After discussing many joints, it was finally determined to abandon any attempt to solder or clamp the wire in any manner, and the joints were made by slipping the ends of the wire into an oval aluminum tube about 9 in. long, which was then twisted with a pair of clamps similar to those employed in twisting the McIntire connector. After twisting the tube a turn was taken by hand of the loose ends, and the wire cut off close. The joint produced proved practically equal to the original wire in both tensile strength and electrical conductivity.

This wire was erected during the winter of 1898-99, which was an unusually open winter over the whole state of California, allowing practically continuous construction work, though the temperature varied all the way from about 30° F. to 80° F. at times when the wire was being strung. After it was finally erected it remained about three months on the poles before the machinery was delivered and put in place. During the first month of that time three breaks occurred which were all apparently due to flaws in the material, but after these breaks were repaired the line wire gave absolutely no trouble whatever, though various accidents occurred to other parts of the construction. Many insulators were shot at and broken, bale wire and bale rope were thrown over the line, a twig short-circuited one phase and fell down burned, a large bird was killed by contact with the wires, and finally several porcelain insulators with porcelain pins were broken off and hung suspended by the wire. In January and February of the present year this whole line was taken down to give place to a much heavier one of the same material, an opportunity for an entire change having been found after the total destruction of the power house by fire last November.

During the past two years other lines of aluminum wire have been erected on the Pacific coast, all but one of which have given a considerable amount of trouble from causes that are not entirely apparent.

One line in Nevada County, erected at about the same time as that we have been describing, and for which the wire was of practically the same lot, has given no trouble whatever.

The power transmission lines of aluminum wire about Seattle have broken a few times, but have not given serious trouble. The breaks in this line, so far as the writers have been informed, seem to have been due to not allowing enough sag at the higher temperatures, and a consequent overstraining of the wire in cold weather.

The most serious difficulties have been encountered by the telephone company in Washington and Oregon, and by the Yuba Power Co. In all of these cases it seemed almost impossible to keep the wires on the poles in certain sections, and in these portions the lines have been finally taken down and replaced by other wire of either copper or aluminum. The writers have examined many breaks from these lines, and would judge, from the appearance of the fracture, that the cause, whatever it may be, was similar. In those breaks there are many small flaws, but by far the greatest majority are clear, sharp fractures, with but a slight reduction of area, and that entirely on one side, a break very characteristic of improperly mixed and brittle alloys. Partially from the appearance of the fracture, and partially from the facts that the breaks occur only in certain sections of the line, the writers are of the opinion that this trouble is due to the presence of impurities in the material. This view is strengthened by the fact when measurements were made on the line of the Yuba Power Co., the resistance of the whole line was found to be 10 per cent greater than it should have been if it were made of the quality of material described in the earlier part of this paper. Furthermore, in one-half of this line there were no breaks at all due to defects in the wire itself.

As a general conclusion, it is the opinion of the writers that aluminum can be safely used in place of copper where the proper precautions are taken in inspecting the wire before it is erected, and

in erecting it with due consideration of its peculiar properties of low and indefinite elastic limit, high coefficient of temperature expansion and active electrolytic power.

Indicating our faith in this opinion, it may be noted that for the new line soon to be erected an aluminum strand $\frac{3}{4}$ in. in diameter has been ordered. This strand will be spliced with aluminum sleeves, and in the whole construction about one million pounds of aluminum will be employed.

OPENING OF THE NORTHWESTERN ELEVATED, CHICAGO.

May 31st the Northwestern Elevated R. R. of Chicago, was opened for traffic. The occasion was celebrated by running two special trains, which entered the Union Loop at 12 noon, and were hoarded at the loop stations by the 500 guests whom the company had invited to be present; the party was then carried to the northern terminus at Wilson Ave. where luncheon was served. Among those present were: C. T. Yerkes, D. H. Louderback, Clarence Buckingham, B. E. Sunny, George H. Weston, H. N. Brinkerhoff, assistant general manager of the Metropolitan Elevated; M. B. Donald, M. H. Hopkins, general superintendent of the South Side Elevated; James Morrison, superintendent of the South Side Elevated; J. R. Chapman, A. S. Littlefield, John M. Ryan, J. E. McGrath, W. L. Kelly, J. S. Dunham, R. J. Dunham, Theodore P. Bailey, of the General Electric Co.; Charles Henrotin, Judge Brentano, L. E. McGann, George Higginson, jr., secretary and treasurer of the Metropolitan Elevated; the officers of the Northwestern and members of the city council.

Immediately following the guests' train, trains for the general public were put in regular service, the intervals between trains being as follows: From 9 a. m. to 3:32 p. m., 6 minutes; 3:32 to 6:36, 4 minutes; 6:36 to 11:00, 6 minutes; 11:00 to 12:00 midnight, 8 and 12 minutes; midnight to 5:15 a. m., 35 minutes; 5:30 to 6:00, 5 minutes; 6:00 to 9:00 a. m., 4 minutes. One-half of the stations were opened to the public on May 31st, and the others will be opened as rapidly as they can be completed.

It will be remembered that the first train was run over this road on Dec. 30, 1899, and that for a time one train was run each day until the controversy between the company and the city was amicably settled and the company given till May 31st to complete its road. The opening of the line was followed by a large traffic, as it serves a territory that was sadly in need of better transportation facilities. An express service is promised within the month.

The expected volume of business has been more than realized, and has averaged over 45,000 daily since the opening, and is increasing daily. The first Sunday showed 60,000 passengers, and this with only 10 out of 20 stations in use.

Physically the structure is the best built and arranged of any in the world, advantage having been taken of all previous experience. Its successful completion in the face of unusual difficulties of depressed financial times and opposition of city officials covering a period of six years, is a monument to the ability and strength of Mr. Yerkes. Few men could or would have endured the strain and annoyances to which he was subjected.

The officers of the Northwestern Elevated R. R. are: President, D. H. Louderback; vice-president, C. D. Hotchkiss; secretary and treasurer, Howard Abel; general superintendent, Frank Hedley; superintendent, Robert B. Stearns.

HISTORY REPEATS ITSELF AGAIN.

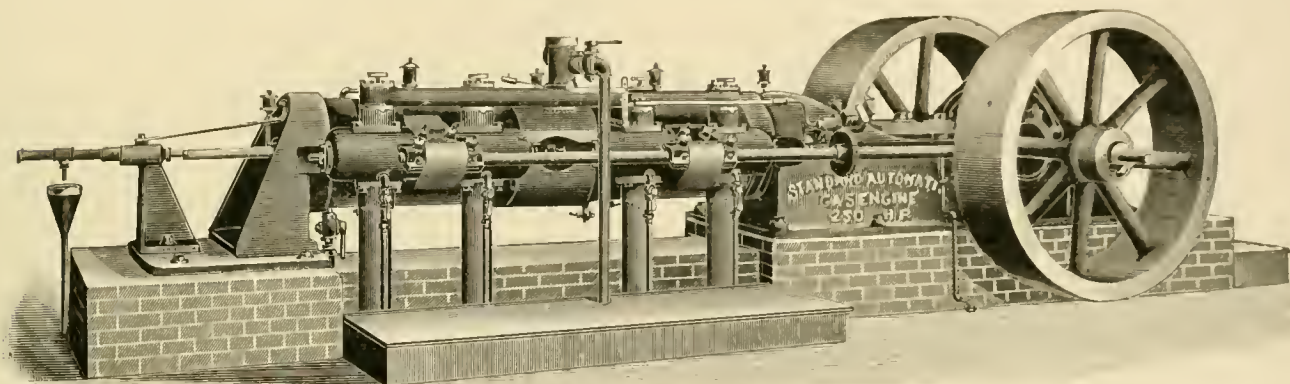
A local paper in Xenia, O., says: "Xenia has had nearly six months of electric roads, and it would seem that with two lines running from that city to Dayton, if there would be any disadvantage to the smaller city, Xenia would certainly feel it more acutely; moreover, the time when such a condition is apt to be felt most is when the roads are new and the people most prone to try the novelty of riding to Dayton to buy goods. Yet the merchants of Xenia, along with everybody else, are enthusiastic in their praise of the new roads and say that it has helped business. Every car that comes to the town is filled with people, and on the streets strangers are constantly seen."

A man at Kansas City was recently fined \$1.00 for expectorating on the car floor in violation of a city ordinance.

AN IMPROVED GAS ENGINE.

The importance of the gas engine as a prime mover has been rapidly increasing of recent years, because of the improvements that have been effected in the construction, and the gas engine of today is a reliable machine of very low fuel consumption. Mr. Alton D. Adams in a recent article on the "Future of Electrical Supply," gives interesting data on this latter point and states that in a small plant containing a gas producer and two engines, each under 100 h. p. in capacity, tests showed the consumption of anthracite buckwheat coal to be only 1.03 lb. per i. h. p. per hour. In large steam plants with compound condensing engines, about the best figure obtained with a high-grade coal is 1.5 lb. per i. h. p. per hour. With larger gas engines even higher fuel economy is reported, one 320-h. p. gas engine using .81 lb. per i. h. p. and 1.03 lb. per brake h. p. per hour. Mr. Adams further says these reductions in fuel consumption have been obtained without a corresponding increase in fixed charges; the first cost of gas engines is given as not far from the cost of compound steam engines with condenser, and the combined cost of feed-water heaters, boilers and attachments is but little less per unit than the fuel gas producers used with the gas engine plant.

The accompanying illustration shows a 250-h. p. gas engine built by the Standard Automatic Gas Engine Co., of Oil City, Pa., and installed in the power plant of the Oil City Street Railway Co. The generator which it drives gives 350 amperes at 550 volts, and the speed variation between no load and full load is given as only



250-H. P. STANDARD AUTOMATIC GAS ENGINE, OIL CITY, PA.

1 per cent. The "Automatic" engines are built after the designs of J. W. Raymond, whose name is well known in connection with the Raymond and improved Raymond gas engines.

The company builds three types; single cylinder engines of from 15 to 40 nominal h. p., single acting tandem engines of from 30 to 160 h. p., and double acting tandem engines of from 200 to 1,000 h. p. The special features to which the maker directs attention are the perfect balance of the engine, its noiseless operation, the automatic starter used on all sizes which enables the engines to be easily started from a state of rest, reliability of the ignition apparatus, the electrodes of which revolve and have a wiping contact so that the sparking points are kept clean, and the compactness, simplicity and durability of the whole mechanism. The guaranteed consumption of natural gas is less than 15 cu. ft. per brake h. p. per hour, or 1-10 gallon of 74° gasoline, when between three-fourths and full rated load.

IMPROVEMENTS AT DECATUR, ILL.

The Decatur (Ill.) Traction & Electric Co. is practically rebuilding its system, taking up the old roadbed and replacing it with new 62-lb. 6-in. steel T-rails on an 8-in. bed of gravel, with new curves, switches and cross-overs complete. The special work was made by the Paige Iron Works, of Chicago. The company has also purchased 10 new car bodies with double G. E. 62 equipments, and is erecting a new power station with 600 h. p. capacity, which will contain Bates Corliss engines, Stirling water tube boilers and Siemens & Halske generators.

UNIFORM ACCOUNTING AND MUNICIPAL OWNERSHIP.

(Abstract of a paper read before the National Electric Light Association by J. B. Cahoon.)

The author, in introducing the subject, mentioned the haphazard way in which the discussion of uniform accounting had heretofore been brought before the association, and his reflections when a year ago the League of American Municipalities had been challenged to a comparison of the costs of production in private and in municipal lighting plants. (It may be said in passing that this challenge has never been accepted.) He predicted that all public utilities must accept public regulation, and continuing, said in part:

We cannot take the stand that it is against public policy that this should be done; it would simply be a case of kicking against the pricks. There lie open before us the two paths. Municipal ownership or private ownership under state regulation. We certainly do not want municipal ownership; therefore let us prepare to accede gracefully to the other course; and not only that, but let us help it along. In that lies our salvation.

To do that we must be prepared, when the question of state regulation is raised, to meet the committee half way—to say to them: "Here is our system of accounting. It is one in which we believe the true costs to be stated. All the factors that enter into the cost are here. We are not a single company using this system.

We are one of a great body, all of whom follow the same method and use the same system of accounts in determining the cost of production. We are perfectly willing to hand in once a year a complete statement of everything, costs as well as receipts, and show you gentlemen, and, through you gentlemen, the great public that is behind you, just what legitimate profit there is in this business. It is not great, and we are willing to have you know what it is and how it is computed. We believe that the introduction of electric lights and gas into a city is a public improvement in the strictest sense of the term. We hazard our money, our reputations, and enter on a somewhat venturesome risk. We believe we are entitled to, and we think the public will sustain us in having, a fair return for our labor, our venture and our capital. We are not only willing that the public should know our profits, but we feel that if the public does know them it will concede that we are holding the right position; and instead of taking away our franchises, letting competition in on us from all sides, and trying to squeeze us to the wall in every way, it will realize that we are what we claim to be, a public improvement, and that we deserve fair treatment." And we shall get it.

From a financial point of view, it matters little to this association what system of accounting its individual members may follow. If they are deceiving themselves in regard to costs, we, as an association, should not be warranted in interiering. We, at most, can only recommend the adoption of any system of accounting; we cannot compel our individual members to accept it, but we can at least ask them to do so.

The necessity, therefore, for a system of uniform accounting lies primarily in the fact that we must unite for self-defense, and

we must be able to ascertain the true cost of our productions, and at the same time show to the advocates of municipal ownership that, to get the true costs, they must follow our system. In unity only shall we have strength to resist the attack that is coming upon us.

Of the accounts themselves entering into the cost of the product, I do not think any question will be raised until we come to the class known as capital accounts. It has not been the custom, heretofore to class these as, strictly speaking, operating-expense accounts, but in order that the true cost of the product may be ascertained, I hold that it is necessary to include these as part of the operating expenses, and not to classify them as deductions from income.

By the Street Railway Accountants' Association, taxes are considered as not a part of the operating expenses, but as something extraneous thereto, which should be a deduction from income, as should also interest on investment, interest on current liabilities, investment insurance and reserve for sinking fund.

I take this stand, open as it is to criticism, for the following reasons: We are not private companies in the strict sense of the word. We are operating public utilities; and the public is going to demand, and is demanding at the present time, to know what it costs us to deliver our product to the consumer, and what our profits are. Certainly, a part of our cost is taxes; and, again, before we can declare a dividend, we must take care of the interest on our bonds, and also on our current liabilities. In regard to investment insurance, or depreciation, as it is often termed, this is truly a factor of cost. Every plant undergoes depreciation from year to year, and in order that the value of the plant may not be depreciated, certain renewals must be made and minor extensions or betterments added.

If we do not charge off each year, and expend as an investment in renewals and minor extensions and betterments, a certain portion of the original investment, the time comes, in the course of 7 to 10 years, when we have got to borrow thousands and thousands of dollars to renew the plant, and it may be at a time when that will be very inopportune. The best policy for ourselves, laying aside the whole question as to whether or not it is better as a source of protection from the public, is to recognize this factor, and include it in our cost of operating expenses.

A certain depreciation, determined on by experience, varying according to location and according to class of manufacture, we find will occur every year. Let us take, then, the yearly proportion on the basis of lasting so many years, and place it each year under the head of investment insurance, and use that in our business for minor extensions or betterments and renewals sufficient to keep our plant intact and in as good operating condition as when first purchased; or, in other words, maintain our plant in such a manner that if a question of being compelled to sell it comes up, we can show that we have maintained it in such a way that the original investment is not impaired in the slightest.

Again, as regards a reserve for sinking fund. Many have held to the idea that if they issue bonds for a term of 50 years, we will say, and pay the interest right along, that is all they can be asked to do; that when the time comes they can refund them, and therefore it is unnecessary to make any provision for a reserve sufficient to redeem the bonds at maturity. Others, again, say that by the time the bonds become due, our income will have increased so materially that we shall have no difficulty in taking care of them; they will be only a minor charge at that time; part of them can be redeemed and part renewed.

Neither of these views is the true economic way of looking at the subject. The only true way is to recognize the fact that the bonds must be redeemed at maturity, and to make provision for their redemption by setting aside each year such a reserve as will take care of the bonds at their maturity, charging this reserve as part of the operating expenses, or, in other words, as one of the factors of the cost of production. We may thus see that the cost of our product is legitimately represented by the four groups of accounts, manufacturing, distribution, general and capital.

The number of agitators that are crying municipal ownership of public utilities is constantly and rapidly increasing; they are attacking us in all parts of the country even now, and the attack will be stronger and stronger as time goes on. Our plan of defense must lie in the correct determination of costs, and in showing that while we are exercising the functions of a monopoly, we are

only attempting to realize therefrom a legitimate profit for the capital we have invested in the enterprise. To do this we must have uniformity of accounting, in order that we may present a solid front and be able to disarm the agitators by showing to the people at large that we are following fair business methods and only obtaining a fair return on our investments. If we are able, then to convince the people of this, they in turn will support us in our rights, will see that we are given the privilege of exercising the functions of a monopoly under proper laws, and will realize the necessity of granting us exclusive franchises in order that the best economy of operation may be affected.

The remarks of Mr. Samuel Insull in the discussion which followed Mr. Cahoon's paper were principally on the question of depreciation; he said in part: "I drew attention to this subject in my address as president of this association two years ago, and took the ground that if we were publicly controlled we should have advantages in the way of exclusive franchises. The first step in this matter is to take our own members, and if we can educate them to a uniform system of accounting, so that they will state in their accounts precisely what their cost is, and stop them, as far as moral suasion will stop them, from working their construction accounts; and if moral suasion will not stop them, if we can get copies of their reports kept on a uniform system of accounting and bring them up here in the convention and ask them to explain their accounts, if we could do that, it would be the first step toward public accounts. There is not the slightest objection to public accounts. We have everything to gain and nothing to lose by the publication of our accounts. We are not in a business that yields an enormous return on the investment; it yields a comparatively small return over ordinary interest rates as they rule in this country. If we can do anything toward getting our own people to submit their accounts to us here in convention, or to a committee that would report on them; and when some company shows an abnormal profit as the result of immoral accounting, fooling itself, we could get that matter straightened out. That would go a long way toward stopping the agitation of the question of municipal ownership. If we cannot stop this agitation of the municipal ownership question, this system of public reports would go a long way toward giving us protection in the enjoyment of our business, and put municipalities in the position that if they want to go into our line of business they must do it by the exercise of the right of eminent domain and condemn our property and purchase it on a fair valuation.

"I have made the remark at different times that the public has to pay for any duplication of investment in any public-service business. The more we can educate the people to our exact position—the fact that if there are two companies in the same city, the interest on the investment made has finally got to come out of them—the more solid we can make our investment and incidentally the less chance there will be of municipal ownership."

SALE OF THE MT. LOWE ROAD.

On June 1st, after negotiations lasting for several weeks, the Mt. Lowe & Pasadena Ry. was transferred to the Los Angeles Ry. The property includes the electric plant at Altadena, the Alpina Tavern, the "Chalet" and the observatory. While the Los Angeles Ry. is the owner, the newly acquired line will be operated in connection with the Los Angeles & Pasadena Electric Ry. and the Pacific Electric Ry., of Los Angeles. Mr. W. H. Smith, manager of the Los Angeles & Pasadena, was recently elected secretary and manager of the Pacific Electric Ry.

The main feature of the franchise tax bill recently passed by the New Jersey Assembly is a provision that in lieu of the franchise tax which corporations now pay to the state, they shall pay a flat tax of 2 per cent to the municipalities in which they have property.

The council of Scranton, Pa., has taken a quite unusual action in reducing the tax on the Scranton Railway Co. to 1 per cent of the gross receipts. The original ordinance provided that in 1901 and until 1904 the tax should be 3 per cent; in 1904, 4 per cent; and in 1905 and thereafter, 5 per cent of the gross receipts, and this is reduced to 1 per cent for the whole term.

his information. Also, the costs of repairs to cars that have been rebuilt or given a general overhauling are entered on a separate sheet 21 in. wide by 5½ in. long; the headings are the same as in the book.

The company is unable to run cars with side steps because of the clearances at the bridges over which it operates. The standard type has double cross seats, with reversible backs and a center aisle, passengers entering and leaving at the platform as on closed cars. The right hand side of the car is also (because of the bridges) protected by a wire screen to prevent accidents at the bridges. The cars used in winter service have the sides closed by a 20-in. panel at the floor, and above that by frames with two panes of glass, a wooden cross bar being put across where the arms and shoulders of passengers strike the frame. In summer these panels between the posts are removed, and the car is then practically an open one. The bodies used only in summer, some 20 of which have just been given an overhauling in the shop, have only the low side panel, and this is placed 1 in. above the floor to facilitate cleaning the cars. The present equipment consists of 127 cars and 15 new ones have been ordered from the St. Louis Car Co.

The officers and operating staff of the Cincinnati, Newport & Covington Railway Co. are: President, J. C. Ernst; vice-president, Julius Fleischman; secretary and treasurer, George M. Abbott; superintendent, J. R. Ledyard; electrical engineer and superintendent of power station, A. C. Harrington; storekeeper, R. W. Phillips; master mechanic, John A. Kreis, jr. Those of our readers who have noted the reports from this company that we have published from time to time, fully appreciate the work done by Mr. Ernst since his connection with the road. The net income, after deducting taxes and fixed charges, has increased from \$28,000 in 1897, to \$94,000 in 1899, with an increase of only \$75,000 in gross receipts, and notwithstanding expenditures for improvements that increased the fixed charges \$150,000 per annum.

The name of the operating company is that given on the blanks, the South Covington & Cincinnati Street Railway Co.

McGUIRE TRUCKS FOR FRANCE.

We illustrate herewith the No. 35 truck made by the McGuire Manufacturing Co., of Chicago, a number of which have been ordered for the Western Railway of France, to be used on its sub-

urban line between Paris and Versailles. The matter was placed in the hands of Mr. Frank J. Sprague, president of the Sprague Electric Co., of New York, who placed the order after a critical examination of all the trucks on the market. It is estimated that the Western Railway will require 900 motor trucks.

The side frames of this truck are of solid steel. Over the journal boxes are helical springs; this feature is covered by the Cloud-McGuire patents. The bolster rests upon a combination of helical and elliptical springs adjusted to give an easy-riding motion, and the combination is suspended from the transom by heavy links. Each truck will have two G. E. 55 motors, 150 h. p. each, and including the motors will weigh about 21,000 lb. The wheel base is 6 ft.

The McGuire company feels that in building this truck it has successfully solved the difficult problem of securing easy riding, simplicity of construction and ample strength. The compliment paid to American builders, and the McGuire company in particular, is fully appreciated. The company has a number of these trucks in operation on the Brooklyn Elevated lines, where they are said to give the best of satisfaction.

A NEW CAR WHEEL PLANT.

The Keystone Car Wheel Co. has been organized at Pittsburg with a capital of \$200,000 to make and sell car wheels. The company's financial backing is of the strongest, and it is the intention to erect near Homestead, Pa., a plant equipped with modern labor-saving devices, pneumatic hoists, automatic carriers, etc., and having a capacity of 350 wheels a day, which will ultimately be increased to 600 wheels a day. The main building will be of brick, 110 ft. wide by 300 ft. long, and so arranged that extensions can be made from time to time by merely taking out one end and adding to the length of the structure. Wheels will be turned out under the Barr and Faught patents, for both steam and electric railway service, a specialty being made of the latter.

The personnel of the new company includes Charles V. Slocum, formerly treasurer and manager of the Pennsylvania Car Wheel Co.; W. L. Elkins, of Philadelphia; William W. Lobdell, president of the Lobdell Car Wheel Co., of Wilmington, Del.; L. B. Whitney, formerly of A. Whitney & Sons, of Philadelphia, and Charles A. Otis, jr., of Otis, Hough & Co., iron and steel merchants of Cleveland. John G. Holmes and Nathaniel Holmes, prominent bankers of Pittsburg, will also be interested.

Mr. Slocum, the organizer of the company, will be general manager, his many years of experience in the making of car wheels well fitting him for the place. At the age of 25 Mr. Slocum was business manager for Frederick Stearns & Co., which firm he left to become treasurer of the New York Car Wheel Works, of Buffalo.



300-H. P. MOTOR TRUCK FOR WESTERN RAILWAY OF FRANCE.

He resigned this position in January, 1898, to organize the Pennsylvania Car Wheel Co., of Allegheny, and became its treasurer and manager, holding these offices until last November, when he and his associates sold their interests in the company to the Pressed Steel Car Co. Mr. A. W. Slocum, brother to Mr. Charles V. Slocum, will probably be made superintendent of the new works.

The side frames of this truck are of solid steel. Over the

FOREIGN FACTS.

Additional electric tramways will be laid down by the Manchester (Eng.) Corporation.

The Dublin Tramways Co. is endeavoring to find a suitable speed indicator for use on its cars.

The District Council of Hales Oliver, England, will apply for a provisional tramways order.

A royal order was recently issued authorizing the construction of electric tramways in Almeria, Spain, and vicinity.

The Batley (Eng.) Town Council has secured a Board of Trade provisional order for an electric tram system.

Definite action has been taken looking to the introduction of electricity on the Calcutta (India) Tramways.

The gas tram cars at Blackpool, Eng., are now drawn by horses pending a change to the overhead trolley system.

Kirkealdy, Scotland, is to have a municipal electric lighting and tramway system. A tramway committee has been appointed.

Steps have been taken to introduce electric trams at Bath, Eng. Sir James Sivewright and Mr. Leopold Hirsch are interested.

Mr. W. G. Bingham recently obtained a concession for an electric tramway from the city council of Adelaide, South Australia.

The Tramways Committee of the Manchester (Eng.) Corporation is receiving bids for the overhead equipment of three new routes.

The electric tramways established at the popular resort of Boulogne, France, are very prosperous and further extensions are projected.

Tenders for electric railway supplies are asked for by the new tramways committee of the Corporation of Newcastle-on-Tyne, England.

At a meeting of the Bolton (Eng.) tramways committee recently it was decided that all motormen and conductors on electric cars must take out a license.

A Board of Trade order recently granted sanctions the working of the trams at Carlisle, Eng., by electricity. The lines are owned by the Carlisle Tramway Co.

Electric tramways at Madras, India, have not been over-successful, as it will probably be necessary to sell the lines in order to pay the contractors for building them.

A Board of Trade inquiry was held last month on the application of the Plymouth (Eng.) Corporation for power to borrow £20,000 for the extension of its electric tramways.

The tramways of Cape Town have 25 miles of track; the employes number 300 men, and 15 single-deck motor cars, 32 double-deck motor cars and 8 trail cars are in use.

At Sydney, N. S. W., the New South Wales Tramways carry about 17,000,000 passengers a year. The power house is not now large enough to supply the necessary power, and its capacity is to be increased.

The Southport (Eng.) & District Tramway's bill for powers to construct an electric railway from Southport to Lytham has been reported favorably to the House of Commons by a special committee.

A contract for converting the local tramways of The Hague, Holland, to electric traction, was given last month to the Elektriciteits Actien-Gesellschaft Schuckert, of Nuremberg, Germany.

The Leicester (Eng.) Corporation is sending a sub-committee to Paris, Brussels, Berlin and Budapest in order to inspect different systems of electric traction and make recommendations for a system at Leicester.

A special committee appointed by Parliament has reported adversely on the Manchester & Liverpool Electric Express Ry. bill by which the promoters sought powers to build a high speed road between the cities named.

A company entitled the Societe des Tramways de Jaroslaw has been formed at Silessin, Belgium, under the auspices of the Compagnie Generale de Traction et d'Electricite, to construct electric trams at Jaroslaw, Russia.

The Cork (Ireland) Electric Tramways & Lighting Co. is promoting a bill in Parliament for the extension of its lines from Ballintemple to Blackrock. An order has been secured authorizing an extension of the line along the Western Road.

Pearson & Son, contractors, of London, are making preparations for introducing electric traction at Vera Cruz, Mexico. They hold valuable franchises for this purpose and Sir W. Pearson of the firm is now in Vera Cruz perfecting arrangements.

The strike of street railway employes at Berlin, Germany, in which 5,000 men were involved, was last month declared settled, the company agreeing to reduce the working hours and arrange wages on a sliding scale according to the term of service.

The Thompson Houston Co. is negotiating for the lease of 12 miles of street railway at Valencia, Spain. It proposes to equip these lines for electric traction. Horace Lee Washington, U. S. Consul at Valencia can give additional information.

Residents of the Western London suburbs will soon be given better transportation facilities by the London United Tramways Co., whose bill for electric tramway extensions has been reported favorably by a committee of the House of Commons.

A prospectus recently issued by the British Electric Plant Co., with headquarters at Alloa, Scotland, states the new concern intends to engage in the manufacture of electrical machinery, including dynamos, motors, transformers, rotary converters, etc. The capital is £100,000.

As an example of the heavy increase in the prices of tramway material in England, the large boilers which were recently purchased by the Sheffield Corporation Tramways at a cost of £2,850 each, 18 months ago could have been bought for £1,950 each, and five years ago they would have cost but £1,450 each.

The Government of Belgium has provided in its annual appropriations for the construction at a cost of 40,000,000 fr. (\$7,720,000), of a high-speed electric railway between Antwerp and Brussels, so built as to be entirely free from grade crossings. Bids for the construction of such a system will be received by the Government officials. Geo. W. Roosevelt is the U. S. Consul at Brussels.

A signalling device for communicating orders to the engineer or other station attendants is in use at the Coventry (Eng.) Corporation Electricity Works. It consists of a frame fitted with transparencies, behind each of which is a glow lamp. The signs read, "Shut Down," "Slower," "Start," etc. and by lighting the proper lamp everyone in the station is acquainted with the order that is being given.

U. S. Consul Bergh writes from Gothenburg, Germany, as follows: The city council has decided that the city itself shall build and run the new electric street railway. In all probability the proposed lines will be extended considerably, and more rolling stock and other material will be needed than at first estimated. American firms should address Figge Blidberg, Esq., engineer and manager, City Tramways, Gothenburg, Germany.

E. W. ASH.

Mr. E. W. Ash, until recently general manager of the Schuylkill Traction Co., of Girardville, Pa., will henceforth represent the Atlas Railway Supply Co., of Chicago, in the East with headquarters in New York. Mr. Ash took his position with the Schuylkill Traction Co. in the fall of 1893 and continued until June 1st of this year; he also had the management of the Lakeside Ry., of Mahanoy City, which was consolidated with the Schuylkill Traction Co. in April last. Before entering the street railway field he was for nearly 25 years connected with various steam railroad companies. He was an active member of the Pennsylvania Street Railway Association and was also treasurer of "The Syndicate." On resigning his position with the Schuylkill Traction Co. the employes presented Mr. Ash with a handsome Elk watch charm as an expression of their appreciation of the pleasant relations existing between them for so long.



R. W. ASH.

The Atlas Railway Supply Co. which Mr. Ash now represents makes the well-known "Atlas" rail joint and also the "I-X-L Composition." The composition is a surfacer for cars which is extensively used in railway paint shops. The "Atlas" rail joint has been adopted as standard by several of the large street railways and at present there is also a large demand for the joints for new construction; they are adapted for both girder and T-rails.

INTERNATIONAL TRAMWAYS EXHIBITION.

We are in receipt of a circular giving the conditions and regulations for exhibitors at the International Tramways & Light Railways Exhibition, to be held at the Royal Agricultural Hall, London, from June 23d to July 4th, under the auspices of the Tramway & Railway World. Exhibits will be divided into a number of classes, including the following: Working models of various electric, compressed air, gas and steam motor systems; track material; power station equipment; rolling stock and equipment; trucks and wheels, and brakes. Consignments of goods must be marked "Tramways & Light Railways Exhibition, Agricultural Hall, London, N.," together with the name and address of the exhibitor.

Among the companies that have taken space and are planning to make extensive displays are the following American firms: Babcock & Wilcox, J. G. Brill Co., Harold P. Brown, Christensen Engineering Co., Consolidated Car Heating Co., Lorain Steel Co., Ohio Brass Co. and Smith of New York.

The patrons of the exhibition include the lord mayor of London, the chairman of the London County Council, the lord provost of Glasgow, mayors of 25 additional cities, and the chairmen of about 50 prominent tramway companies.

INSULATED ELECTRIC WIRES AND CABLES.

In October last the Hazard Manufacturing Co., of Wilkes-Barre, Pa., well-known as the maker of wire rope for cable railways, enlarged its plant and commenced the manufacture of covered wires and cables. The capacity of the plant was increased by the erection of a new four-story brick building, 150 x 60 ft., and by an increase of engine capacity, aggregating 250 h. p. The company makes a specialty of rubber covered wire for all purposes and also other waterproof wires and magnet wires. It claims to make the most perfect rubber covered wires in the country, both solid and double cover. For this purpose it imports large quantities of crude rubber and employs the spewing process for applying the rubber to the wire. It also makes a specialty of waterproof Randell wire, in the manufacture of which the wire is first covered with cotton fiber and is then braided over; this makes a cable that is very flexible and more perfect in insulation than can be obtained by the ordinary method of covering. The company's submarine wire is made in

continuous lengths up to 20 tons in weight. Both lake and electrolytic copper are used, the wire being drawn from the rods purchased from the large copper mills. All the braiding and covering machines are of modern design and many of the new machines differ materially from those employed in other wire covering establishments.

THIRD AVENUE RECEIVER DISCHARGED.

The stockholders of the two companies having ratified the acts of their respective boards of directors for the lease of the Third Avenue R. R. to the Metropolitan Street Railway Co., of New York, the United States Circuit Court on May 23d ordered the receiver of the Third Avenue to transfer the property to the lessee. Mr. Grant having been notified that the Metropolitan company had deposited money with the Morton Trust Co., \$23,343,885.88, to pay all debts against the Third Avenue company, he turned over the property on May 24th. The formal transfer was made in a car of the Third Avenue company on the loop near the post office, in order to comply with the law that such acts take place on the company's property.

Mr. Vreeland that night issued the following order: "The Metropolitan Street Railway Co., having acquired control of the Third Avenue R. R. property, has this day taken possession of same and will, hereafter operate the property as the Third Ave. division of the Metropolitan Street Ry. system.

"The authority of the officers and the heads of departments will be extended over this division as follows:

"Orren Root, jr., assistant to the president; F. D. Rounds, general superintendent; Henry A. Robinson, attorney; H. S. Beattie, treasurer; R. Warren, secretary; D. C. Moorehead, auditor; A. C. Tully, general purchasing agent; M. G. Starrett, chief engineer; Thomas Millen, general master mechanic; W. B. Reed, engineer of maintenance of way."

LORD'S BOILER COMPOUNDS.

These compounds which are for removing scale from steam boilers, are known throughout the industrial world, and the name of George W. Lord is a familiar one to steam users, for he has probably been longer engaged in the study and manufacture of compounds of this character than any other person in this line of business, having begun more than 35 years ago.

In order to meet the deservedly large demands for this class of goods, Mr. Lord last summer built for himself an extensive plant at 2238 to 2250 N. Ninth St., Philadelphia. The buildings are of brick, a three-story building 175 x 122 ft. and a wing extending back from the street 100 x 112 ft. The offices for the clerical force occupy part of the first floor of the main building and these are large and tastefully finished and furnished. The machinery equipment includes 14 sets of burr mill stones for grinding the materials, with bolting machinery much like that employed in flouring mills; this is driven by a 65-h. p. engine. Conveniently located are storage bins with automatic chutes and all the necessary appliances for packing the compounds in kegs, barrels and casks. There are elevators and weighing devices as well as appliances to facilitate shipping. Some idea of the amount of the compound used can be had when we are told that an average of 80 packages are shipped every week day which go to all parts of the world. The compounds consist of both vegetable and mineral elements, and are made and shipped as dry powders only. While the compounds are made of chemicals of a similar nature, there are over 50 preparations which are designed to act upon impurities that may be found in feed water in different localities. A department for chemical analysis is maintained, Mr. Lord himself being an expert chemist, and waters from different localities are analyzed and a compound that will suit the particular conditions is shipped to that locality.

In a recent conversation with Mr. Lord, it was learned that his attention was first turned to the study of boiler scale before the Civil War, he being at the time a locomotive engineer, and afterwards chief engineer of some large boiler works in Pennsylvania. At the outbreak of the Civil War he enlisted in the Fifth Pennsylvania Cavalry; after being mustered out in 1865 he returned to his laboratory and began the manufacture of boiler compounds, which business he has pursued ever since with marked and increasing success.

CAR FOR THE CENTRAL LONDON RY.

The Central London Ry., which is an underground electric road extending from near the Bank of England to Shepherd's Bush in West London, is approaching completion, and will soon be opened for traffic. In our issue for July, 1897, page 478, we published a map of the road, showing the location of the stations, and in April, 1898, page 238, illustrated the locomotives, station apparatus and interesting details of construction. The company has 13 miles of track, which occupies twin tunnels laid about 75 ft. below the street surface. The power house is at Shepherd's Bush, and is equipped with Babcock & Wilcox boilers, Allis engines and alternating current generators built by the British Thomson-Houston Co. Current is transmitted at 5,000 volts and reduced to 500 at four sub-stations. Operation will be on the third rail system, the cars being run in trains of seven drawn by electric locomotives.

By courtesy of the Brush Electrical Engineering Co., Ltd., 49 Queen Victoria St., London, E. C., we have received a photograph of one of the cars it has furnished to the Central London Ry. These cars are 46 ft. 3 in. long over the buffers, 39 ft. over



CAR FOR THE CENTRAL LONDON RY.

the body, 8 ft. 6 in. wide at the panels, 7 ft. 5 in. high in the middle. The underframing is of rolled steel channels, connected by knees and gusset plates, and the body framing of well-seasoned teak, the side frames being trussed with diagonal bracing, strap bolts and vertical tie rods.

The trucks have a wheel base of 5 ft. and are spaced 29 ft. 6 in. between centers, giving a total wheel base of 34 ft. 6 in. The axles are of Siemens-Martin steel, 4 in. in diameter in the wheel seats, and with journals 6 x 3 in. The wheels are 29 in. in diameter, with steel tires 4½ in. wide by 2 in. thick. The gage is 4 ft. 8½ in. The truck frames are of steel; they were made by the Leeds Forge Co.

The platforms at each end are 3 ft. 3 in. long and fitted with Gold automatic locking platform gates on each side; also, across the ends are iron screens 4 ft. 6 in. high, and the cars are connected by collapsible gates to prevent passengers stepping between the cars. The cars all have Westinghouse quick-acting air brakes.

Each car seats 48 passengers; four rows of cross seats are placed at the center with longitudinal seats at the ends, this arrangement being adopted to permit the wheels to swivel, under the end seats. Brass luggage racks and hat and coat hooks are provided in the interior of the cars. Ventilation is had by means of "hit-and-miss" ventilators fitted to the sides of the clerestory, hinged ventilators directly over the windows, and 10 "Torpedo" air extractors along the roof.

The seats and backs have Wood's woven wire frames and are upholstered in blue and crimson moquette velvet. Ten incandescent lamps, eight inside and one on each platform, are provided; also two oil lamps for emergencies. The exterior is painted in purple lake and white, with gold stripes.

The end coaches of each train are arranged as smokers, being upholstered in hair cloth instead of velvet.

Mr. S. L. Nelson, general manager of the Wichita (Kan.) Railroad & Light Co., writes in regard to the re-rolled rails, of which his company recently purchased 300 tons, that the rails have not been in use long enough to warrant a positive opinion regarding them, but it is believed they will prove entirely satisfactory and will be equal in every respect to new rails.

ELECTRICAL BONDS FOR PIPES.

In the abstract of Mr. E. H. Jenkins' paper on "Electrolysis" published in our May issue, page 260, reference was made to an article by Mr. A. A. Knudson in which he stated that the electrical resistance of the joints of water and gas pipes and Edison tubes increases with age because of the galvanic action between the metal of the pipes and the lead of the joints, and that the effect of this increase in joint resistance is to cause electrical currents that may flow in the pipes to shunt around the joints through the surrounding earth or (in water pipes) the enclosed water, and pit the pipes.

As a preventive of this destructive action Mr. Knudson proposes to electrically bond the iron pipes and has secured patents on such bonds. The bonds are tinned copper rivets; under the head of the rivet is a washer made of a spiral of copper wire which can readily be made to conform to the curvature of the pipe. At the bell end the rivet is driven into a hole drilled in the interior of the pipe, and at the spigot end driven in a hole and the end riveted on the inside of the pipe. One or more pairs of these contacts are to be used at each joint. Connection between the rivet contact pieces

is made by the lead of the joint, or if desired the wires of the spiral washers of the rivets may be uncoiled and twisted together.

Tests made on 8-in. pipes showed resistances of .0035 to .0097 ohm for unbonded joints and of .00008 to .00011 ohm for similar joints having the Knudson pipe bonds.

STREET RAILWAY BAND AT HARTFORD.

Hartford, Conn., has a street railway employes' band, modeled after a similar organization formed among the employes of the Toledo (O.) Traction Co., and which has frequently been mentioned in the columns of the "Review." The success of the Hartford band is due to the efforts of Mr. Thomas Davis, barn foreman of the Hartford Street Railway Co., whose attention was attracted to the idea through reading an account of the organization at Toledo. He made inquiries and found there were a number of musicians among the men employed by the Hartford road and a meeting of those interested was called, resulting in the formation of a musical club. The Employes' Mutual Benefit Association donated \$150 for the purchase of instruments and later when the success of the organization was assured, this association furnished the money with which to buy uniforms. The band has a membership of 25 and has given a number of creditable entertainments.

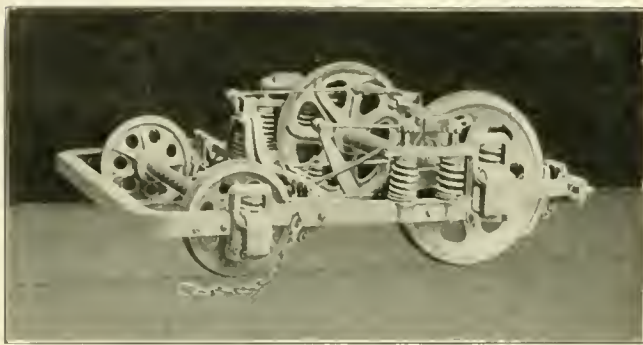
NEW OHIO COMPANY.

Mr. John P. Martin, of Xenia, O., is actively engaged in promoting the construction of an electric railway from Xenia to Springfield, O., a distance of 20 miles. The company is the Clifton Scenic Railway & Power Co. On the route are Oldtown, Goes Station, the works of the Miami Powder Co., Yellow Springs, Riverside Park and Clifton. The regular business traffic in this territory should prove remunerative and in addition the picturesque scenery and historical associations would prove very attractive for pleasure riders.

The shareholders of the Southern Ohio Traction Co., of Hamilton, O., have authorized a bond issue of \$2,000,000 to retire prior liens of the companies recently absorbed.

AN IMPROVEMENT IN TRUCK BUILDING.

Rather more than eight years ago the J. G. Brill Co. placed on the market its first No. 21-E trucks having solid forged side frames. The construction of these frames was a difficult mechanical problem and for over a year they were sold for less than the cost of production. The company was convinced that the advantages which a solid forged side frame offered in the way of lightness combined with strength and stiffness, convenience when once made, durability, and the entire absence of the troublesome and expensive repairs attendant upon a built-up riveted construction, fully justified the expense of developing processes for more economical pro-



IMPROVED BRILL TRUCK FOR PARIS.

duction. The strongest part of a forging being the outer skin which has been condensed under the hammer it is evident that the best results are to be expected with a forging so finished under the hammer that it will not be necessary to machine it and thus remove the skin. The Brill company undertook to produce side frames that would require no machine work except the drilling of a few holes and the facing off of the seats that received bolted members. By the ingenious combination of drop forging with blacksmith work pure and simple two important steps have been achieved, the 21-E side frame previously mentioned and the forged side of the maximum traction truck shown in the accompanying illustration.

The frame consists of two jaws of unequal size connected by a heavy bar on which are two spring seats surrounded by bosses and brackets for the attachment of braces; projecting from the top of the main jaw is an arm in which are two large holes surrounded by suitable enlargements, and on the outer side of this jaw an arm with a broad palm at the end for receiving the cross tie bar. An inspection of this frame makes the difficulty of the work apparent and remembering that the blacksmith's "hair line" is about $\frac{1}{4}$ in. wide, the accuracy of workmanship which enables the side frame to go in place without finishing except in the jaws, will be appreciated.

The truck illustrated is one of a number made for an electric line in the city of Paris; it has all the general features of the No. 22 type of maximum traction truck. The cars will be operated by storage batteries within the city limits, and the batteries weigh 10,000 lb., bringing the weight of the body with 60 passengers up to 38,000 lb. The space under the center of the car occupied by the batteries made it necessary to place the trucks far apart with the pony wheels under the platforms. One truck for each car has an angle passing from jaw to jaw of the pony wheels, as shown in the illustration, to which an axle driven air compressor is attached. The other trucks are without this angle. The axles are $4\frac{1}{2}$ in. at the center and $3\frac{7}{8}$ in. at the journals.

A STREET RAILWAY MENU.

In a Chicago restaurant patronized chiefly by street railway employes the bill of fare is made up in terms with which they are familiar. The roasts and substantial served daily are called "regulars"; entrees are termed "trippers"; ice cream and cake are known as "extras," and tea and coffee are "trailers." The check is called a "transfer" and the waiters are dubbed "spotters." Oysters and clams are "fenders" because they come ahead of everything. The owner of the restaurant is always referred to as "Yerkes."

EXPRESS WAR IN CONNECTICUT.

May 19th the Adams Express Co. announced that the Bridgeport Steamship Co. would accept no New York express matter that had reached Bridgeport over the lines having agreements with the Trolley Express Company of Connecticut. This latter company is the successor of Cole's Express which began business two years ago between New Haven and Woodmont; with the consolidation of electric lines effected by the Young syndicate the trolley express service has been extended and this season is operating over 50 miles of track.

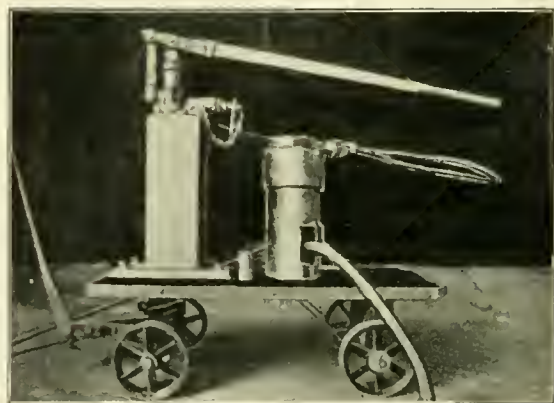
ENJOINED FROM SELLING TRANSFERS.

The Chicago City Railway Co. last month secured in the Superior Court of Cook County an injunction against 150 newsboys by name, restraining them from buying or selling street railway transfers or giving newspapers in exchange therefore. The action was considered necessary as the only means of stopping the illegitimate traffic in transfer tickets, which in spite of all the companies could do has grown to enormous proportions in Chicago. June 11th two of the boys were brought before the court for contempt of this order; after a reprimand they were released.

EXHIBITS AT THE ELECTRIC LIGHT CONVENTION.

The Splice & Terminal Co., of 15 Cortlandt St., New York, for which the Morris Electric Co. is general sales agent, demonstrated in one of the Auditorium parlors, a radically new process of splicing wires and cables by compression alone and without the use of heat or solder. The method is as follows: The ends of the cable are stripped of insulation and inserted into a sleeve of copper, 3 in. long. Then by means of a portable hydraulic press, this sleeve is swaged down around the cable ends, consolidating the wires of the cable into a compact, substantially homogeneous mass of copper free from internal voids, and forcing the metal of the sleeve into the external crevices of the cable. Tests on the new splice show it has greater conductivity and greater tensile strength than the cable itself.

The portable press or cold hydraulic welding press, as it might be termed, is illustrated herewith, and is capable of giving pres-



HYDRAULIC WELDING PRESS.

sure up to 100,000 lb. per sq. in. When making a splice the cable ends, with the copper sleeve in place, are inserted between tool-steel dies. The work can be performed at some distance from the press if necessary, as in conduit work, hydraulic connection being made between the compression cylinder and the press by means of strong copper tubing.

Another interesting exhibit was made by H. W. Johns Manufacturing Co., of New York, through its Western representative, the Manville Covering Co., of Chicago. The display consisted of samples of the many styles of the Sachs "Noark" safety fuse, ranging in size from 110 to 20,000 volts. Mr. Sachs, of Hartford, and Mr. S. H. Finney, who represents the electrical department of the Manville Covering Co., were on hand to explain the safety reliability and economy of enclosed fuses.

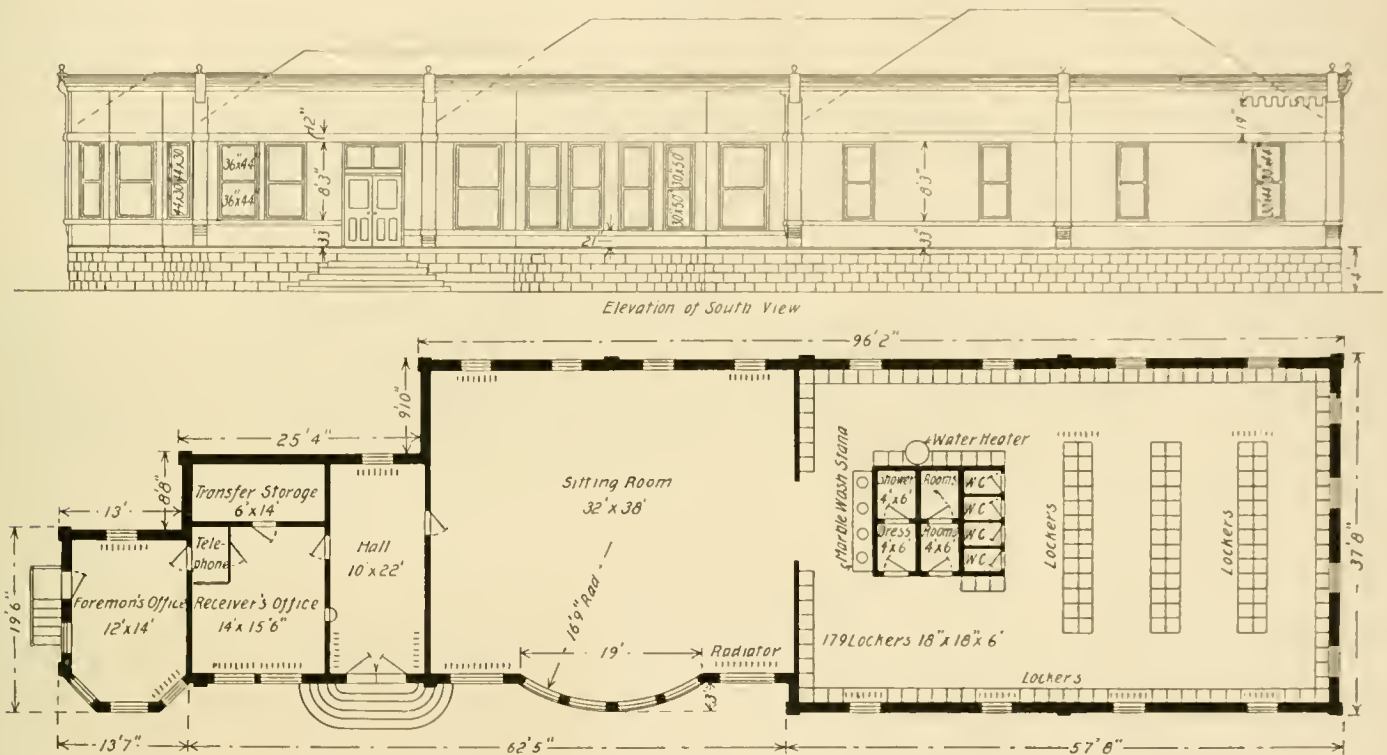
NOTES FROM CINCINNATI.

The Cincinnati Street Railway Co. is at present operating five electric power stations, four of which are within two or three miles of Fountain Sq., which is passed by all the cars. Of these four stations one is on the Ohio River, 3¼ miles northeast of Fountain Sq., one 2¾ miles due west, one (Hunt St.) 2¼ miles north-northeast and one (Brighton) 2½ miles northwest from Fountain Sq. The fifth station is at Cumminsville 4½ miles north-northwest from the square. This arrangement was adopted in order that the stations might be near the heavy grades (from 6 to 13 per cent) and thus reduce the amount of copper required for feeders, an important feature because the double overhead system is used everywhere. The Brighton power house was built in 1889, being the first electric station erected by the company, and at the present time has a capacity of 4,000 h. p. The development of the system has been such that three of the other stations each about two miles distant from it feed into the territory almost up to the Brighton station, and the company is now contemplating removing the generating machinery and making a storage battery station

Knoxville marble; a shower and tubs with hot and cold water are provided. Each man has a locker for his clothes; these lockers are 18 x 18 in. x 6 ft., the doors having two panels, 12 x 30 in., of wire netting for ventilation. Three other such buildings are contemplated, one of which is to be two stories high.

In the shops at Chester Park (which were illustrated and described in our issue for March, 1897, page 186) the new work now under construction comprises 30 open cars and 4 special or private cars. The company already has seven of these handsomely furnished special cars which are very extensively used to carry private parties, schools, tourists, etc. That they are popular is shown by the fact that four more of them are building. During the meeting of the American Society of Mechanical Engineers in Cincinnati, last month, the company placed a number of the special cars at the disposal of the Society and thus enabled the visitors to see much of the city in a most pleasant manner, a courtesy which was greatly appreciated.

The 30 open cars now building are of the company's standard type, adopted three or four years ago. They are 29 ft. 6 in. over all with a 23-ft. body; from the bottom of sills to top of roof is 8 ft



ELEVATION AND PLAN OF STATION FOR EAST END DIVISION.

of it. The company now operates 260 miles of track, making about 53,000 car-miles per day.

A contract has recently been closed with the Pittsburg Reduction Co. for 40 miles of insulated aluminum feeder cable, which is believed to be the first large order for the insulated aluminum that has been placed. The cables are to have 37 strands, aggregating 795,000 c. m. in cross-section, which is about equivalent in conductivity to a copper cable of 500,000 c. m. The joints are to be welded. The new feeders when installed will constitute about one-tenth of the feeder system.

Last Christmas the company opened the club rooms which had been fitted up for the employes of the Vine & Clifton division, and since then has prepared plans for similar stations at the other operating car houses. We show herewith the floor plan of a building, now approaching completion, which is for the accommodation of the employes of the East End division. The building is located at Eastern Ave. and St. Andrews St., opposite the car house. It is one story high, of pressed brick with stone trimmings, and contains offices for the division foreman and receivers, and a room for storing transfers, as well as the employes' rooms. On the interior the walls are wainscoted to a height of 3 ft., and above that are painted. The floors are of hard pine quarter-sawn. The bathrooms are particularly complete and are finished in gray

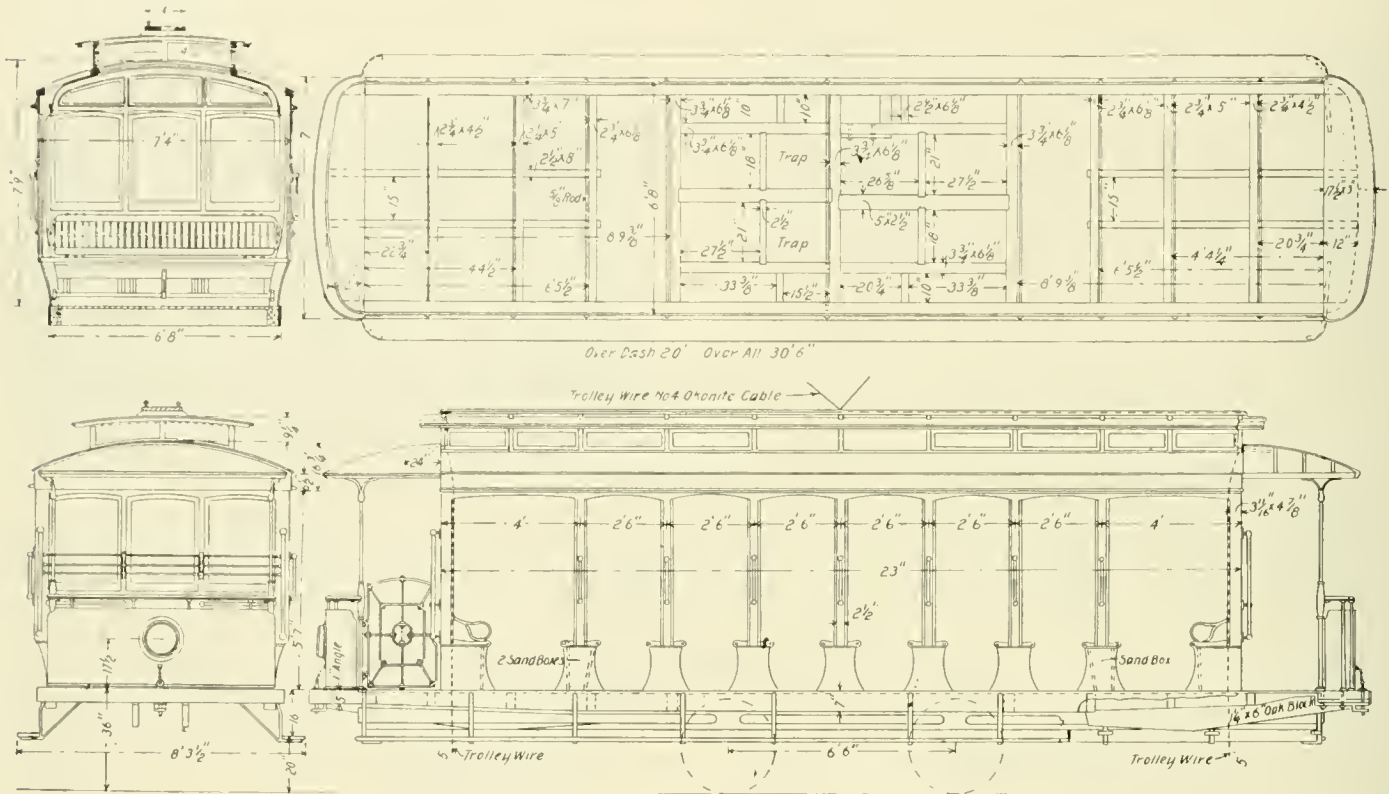
4 in.; the width over the sill plates is 6 ft. 8 in.; and at the sash rails 7 ft. 4 in. The sills and bottom framing are of long leaf yellow pine, the timber being painted before the parts are assembled. Steel plates 7 x ½ in. extending the entire length of the sills are bolted to the outer sides of the side sills, and cross tie rods ½ in. in diameter extend through the car bottom. The posts and ventilator rails are of ash, the window and desk sash are of cherry, the ceiling of three-ply birdseye maple veneer, and the floor of quarter-sawn hard pine. There are nine cross seats, two against the bulk heads and seven with reversible backs. The fittings include electric push buttons on all the posts, the automatic curtain replacers invented by Mr. Kilgour, president of the company, three Robinson patent sand boxes, safety gates, and striped duck curtains mounted on Hartshorn spring rollers.

The framing of these cars is apparent from the accompanying illustrations. We also show a drawing of the standard open cars, 30 of which were built at the company's shops last fall.

One of the departments of the shops of the Cincinnati Street Ry. which always excites the interest and often the surprise of visitors is the armature and controller repair shop. The company has about 1,000 double motor equipments, and of these 700 are in regular service, making 1,400 motors in constant use; all the armature and controller repairs for these cars are made by two men and two

boys. The work includes the winding and taping of the armature coils, the winding of field coils, and the making of commutators. A boy winds 20 field coils per day. By aid of the taping machines designed by Mr. B. L. Kilgour, electrical engineer, a boy can tape a full set of armature coils in a day. This device is driven from the line shaft and consists of an outer stationary ring and an inner rotating ring which carries a bobbin of tape paid out through a tension clamp. The copper commutator segments are cast in the

For cutting the groove a special cutter is mounted on a 1-in. shaft supported in a suitable frame in front of the trolley wheel which is mounted on a lathe head. The cutter is shaped as shown in the sketch and is rotated by a worm which meshes with a gear on the end of the tool shaft. The cutting edge of the tool being in the position a b the trolley wheel can be slipped past it and mounted on the lathe head. Then the tool is rotated in the direction of the arrow and as the cutting edge advances the grooves



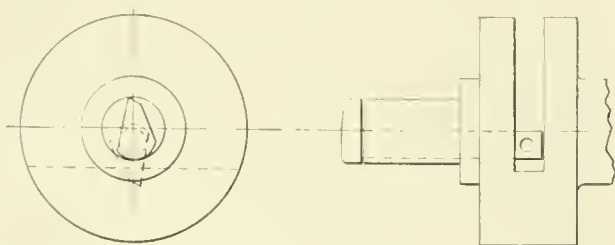
STANDARD OPEN CAR, CINCINNATI STREET RY.

foundry from scrap copper wire. The armature repair shop is under the supervision of Mr. B. L. Kilgour and the other departments are under Mr. P. Leen, master mechanic.

For finishing trolley wheels two special machines are used, a turret lathe for boring and reaming the hole and facing both ends of the hub at one chucking, and a special cutter for turning the groove. There are four tools in the turret of the lathe; first, a flat drill for roughing out the bearing; second, a flat drill for giving it the finishing cut, and this is provided with shoulders at right angles to its axis for facing the front end of the hub; third, a reamer; fourth, a special tool for facing the rear end of the hub. None of these require any special description save the last which is shown in the accompanying diagram. The cutting-off tool is at the end of a shaft which is eccentric to the tool body and may

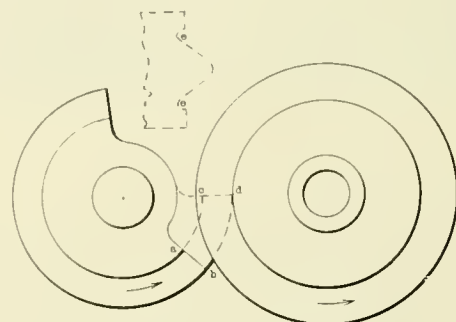
be first cut the flange of the wheel and when in the position c d on the line joining the centers, the maximum depth of cut is reached. With these two machines about 100 wheels can be finished per day, an unskilled workman only being required; the capacity of the turret lathe is about twenty-five and of the groove cutter about seventeen per hour.

For cutting keyways in the car axles Mr. William Wilson, foreman of the machine shop, some years ago designed a portable machine tool which has been used ever since. Some difficulty had been experienced in getting the keyways at the proper point if the work was done before the wheels were mounted on the axle and



SPECIAL CUTTING-OFF TOOL.

be rotated through an angle of 180° by a handle (not shown in the cut) which is movable in the slot shown in the enlarged portion of the tool body. When the turret is moved up the projecting stud of the tool body is thrust through the bearing of the trolley wheel, and the eccentrically mounted shaft turns so that the cutting tool assumes the position shown by the dotted line in the end elevation.

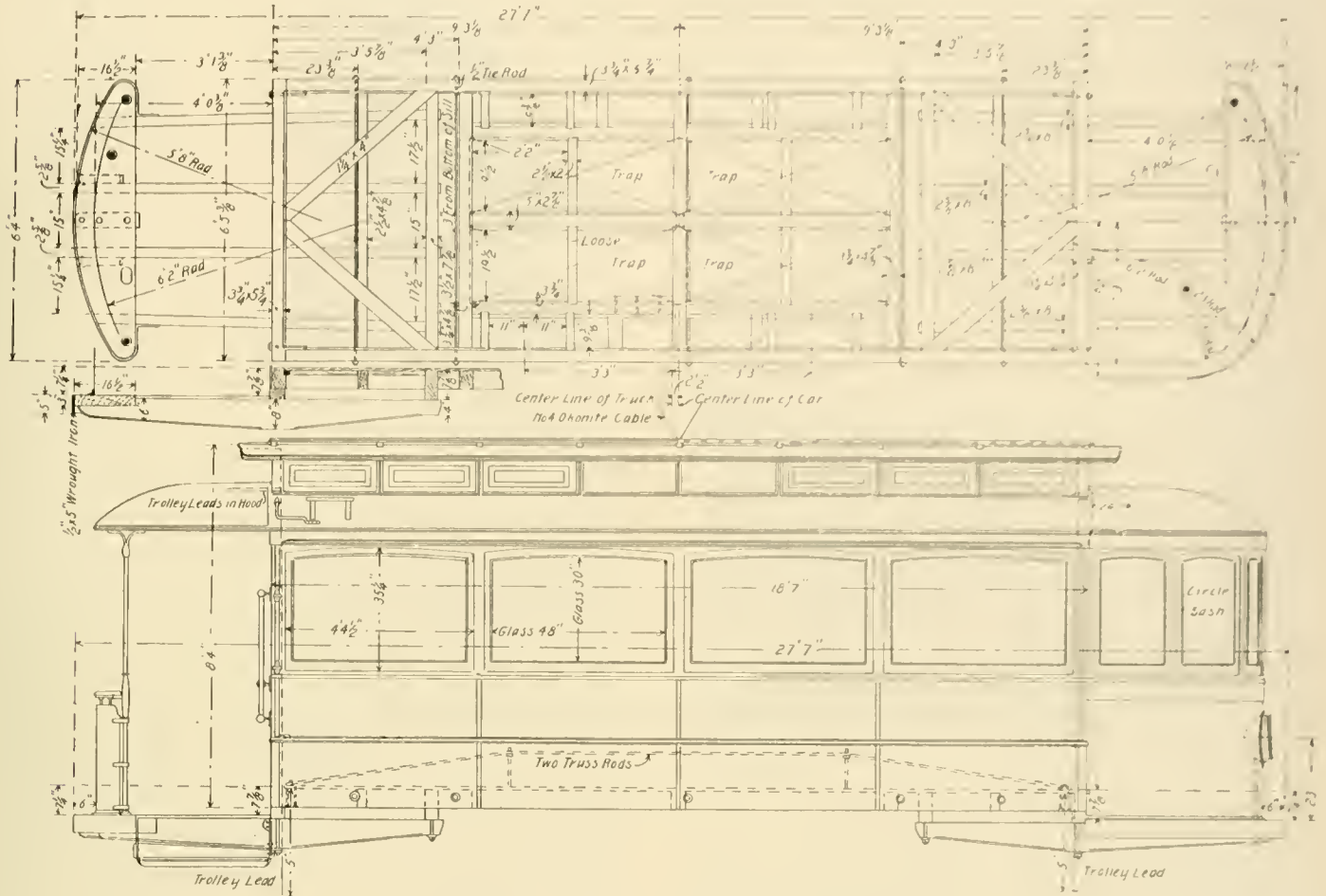


SPECIAL CUTTER FOR TURNING TROLLEY WHEELS.

the tool was designed to cut the keyway after the wheels had been pressed on. The machine, which is about 18 in. long by 12 in. high, has a bed similar to that of a lathe that is clamped on the axle at the proper point. Above the bed is a shaft having at one end an 8 in. pulley to receive a driving belt, and at the other end a bevel gear meshing with a gear on the shaft of the tool

which is an end-milling tool mounted vertically. The driving shaft has a spline so that the bevel gear may be moved along it by a feeding device. The tool also has a vertical feed. There are several types of motors used on the road and for convenience in locating the keyways a template bar is used; one end of this is placed against the hub of the wheel and at the other end is a series of steps

The oak form is bolted to two pieces fastened to the floor which serve to raise the form off the floor and at the same time support the pulleys over which the tension rope run. In bending, the steamed rail is laid against the form with a piece of 2 1/4 x 3/4 in. strap iron along the outside edge, and wedged at two or three points along the middle portion of slight curvature. Levers are then in-



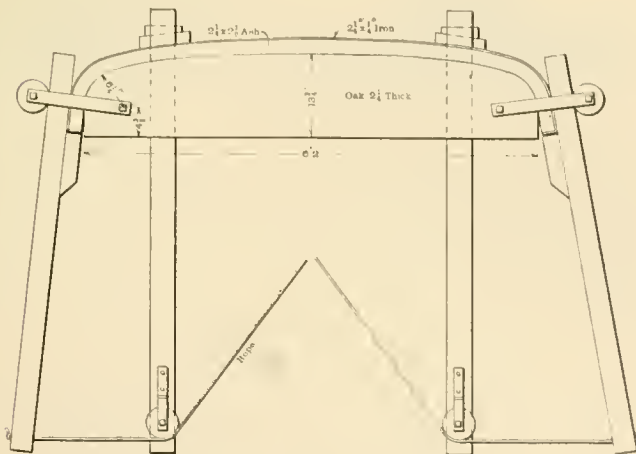
STANDARD CLOSED CAR, CINCINNATI STREET RY.

each of which indicates where the keyway for a given type of motor should be located. The template bar can be thus used because the inner sides of the wheel hubs are faced up to gage so as to be the same distance from the flange.

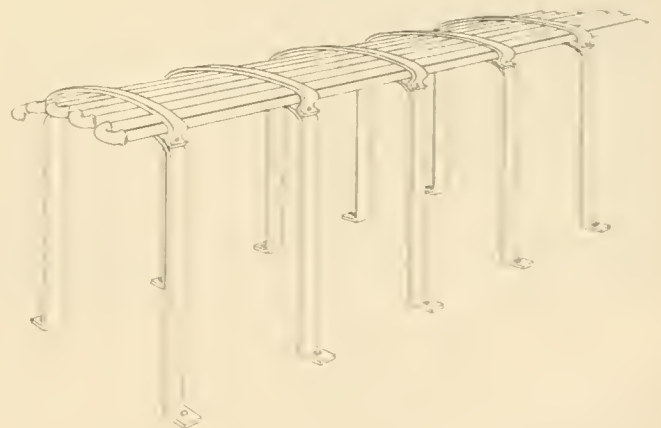
One of the sketches shows the form used for bending the dash

sorted in the links and the ends bent around as shown in the sketch; ropes are led over pulleys to a differential chain block for drawing the levers around.

For drying light work after steaming a hot table made of steam piping is used. This consists of 10 sections of 1-in. pipe, 21 ft. long, supported on wrought iron frames spaced 18 in. apart



FORM FOR BENDING DASH RAILS.



HOT TABLE.

rails. The sharp curves of 6 1/4 in. inside radius extending over nearly 90° make this a difficult piece to bend and with one form only one pair of rails can be bent per day; a single piece 2 1/2 x 2 1/2 in. is bent and then sawed in two to make the two rails for a car.

The fire regulations adopted in these shops may be of interest to other roads having large shops. In each building is a large gong mounted in a prominent place, with a rope depending, and on a sign board near the gong is the following notice in large letters:

"In case of fire pull rope attached to gong. All employes must respond."

Sections of hose are located at various points about the shop, being laid upon flat shelves at such a height that the covering shell which is placed above the hose to protect it from dust can also serve as a desk; the hose shelves are painted red, and draped with red curtains. Instructions to employes are contained in the fire regulations which are framed and posted at various points throughout the buildings, and read as follows:

"I. Any employe detecting a fire in any part of the buildings will rush immediately to the nearest fire gong and sound same a number of times in rapid succession; wait a moment, and then sound the number of the building in which the fire is according to the following code of signals, repeating the number three times:

Paint shop	1-2	Blacksmith shop	2-3
Erecting shop	1-3	Machine shop	2-4
Cabinet shop	1-4	Armature shop	3-1
Mill shop	2-1	Stock storeroom	3-2
Power house	2-2	Car storage barn	3-3

"II. Any employe hearing the fire alarm from another building than the one in which he is employed will rush immediately to the nearest fire gong and sound one stroke on same,—then wait till he hears the signal indicating location of fire, when he will immediately repeat the signal.

"III. All other employes in the building where fire is discovered than the one at the fire gong, will rush immediately to the nearest fire plug and get the hose ready for at once throwing water.

"IV. Employes in other buildings where extra hose is kept will as soon as the signal locates the fire, rush at once to the spot where the extra hose is stored and proceed with it as rapidly as may be to the fire.

"V. Extra hose is stored for convenience in the cabinet, paint and machine shops.

"VI. Above everything else keep a cool head and avoid loss of time by doing unnecessary things.

"VII. In handling hose, see that the nozzle is so directed that the water goes either on the fire or in close proximity, and avoid indiscriminate deluging of valuable stock, material or machinery.

"VIII. The object of the above is to secure the subjugation of the fire at the earliest possible moment."

The officers of the Cincinnati Street Railway Co. are: President and general manager, John Kilgour; secretary and assistant general manager, James A. Collins; treasurer, R. A. Dunlap; general superintendent, John Harris; electrical engineer, B. L. Kilgour; auditor, W. R. Avery.

REPORT OF SPECIAL EXPERTS AT CLEVELAND.

The two experts, Mr. Richard Tregaskis, and Prof. John W. Langley, appointed by a committee of the Cleveland city council to examine into and report upon the financial and physical condition of the Cleveland City Railway Co., have finished their work and filed their report. They find the state of the property to be substantially as was reported by the officials of the company before the examination.

The authorized capital stock is \$8,000,000, issued \$7,600,000. Dividends paid in the past seven years have averaged 2 per cent per annum.

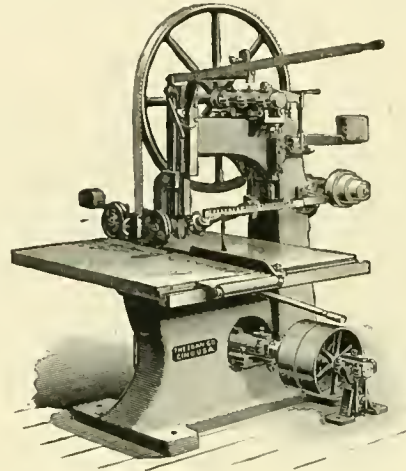
The experts find the actual operating expenses, excluding all interest, have averaged since 1894, 2.98 cents per passenger carried. Including interest the average has been 3.335 cents per passenger.

RAILS BY EXPRESS.

It is not often that a railway finds it necessary to order its rails and other heavy supplies shipped by express, but last month the Larchmont (N. Y.) Horse Ry. in order to fulfill franchise requirements had three carloads of rails, poles and wire sent from Reading, Pa., by express at a cost of \$400. The Pennsylvania R. R. furnished new cars for the shipment. After the material had arrived the village board made changes in the franchise which rendered this expensive haste unnecessary.

NEW AUTOMATIC BAND RIP SAW.

The accompanying illustration shows the new automatic band rip saw just brought out by the Egan Co., of 322-342 West Front St., Cincinnati. It is stated that this saw will do the work of several circular rip saws, and that it is much safer to use because there is no danger of the material being thrown back and striking the operator. The saw blade is very thin, and removes only a slight kerf, which is an important item in ripping fine lumber. Lumber from 1 to 9 in. thick

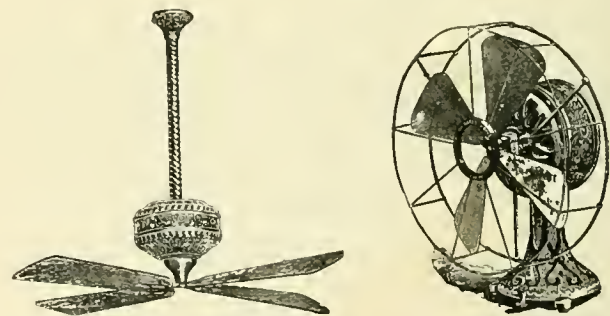


may be sawed without changing blades, and the adjustments are quickly made.

The column is made heavy so as to be free from vibration; the table is of ample size, always level, and has at the front a plainly marked index. The straining device is of a new design, with forward, backward and side adjustment, and is quite sensitive. The feed is powerful, and as the feeding-in and feeding-out rolls are close together, short stock can be worked to advantage. The machine will be found to have a number of convenient devices not possessed by rip saws heretofore placed on the market.

ELECTRIC FANS.

The ceiling and desk fans shown in the accompanying illustrations are two of the latest patterns from the factory of D. L. Bates & Bros., of Dayton, O., a concern that has been making electric fans for over nine years. These are wound for direct current at various voltages, including 500 and 550 volts, and are



BATES ELECTRIC FANS.

largely used in street railway general offices and in waiting rooms, as they can be easily operated from the trolley circuit. The fans are finished in nickel, oxidized copper, polished brass and the ordinary Japan finish for cheaper grades.

Bates & Bros. also make 12-in. and 16-in. water motor fans of the buzz type, for which they report an increasing demand.

"REFORM" IN CONNECTICUT.

Last year the street railways of Connecticut paid taxes aggregating 4.9 per cent of their net earnings, which is equivalent to over 13 per cent of the amount remaining after deducting operating expenses. Yet, as if this were not enough, a reformer proposes that the state laws be so amended that the street railways be required to pay license fees of \$100 per passenger car and \$50 per freight car per year, and to furnish current to light all streets on which they operate cars, the municipality to fix the number of lights needed in each case.

EXPERIMENTAL THIRD RAIL INSTALLATION AT LONDON.

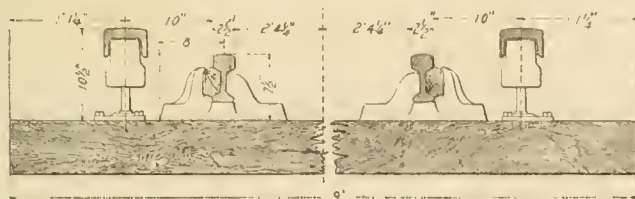
The directors of the associated Metropolitan and District Railway companies, of London, in February, 1899, voted £20,000 to be used in building an experimental electric line for the purpose of demonstrating whether electricity could be utilized for operating their systems, and also for determining if the change from steam to electric traction could be made without interfering with the regular daily traffic. The branch selected to be equipped is a double-track division, 5,000 ft. in length, running from Earl's Court to High St., Kensington, numerous gradients and sharp curves making this section a particularly good one for the purpose. The steepest grade is one 450 ft. long having a rise of 1 in 43; two others each 600 ft. long have a rise respectively of 1 in 47, and 1 in 62; and one other 900 ft. long is 1 in 67.

On May 21st the line was opened to the public, a third-rail system having been successfully installed without stoppage or delays to the regular travel.

As the engineers in charge, Sir John Wolfe Barry and Sir W. H. Preece, were instructed to equip the line in such a way that no current would be permitted to pass through the track rails or the sub-soil, lest it should interfere with the electrical signalling arrangements, it was necessary to provide outgoing and return conductors for each track. The conductor rails, consisting of inverted steel channels, weighing 75 lb. to the yard are placed 7½ in. outside the track rails and are carried on double-petticoat porcelain insulators, between which and the conductor rails, pieces of leather are interposed to deaden vibration and noise. At intervals of 100 yd. a special anchoring insulator is placed to prevent creeping of the conductors. The insulators are fastened to the ties by steel bolts.

At switches and crossings the continuity of the current-carrying rails had to be broken, leaving in several instances long gaps, which are bridged by insulated cables laid in conduits or protected by iron plates. The channel rails are bonded at joints with heavy copper strips, hydraulically riveted to the steel. Conductor rails for each track are cross-connected at intervals with the conductors of similar sign for the other track, though disconnecting links are provided whereby one track may be electrically isolated from the other.

At the generating station, which is of a temporary character, are installed two Belliss engines known as the T E C 4 type, giving normally 300 i. h. p. at 380 r. p. m., and having a rated maximum load of 360 i. h. p. The engines are direct connected to two Belliss-Siemens generators of the two-pole H B type, with armatures 27 in. in diameter and 40 in. long. The dynamos are compounded to give 500 volts at no load and 550 volts at full load of 385 amp. In the boiler room are two Babcock & Wilcox boilers, each capable of evaporating 9,000 lb. of water per hour at 160 lb. pressure.



SECTION SHOWING CONDUCTOR RAILS.

The single train at present in operation consists of two motor cars, one placed at each end with four ordinary coaches between, all the cars being mounted on two four-wheel trucks. Each motor car is equipped with four series-wound motors, of the Siemens four-pole type, with the armatures rigidly mounted on the axles of the driving wheels. Each motor develops a normal drawbar pull of 4,000 lb. and is rated at 110 b. h. p., the maximum power being 200 b. h. p. The controller is manipulated by an up-right wheel resembling the steering wheel of a yacht. The controller connections are arranged as follows: On notches 1, 2 and 3, all motors are in series and resistance is in series; notch 4, all motors in series, without resistance; notches 5, 6, and 7, two series of two motors in parallel, with resistance in series; notch 8, two series of two motors in parallel, without resistance; notches 9, 10 and 11, all motors in parallel, with resistance in series; notch 12, all motors in parallel, without resistance. Notches 4, 8 and 12 are the ordinary service positions.

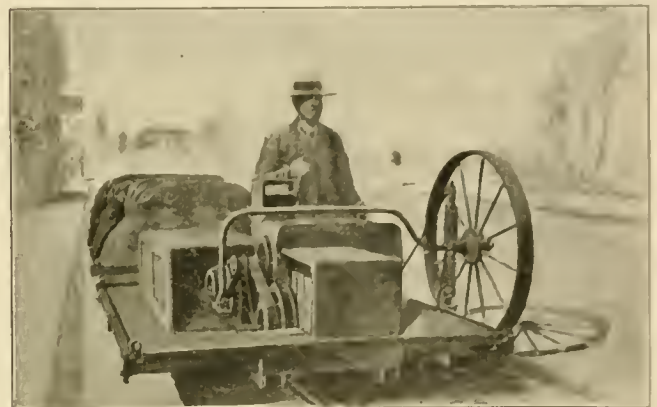
To make connection at the long gaps in the conductors and obvi-

ate the necessity of coasting, a positive and negative collector shoe is carried on each car so that some of the shoes are always in contact with the live rails. Each shoe is fastened to the truck by insulated suspension bolts, and all the positive shoes on the train are interconnected, as are also the negative, by cables and special couplings. The train is fitted with Standard air brakes.

As soon as this experimental line has been thoroughly tested, and the system proved feasible, it is said the order will be given for the complete electrical equipment of London's "Inner Circle" of underground transportation lines.

STORAGE BATTERY TRUCK FOR SINGLE-RAIL TRAMWAY.

We are indebted to the Scientific American for the accompanying illustration showing a storage battery truck built by a Glasgow firm for operation in India on an Ewing single rail tramway; the Ewing road and the ox-drawn vehicles as used in India were illustrated in our February issue, page 81. In the truck here shown



STORAGE BATTERY TRUCK FOR SINGLE RAIL TRAMWAY.

the motor is placed between the two wheels, and carries on its spindle a double pulley, which is belted directly to a pulley on to each of the axles. The storage batteries are grouped around the motor and the whole is boxed over to form a carrying platform. The truck is designed to carry a load of a quarter of a ton, and is capable also of drawing two other trucks, each carrying a ton, at a speed of eight miles per hour.

LAKE STREET ELEVATED LITIGATION ENDED.

On June 3d it was announced that all litigation between the Lake Street Elevated R. R., of Chicago, and Wilham Zeigler, of New York, had been ended; the original bill in this case was filed in December, 1895. Settlement was effected out of court and Mr. Zeigler received par and accrued interest on his \$605,000 of bonds, which were bought by a syndicate in which Blair & Co. were interested; this firm was active in financing the Northwestern Elevated. The syndicate will deposit the Zeigler bonds with a trustee under the scaling agreement made in 1895, taking out 60 per cent of the face in collateral trust debenture bonds and 15 per cent of the face in income bonds. It was the refusal of the Zeigler interests to accept the scaling agreement that brought about the litigation.

It is believed that the compromise now effected is preliminary to a consolidation of the Lake Street and the Northwestern Elevated.

The different offices of the United Railways & Electric Co., of Baltimore, now scattered in various parts of the city, will be concentrated on one floor of a new building at Baltimore and Calvert Sts.

The fare on the Penn Yan (N. Y.) & Keuka Park Electric R. R. will shortly be reduced to 10 cents between Penn Yan and Branchport.

SOME NEW ENGLISH ROLLING STOCK.

The Waterloo & City Ry., about 1½ miles long laid in two 12-ft. tunnels connecting the Waterloo and the Liverpool St. railroad stations, which are on opposite sides of the River Thames, was opened for traffic in August, 1898. During certain hours morning and evening there is more traffic offered than can be well handled and four-car trains are run. At other times during the day a four-car train is much too large and to secure greater economy of operation with light traffic the company recently ordered five motor cars to run



NEW CAR FOR WATERLOO & CITY RY., LONDON.

singly. These were built for Dick, Kerr & Co. by the Electric Railway & Tramway Carriage Works, of Preston, Lancashire, and exterior and interior views are shown herewith. The length over all is 47 ft., the body being 45 ft. long; the width over panels is 8 ft. 6 in.; the width at roof line, 8 ft. above the rail, is 7 ft. 9 in.; the height from rail to top of roof is 9 ft. 8 in., and to the floor 4 ft. 10½ in. The trucks were built by the Leeds Forge Co.; they are standard gage, 5 ft. 6 in. wheel base, and placed 31 ft. between centers.



INTERIOR VIEW.

The cars are divided into two compartments, one for smokers. The framing is of steel and the side and end walls are also of steel for the most part.

The motors were designed by Mr. S. H. Short, technical director of the English Electric Manufacturing Co., of Preston. These are known as the 15 L. type and tests showed the efficiency to be 88 per cent at 40 h. p., 92.5 per cent at 100 h. p. and 88 per cent at 165 h. p.; the rated power is 75 h. p.

All the offices of the Chicago Consolidated Traction Co. have been moved to the second floor of the Union Traction office building at Clark and Division Sts.

At Grand Rapids, Mich., a passenger for 20 cents can ride 21 miles on the street cars, visit three park resorts, and attend a free vaudeville show.

PROTECTION OF PENSTOCKS FROM CORROSION.

This subject was before the American Society of Mechanical Engineers for general discussion at its Cincinnati meeting. Mr. H. de B. Parsons said:

"It has occurred to me that it would be of interest to the members if information could be elicited as to the most satisfactory steps to be taken to preserve the metal feeder pipes and cases of turbine water-wheels.

"There is an increasing demand for the utilization of water powers, and it frequently happens that such problems will involve the bringing of water under a considerable head through a pipe from the foot or base of a masonry dam to the power house. In connecting this steel or other plate metal pen-stock to the face of the dam, it is usual to embed a metallic flanged ring or extension of the pen-stock proper, either part way into the masonry or else to carry such pen-stock clear through to the upper face. In either case, this pen-stock will be embedded in the masonry under water and difficult to inspect or replace; and will furthermore be exposed to the corrosive action of such water, as well as to the erosive action which may result from the movement of grit or sediment carried forward by the flow of the water.

"What is the best material for coating this pen-stock both outside and inside with a view of prolonging its life under the conditions of its exposure? Can it be done with any known form of paint, or is the only safeguard some form of the methods which have been proposed for a coating or enamelling, which shall be a metallic oxide in such union with the metal as to be in effect part of it?"

Mr. D. J. Lewis, jr., of South Orange, N. J., related his experience with a pen-stock erected in 1847 and which he had examined in 1893. The interior was covered with barnacles (as large as 2 in. high and 1½ in. in diameter) and on their removal the metal was found badly pitted, as deep as 3-16 in. in places. He had dried the pen-stock by building wood fires in it, as soon as the water was shut off (water being shut off only from 5 p. m. on Saturday until 5 p. m. Sunday) and the next day applied a coat of enamel paint such as he knew to be extensively used in England for painting the bulkheads and coal bunkers of ships. Before painting the wheel developed only 1,000 h. p.; after painting the output was 1,150 h. p. Two years later an examination showed the paint to be in first class condition. Since that time he had recommended this paint for similar structures. In answer to questions he stated that the paint was known as "Bitumastic Enamel"; it was expensive, costing about \$2 per gallon; it dried in two hours. When thus painting this pen-stock he had painted a ring at the mouth with red lead, also a ring with boiled coal tar. Both were badly scored after a year, while the enamel paint adjoining it showed no abrasion; the coal tar had remained soft after a year.

CHANGE IN NEW HAVEN (CONN.) ROAD.

The owners of the Fair Haven & Westville R. R., of New Haven, Conn., have secured a controlling interest in the New England Street Railway Co., which by ownership of stock controls the Winchester Avenue Railroad Co., of New Haven. Changes have been made in the directorate, and new officers elected; they are: President, Henry S. Parmelee; vice-president, Samuel Hemingway; secretary and treasurer, A. E. Pond. Messrs. Parmelee and Hemingway hold similar positions with the Fair Haven & Westville.

There is now pending a suit to determine whether the option secured on the Winchester Avenue road by I. A. Kelsey for the Connecticut Lighting & Power Co. can be enforced.

All controversy over the consolidation of the Dayton (O.) Traction Co. with the Southern Ohio Traction Co. has been satisfactorily settled out of court.

An illustrated guide to Columbus, O., and the nearby pleasure resorts is published by the Columbus Railway Co. The book in addition to a map of the street railway lines, contains handsome half-tone engravings of the principal buildings in the city and views in Olentangy and Minerva parks. Mr. J. W. Pickens is excursion agent for the company.

MECHANICAL DEPARTMENT

SOME CAR PAINTING AND CLEANING KINKS.

A cheap but very convenient adjustable scaffolding used at the West Side shops of the Chicago Union Traction Co., for cleaning and painting the cars, is shown in Fig. 1. It consists simply of two upright ladders having three or four rungs to support the cross plank at any desired height, and can be made in half a day by the shop carpenter out of scrap stock. One of its advantages is the little room it takes when not in use.

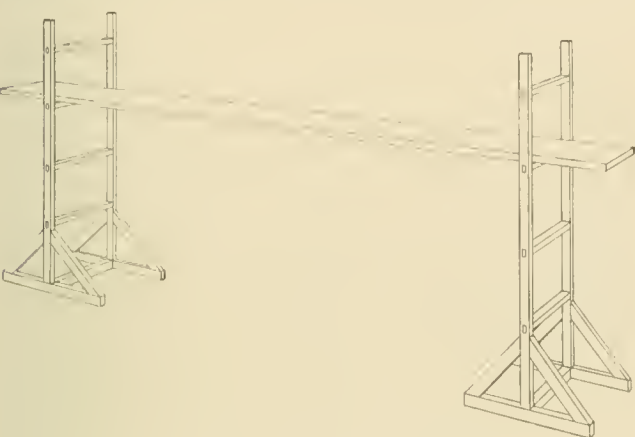


FIG. 1—SCAFFOLDING FOR PAINT SHOP.

A more elaborate portable scaffolding, used by the Kansas City, Fort Scott & Memphis R. R., but which is equally well fitted for street railway work is illustrated in Fig. 2. This is a barrow-like contrivance, the frame of which is a permanent combination of platform and horses, and has at one end a pair of light wheels in place of legs. As will be seen it is provided with a tank or receptacle for carrying sponges, cleaning materials or paints, and it will be found particularly convenient for open-air work, as where cars are washed at the terminals instead of in the shops. This staging can also be made in the carpenter shop out of waste material and of



FIG. 2—PORTABLE SCAFFOLDING.

suit the various classes of work to be done, and in addition the angle blade may be set at an angle to the handle. The handle has extending through its length a rod screwed into the cap, which forms the outer end of the handle proper, the cap having a squared interior projection fitting into a recess in the handle, whereby the two turn together. The opposite extremity of the rod is flattened for a short distance back from the end to enable it to pass through a slot in the blade. At the same end is a hinged button which presses the blade against the extremity of the handle whenever the latter is given a quarter turn in the proper direction, which is done by grasping the blade in one hand and the handle in the other. To set the blade at an angle a wedge-shaped button, with a slot corresponding to that

of the blade is inserted between the bearing surface of the handle-end and the blade, giving the latter any desired inclination. The parts are clamped in place as before by a quarter turn of the handle. This adjustment is useful on account of the varying degrees of hardness in the wood upon which the scraper is used and prevents tearing up the grain on soft woods. For the cuts and description of the barrow-scaffolding and the paint scraper we are indebted to the Railway Age.

We are in receipt of three letters giving a short summary of the practice followed in repainting and cleaning cars at Birmingham, Ala., Los Angeles, Cal., and Waterloo, Ia.

Mr. J. B. McClary, general manager of the Birmingham Rail-

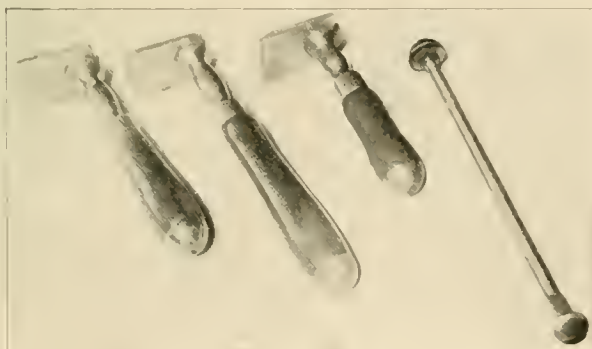


FIG. 3—PAINT SCRAPERS.

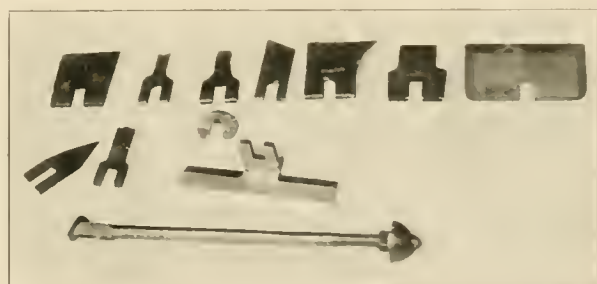


FIG. 4—BLADES FOR PAINT SCRAPERS.

any size that will best suit the dimensions of the cars to be cleaned or painted.

A useful tool invented by Mr. Frank Crocker, master painter of Kansas City, Fort Scott & Memphis R. R., for lessening the labor of scraping off paint and varnish after burning is shown in Fig. 3, and a few of the blades designed for use with the tool are illustrated in Fig. 4. The principal feature of the scraper is that the same handle can be used with as many forms of blade as may be desirable to

way & Electric Co. states that for cleaning, his company uses Ivory soap only, except on certain interurban cars where MODOE soap is used. For repainting, Masury's paints and Valentine's and Masury's varnishes are used. Cars should have three coats of paint and two of varnish and should be run through the shops for repainting once every year. He considers orange the most durable color and states that he finds it costs from \$50 to \$80 to properly repaint a car.

Mr. C. W. Smith, manager of the Los Angeles (Cal.) Railway Co., writes as follows: "For cleaning the surfaces of cars preparatory to revarnishing we use the best grade of laundry soap, and prepare a cleaning mixture in the following manner: soap 10 lb., water 9 gal., wood alcohol $\frac{1}{2}$ pt., turpentine $\frac{1}{2}$ pt. The soap is shaved thin and boiled until thoroughly dissolved, the mixture being stirred constantly while boiling. The other ingredients are mixed in after the soap has cooled down somewhat. This preparation is applied with a brush and used only for scrubbing prior to revarnishing. It is not used by car washers or on cars in service, except in extreme cases where some foreign matter cannot be removed with the air blast or water. We use gasoline for removing grease spots, and clear water only for washing cars in service which are not badly stained.

"Compressed air is used for cleaning out the interior of our rolling stock. We have a pipe line running between two tracks with outlets at convenient points, to which may be attached a $\frac{3}{4}$ -in. hose, with a throttling valve and $\frac{1}{8}$ -in. nozzle opening. We use an air pressure of 50 lb. direct blast; the compressors deliver air to a large chamber where the moisture is precipitated and drawn off so that there is no dampness to the air when in use.

"In this peculiar climate we apply eight coats of paint for cars in light colors and seven for dark colors; this includes three coats of rough stuff. Two coats of varnish are put on when cars are varnished every 10 months and three coats when they are varnished at intervals of from 12 to 18 months. Cars will run here about seven years before it is necessary to repaint them; they should be varnished every 10 months.

"I consider chrome yellow and colors made therefrom the most durable in service. For repainting we use Harrison Bros. special carriage lead and Valentine's and Masury's colors; for revarnishing, Murphy's varnish is used."

Mr. L. S. Cass, president and manager of the Waterloo & Cedar Falls Rapid Transit Co. states that nothing but white laundry soap is used on his road for cleaning. Cars are given three coats of paint and two of varnish and are passed through the shops twice a year for revarnishing and once in two years for repainting. Yellow is the color selected for city service and green for interurban cars.

THE PAINT ON A STREET CAR.

By Gorham B. Coffin, General Salesman, Heath & Milligan Manufacturing Co.

"Painting, Sir, I've heard say, is a mystery."

—Measure for Measure.

Many people have an idea that painting a street car is easy enough but the fact is that it still remains a problem as to which is the best and most economical method of preserving the cars, after coming from the maker or the railroad companies' shops.

The varnish or finished surface of a car will soon perish if it is allowed to remain any length of time in an atmosphere permeated with ammonia or other gases resulting from stabling horses in a building adjoining the car house or upon any of the floors in which the cars are stored, and when the varnish once begins to perish either by cracking or losing its luster, it may be taken for granted that in a short time the color will disappear, and a general destruction of all under coats will be the result.

The cleaning of cars is a very important matter and affects all those who have furnished the supplies for the building and equipment of the rolling stock, and yet the exercise of a little care day by day will keep the cars in perfect condition for a long time. By a little care is meant daily washing with cold water. A street car is not like a steam railway coach, and does not usually require a solution of chemicals to properly clean it.

"How to paint a street car" is the question propounded, so the writer can only express his own opinion in offering a few suggestions as to the proper colors and the best surface for the color and his ideas as to ornamenting, lettering and striping.

The paint shop (a homely phrase) is often the most abused portion of a railway plant. Painting should, however, be considered as important as any part of the car construction. We have seen the stock or mixing rooms of some of the finishing departments of the largest railroads that are a credit to the foreman and as tidy as the president's office, and this is the way they should always be kept.

The cars as they come from the car builder or the company's car shops, by the beauty of their exterior usually excite the admiration of the public and the officials of the road, but in a short time they often become faded and unsightly; the reason for the disappointment is that someone has blundered, either the foreman painter did not understand his business or the varnish and paint makers deceived the railroad company. There is no necessity for this. From the manufacturer's standpoint as good colors and as good varnish can be obtained today as ever were used. Do not try to buy cheap paint or cheap varnish. Select the most responsible makers of these goods that you know anything about, then buy their products and hold them responsible. But you say, suppose the manufacturer furnishes the best colors and the best varnish and still the result is not satisfactory. What then? Why then your workmanship is at fault and an investigation will oftentimes reveal the true condition of affairs.

In painting your cars do not hurry the work. The priming or first coat that is applied should be given at least 48 hours to dry. On the third day apply the gray coat (S. P. white lead) treated with lampblack; the fourth day putty up the openings, and on the fifth day put on the rough stuff, giving the work a coat each day until three coats are applied. Then rub down with pumice. The car is now ready for the first coat of color.

To select a rich color that is permanent seems to be a problem. This depends entirely upon the application. Even a lake color that is transparent can be made effectual and durable if the painter is skilled in the use of colors. Tuscan red, green, yellow, olive or white are most commonly used and can be had ground impalpably fine in coach maker's japan. They are made ready for application by thinning with turpentine so that when applied the surface has a dead finish like a piece of velvet. If yellow is used, either lemon or orange chrome, the color should be tempered with linseed oil especially the orange shade which is produced by the use of lime. A green should not be used chemically pure but any of the standard brands of chrome green are reliable. If an emerald shade is desired a glazing coat of paris green produces a brilliant effect. Vermilion is a color of dense body and can be made lasting by the use of hard rubbing varnish added to the thinner; the subsequent coat should be rubbed flat. A glazing coat of French carmine produces the most brilliant and permanent red known. So-called economy, however, has dispensed with the use of carmine almost entirely, the artificial vermilion being used as a substitute.

The olive shades of body color, such as the Pullman shade and others, have come into general use on account of their being susceptible to ornamentation. A dark color for a car in the writer's judgment is not desirable. The bright yellows that have been used for years cannot be improved upon. The white panels of a car are usually worked up with the best white lead, and no improvement can be suggested. A very white surface is made by using flake white in japan for the finishing coat.

As to varnishing or finishing the car—"Ah! There's the rub." The old way was to apply one or more coats of hard rubbing varnish, stripe or ornament on the rubbed surface, then apply two coats of railway finishing varnish. This consumes time, as work with good rubbing or finishing varnish cannot be hurried. The temperature at the time the work is being done is also a very important factor. The best varnish applied in a humid atmosphere is a total failure. Assuming proper care in the paint shop, the problem of furnishing a satisfactory varnish is one for the varnish-maker.

The new methods such as the repeating process in varnishing and the rapid systems of surfacing are some of them excellent, and worth at least a trial, for the time required is what makes painting cars expensive. It is the practice in many shops to allow only 10 or 12 days for repainting and varnishing, but this is not enough time. Good and perfect work cannot be hurried, and 20 days is the minimum period that should be taken for finishing a car from the bare wood to varnish.

We have not touched upon the interior work. The plainer it is the better, and the new idea of simply making the ceiling of veneer without decoration is good. So far as the lettering and ornamentation of a street car is concerned, the judgment and taste of the superintendent must prevail. Scroll and fancy ornamentation is a thing of the past. Good, plain lettering and striping that will assist the harmony of colors and effect a perfect symmetry is all that is necessary.

The Strikes.

LITTLE ROCK.

The strike at Little Rock, Ark., begun May 2d, was settled on May 11th. The matter was briefly mentioned in our May issue but the following account of the causes, taken from a letter prepared for publication by Mr. Allen N. Johnson, president and receiver, will be of interest. April 28th a committee of 16 men, of whom the chairman and a majority of members had never been employed by the company, presented a peremptory demand that six men recently discharged be reinstated. This was refused, and on May 1st a committee of employes presented six demands, four relating to matters of detail in operating cars and two to wages. The following day the president, at the request of the men, met a committee of citizens and discussed the matters at issue. Mr. Johnson proposed a basis of settlement which met the recommendations of the committee, but this was refused by the men unless an amendment were added providing for the reinstatement of men discharged for cause and for the discharge of certain other men employed. Mr. Johnson, declining to accept this amendment the strike was ordered.

May 10th a verbal proposition from Mr. Johnson was considered. This assured the employes of an increase of wages, the minimum to be not less than 10½ cents per hour, the exact amount to be fixed by the court in which the receivership is pending. The rates paid before the strike were: motormen, 12 to 15 cents; conductors, 9½ to 12½ cents.

The men returned to work on May 11th. In making up the lists of men who would have regular cars in the future preference was given to the men who had stood by the company during the strike. The men who had not struck were continued in the places they had occupied before the strike. The new men who had been employed to operate cars during the strike were next and as many as were competent were given regular runs. About six of the new motormen, who had been at work only four or five days and did not fully understand the duties of motormen, were placed at the head of the extra list and will be thoroughly instructed in their duties that they may be given a chance for regular runs in cases of vacancies. The motormen who had struck were placed next in order on the extra list, except those who had applied for work before the strike was called off. With the conductors the same plan was followed.

KANSAS CITY.

The strike on the lines at Kansas City was a failure from the start. On only a few lines were there any delays, and at midnight on May 12th, the day the strike was declared, President Holmes said: "So far as the Metropolitan Street Railway Co. is concerned the strike is over. We have as many men as we need and are turning away applicants for places. No more of the strikers will be taken back. It is hard on some of them, but we must draw the line, and we have no need of their services anyhow. We are not expecting trouble, but we are amply able to deal with it if there should be any. We are prepared to protect our employes and property and protect the passengers from any annoyance and insults by strikers or delays of the trains. Practically all of our men are now deputy marshals, authorized to carry weapons, and I think a good many of them do."

The United States District Court, Judge W. C. Hook, issued two interlocutory injunctions, one at the request of the Kansas City Elevated Railway Co., and one at the request of Metropolitan Street Railway Co. and the Central Electric Railway Co. The two orders were directed to a score or more of persons by name and to all other persons combining with them.

DAYTON.

The men of the Peoples Railway Co., Dayton, O., struck on May 14th. The manager had secured motormen from Cincinnati but was not willing to send cars out until assured of what he believed was ample police protection. The men had asked for 20 cents an hour and a 9-hour day which the company was quite willing to give; the fight was made on recognition of the union. May 19th a settlement was effected on the following basis:

"It is agreed that in all matters involving discharges, pay-offs or alleged offenses by the employes the employe suspended or discharged shall, upon the recommendation of a hearing by three of

the People's railway employes, have his grievance submitted to arbitration; one arbitrator to be selected by said employes, one by the company, and a third by the two. Decisions reached by such arbitration shall be final. The party in the wrong shall bear whatever expense might ensue, said expense, however, not to be more than \$20. It is understood that there shall be arbitration only in the event that the company and the committee cannot adjust the difference.

"Any employe of the People's Railway Co. may join any organization without prejudicing his relation to the company."

ST. LOUIS.

The strike of the employes of the St. Louis & Suburban Railway Co., begun April 29th but practically ineffective until after the St. Louis Transit men went out on May 8th, was settled on May 14th.

On April 6th the following agreement had been entered into between the management and the employes:

1. All men, who claim to have been discharged on account of connection with the union are to have a fair and impartial hearing, with a view to reinstating them, if their charge is true.
2. Company will arrange straight runs of not more than 10 hours when it is possible.
3. Bulletin board will show when a man is assigned to duty, and he will be immediately notified if his services are not required. If his services are required, and he is obliged to remain on duty until assigned a run, he shall be paid for the time.
4. Men will work in two shifts, and will be paid extra when working outside their shift.
5. Company will treat with committees from employes at all times.
6. The union is recognized. But it must be open to all employes of the Suburban, and there must be no restrictions to the membership.

The strike of April 29th was because of the alleged failure of the company to fulfill these conditions; the management on the other hand claimed that the last clause had been violated by the men.

The agreement of May 14th provided that the question of whether the men had violated clause 6 of the former agreement be submitted to arbitration, the decision of the board to be final. If this decision should be against the company it would then also submit to arbitration the cases of men discharged between March 21st and April 29th.

In our issue for last month we gave an account of the causes of the strike of the employes of St. Louis Transit Co., and a brief account of the events attending it up to May 12th. Since that date the greater portion of the lines of the company have been opened but a great deal of rioting has resulted from the inadequate police protection afforded. The situation, day by day, has been as follows:

May 13.—No cars were run, the police commissioners withdrawing all the patrolmen to give them an opportunity for rest. A number of new men to take the places of strikers arrived and were quartered at the company's barns. In the evening one of the waiting stations (an old car) of the Transit company was burned.

May 14.—Slight disturbances followed the opening of the Chouteau Ave. line and several rioters were slightly injured.

May 15.—Nine lines of the Transit company were partially opened with much rioting. A car being attacked by a mob the conductor fired on the crowd, wounding two men, one mortally. The crew of a repair wagon also fired on a mob wounding one man. A strike sympathizer wounded in a riot on the 11th died.

May 16.—Cars ran as on the previous day. Sixty-two men arrived from Cleveland to take the place of strikers. A number of indictments were returned against men charged with obstructing the tracks. One striker was wounded. The strikers rejected an offer to compromise by taking back union men and treating with the union men as such, leaving it optional with employes whether they join the union.

May 17.—There were numerous small riots in which both strikers and employes were injured.

May 18.—Two non-union men were shot while on their cars, one probably fatally. The House of Delegates made a political play by

passing an ordinance annulling the franchises of all St. Louis street railway companies.

May 10.—The postmaster made complaint to the district attorney who on behalf of the United States petitioned the United States Circuit Court and secured a temporary injunction against interference with the street railway postal routes or cars. Some 50 of the strikers were named as defendants.

May 20.—Cars were operated on five lines. The strikers and their sympathizers had a parade.

May 21.—About 300 cars were operated. Five persons, two of them women, were injured in riots; one of the women died later.

May 22.—Three policemen were indicted for neglect of duty. One employe was shot. Twenty-four lines were in operation, nine of them having the full complement of cars.

May 23.—A special policeman was killed during a riot.

May 24.—The governor of Missouri in an interview charged that the strike was fomented by designing politicians.

May 25.—A striking motorman was fatally shot during an attack on a car.

May 26.—No cars were run after 10 a. m. as the police had been withdrawn from the car lines and transferred to the polling booths during the Democratic primaries.

May 27.—Cars were operated under police protection till 6 p. m. In the course of the day one man was killed. In the evening three strikers and one woman were shot by unknown persons.

May 28.—General Manager Baumhoff stated that cars were operated over the whole or portions of all but three lines. A car on the Bellefontaine division was blown up by a dynamite bomb placed on the track, the crew and two policemen on board being more or less injured. The state labor commissioners endeavored to arrange for arbitration.

May 29.—Cars were run much as on the preceding days. Numerous disturbances occurred in the course of which 11 persons were wounded by pistol shots. At midnight an explosion at 15th and Chambers Sts. tore up a section of the street railway track.

May 30.—The mobs continued the plan of campaign begun the previous day of assaulting persons patronizing the street cars, particularly women. Three men were reported shot, one fatally. An attempt was made to wreck the power house at Prairie and Easton Aves. The police commissioners directed the sheriff to summon a posse comitatus of 2,500 men.

May 31.—A striker was killed after fatally wounding a policeman who attempted to disarm him. The sheriff proceeded to raise his posse of citizens. There was less rioting than on previous days but wire-cutting and other obstructive tactics were continued.

June 1.—Strikers continued their attacks on passengers, especially women. Only one man, a non-union motorman, was reported injured; he was shot in the arm by a bullet fired from a building along the line. About 11 p. m. an attempt was made to blow up one of the brick car houses of the company.

June 2.—More cars were operated than on any day since May 8th. The sheriff continued the work of enrolling citizens for his posse.

June 3.—The situation was practically unchanged save that the attacks on persons using the cars were more violent.

June 4.—All but two or three divisions of the Transit company operated cars. About 900 of the citizens posse were armed.

June 5.—A special car containing 54 deputies was wrecked by explosives on the track, two men being slightly injured. The crowd was dispersed without casualties. A committee of citizens telegraphed the governor asking that the state militia be ordered to St. Louis.

June 6.—There was but little change in the situation; one more line was operated than on the previous day. No cars have been run at night since the strike began.

June 7.—Three policemen and a boy were shot, two of the policemen seriously, during riots. Cars were run over the main line of the Lindell division in the evening; these were the first cars run at night since the strike was begun.

June 8.—Three women who participated in an assault on a woman patron of the street cars May 20th, were each sentenced to two years' imprisonment in the reform school. Four cases of assault on women patrons of the cars by mobs of women were reported; teachers were visited in their school-rooms and threatened if they rode on the cars. Two strikers were seriously injured in an attack on car. Some 200 new men from Eastern cities arrived in St. Louis and went to work.

June 9.—Little change in the situation was reported.

June 10.—A procession of strikers came into conflict with a company of deputy sheriffs about 6:45 p. m. near Washington Ave. and Sixth St. Pistol shots from the strikers drew a volley from the sheriff's posse which killed three men and wounded many others. One other man was killed in a riot in a different part of the city. During the day four cars were derailed by explosives and two lines temporarily crippled by cutting the overhead wires.

June 11.—This was one of the worst days since the strike began, the populace being very much excited over the killing of four men by deputy sheriffs on Sunday, and attacks on cars and cases of cutting overhead wires were very numerous. The mayor issued a proclamation warning all persons against gathering on the public streets or other public places, engaging in disputes, discharging fire-arms, etc.

June 12.—All lines were operated, many of the cars being without guards; but little rioting occurred.

June 13.—The president of the local street railway union was stabbed in the throat by a man giving his name as Edward Cantry.

DETROIT & NORTHWESTERN RY.

The Detroit & Northwestern Railway Co. is now operating its line from Detroit to Farmington, Northville, Orchard Lake and Pontiac. The distances from Detroit to the different points are as follows: Power house, 18½ miles; Farmington, 20 miles; Northville, 27 miles; Orchard Lake, 28 miles; Pontiac, 29 miles.

At the present time only a single track is operated, but it is expected to have the other track completed soon. The grading has been done for a double track from Detroit to Farmington and rails are now being laid. The country is very level and the road has few curves so that high speed can easily be made the whole length of the line. The new power house is one of the finest and best equipped in the country; the equipment comprises three E. P. Allis 400-h. p. engines, each of which is direct connected to a Siemens & Halske generator, and six Babcock & Wilcox boilers arranged in three batteries of two each, with patent stokers. The buildings are all of brick, including the car shed, and are as near to being fire-proof as it was possible to get them. The cars were made by the G. C. Kuhlman Co., of Cleveland, and are as fine as any that have been built. Each car is equipped with four Westinghouse motors of 50 h. p. each.

As this is to be a high speed road, only the very best material has been used in its construction; oak hewn ties are used on the entire system; the rails are 70-lb., A. S. C. E. section rolled by the Carnegie Steel Co. The joints used are what are known as the "American Standard" made by the Chisholm & Moore Manufacturing Co., of Cleveland, O. This is a boltless joint with no bolts or nuts to get loose, and makes practically a continuous rail. It is impossible for the ends of the rail to settle, as there is 3-4 in. of metal under the ends, and when riding over it, there is not the usual noise heard where angle plates are used. The ballasting is done with gravel of which there is plenty on the line.

On June 9th a party of electric railway men and engineers spent a good portion of the day inspecting the system. They were unanimous in their belief that the entire equipment was strictly up to date and was as good as could be secured, and there was no question but what the speed of the cars would be second to none in the country. The boltless joints were a new thing to most of them and they were surprised at the fact that there was no jar or noise in passing over them; they were all of the opinion that the joint was a success and came nearer to making the continuous rail than anything they had before seen.

SERIOUS ACCIDENT NEAR PROVIDENCE.

On the morning of Sunday, June 10th, a head-end collision occurred on the Oakland Beach line of the Rhode Island Suburban Street Railway which resulted in the death of 4 persons and the injury of 28 others, a number of whom are believed to be fatally hurt. Among the injured was C. D. Kimball, lieutenant-governor of Rhode Island.

The Suburban company is controlled by the owners of the Union R. R., of Providence, and operated in connection with the latter road. The Oakland Beach line was purchased from the New York, New Haven & Hartford last year; it extends down the west side of Providence Bay to Buttonwood, 16 miles from Providence.

PERSONAL.

MR. C. C. HOWELL, manager of the Knoxville Traction Co. suffered a severe attack of illness last month.

MR. J. H. CARSON, of New York, president of the Sterling Meaker Co., was a "Review" caller last month.

MR. HARRY W. FULLER has been made assistant general manager of the North Jersey Street Ry., of Jersey City.

MR. C. G. BALLENTYNE, general manager of the Honolulu Rapid Transit & Land Co., is in St. Louis to purchase cars.

MESSRS. JOHN C. DOLPH AND H. LEE BRAGG, of the Sterling Varnish Co., of Pittsburg, were "Review" callers recently.

MR. EDWIN S. HARTWELL was last month made vice-president of the Chicago Consolidated Traction Co., succeeding Mr. I. S. Owsley.

MR. H. J. WILSON HUMBERD has been elected a director of the Cumberland (Md.) Electric Railway Co., succeeding Mr. Lloyd Lowndes, resigned.

DR. H. S. PRITCHETT of the United States Coast and Geodetic Survey has been elected president of the Massachusetts Institute of Technology of Boston.

MR. F. P. UNGER, formerly of Charlestown, W. Va., has been appointed manager of the Schuylkill Traction Co., of Girardville, Pa., succeeding Mr. E. W. Ash.

MR. HERSCHEL A. BENEDICT, electrical engineer of the Hudson (N. Y.) Street Ry., has been appointed chief engineer of the United Traction Co., of Albany, N. Y.

MR. B. W. GRIST, formerly with the Pennsylvania Iron Works, has been appointed general superintendent of Richle Bros. Testing Machine Co., 1424 N. Ninth St., Philadelphia.

DR. G. M. STILES, of Williamstown, Pa., has been appointed superintendent of the Lykens & Williams Valley Railway Co., of Harrisburg, Pa., succeeding Mr. W. O. DeWitt.

MR. J. N. CONNOLLEY, formerly of Memphis, Tenn., has been appointed superintendent of the Little Rock (Ark.) Traction & Electric Co., succeeding Mr. Andrew Collins, resigned.

MR. J. P. E. CLARK, general manager of the Binghamton (N. Y.) R. R., will probably be nominated for New York state senator at the Republican convention to be held on June 26th next.

MR. T. C. PENINGTON, treasurer of the Chicago City Railway Co. recently made a trip to Washington, D. C., with a delegation from Medinah Temple of the Mystic Shriners of Chicago.

MR. O. D. HENRY, formerly superintendent of installation for the Lorain Steel Co., has been appointed general superintendent of the Kansas City-Leavenworth Ry. with headquarters in Kansas City, Mo.

MR. F. D. WARD, who has heretofore been general foreman of the Lake Street Elevated shops, has been appointed general master mechanic of the Lake Street and Northwestern Elevated system, Chicago.

MR. ROBERT HARDIE, chief engineer of the recently organized Compressed Air Co., of New York, and one of the best authorities on compressed air apparatus in the country, was a "Review" caller last month.

MR. E. G. LONG, vice-president of the Peckham Truck & Motor Co., sailed for England on the Laconia, on June 2d, with the intention of spending two months at the Paris Exposition, and in making a continental trip.

MR. A. C. HEIDELBERG, formerly assistant superintendent of the Chicago City Ry., with the Metropolitan Street Railway Co., of Kansas City, Mo., and at present in charge of special construction for that company.

MR. THOMAS ELLIOTT, chief engineer of the Atlanta Railway & Power Co., of Atlanta, Ga., spent several days in Chicago in the early part of June after having made a somewhat extended tour through the north central states.

MR. F. C. RANDALL, who has represented the Christensen Engineering Co., of Milwaukee, in the East for several years, has opened an office at 135 Broadway, New York, in order to better handle the increasing business of the company.

MR. JOE S. MIXARY recently resigned a division superintendent of the St. Louis Traction Co. to take a needed rest during the summer. He will return to St. Louis in the fall to take charge of a manufacturing plant in which he is interested.

MR. C. W. FOOTE, formerly general manager of the Cincinnati & Miami Valley Traction Co., writes us that he will take up his residence at San Bernardino, Cal. Mr. Foote has accepted the position of general manager of the Arrowhead Reservoir Co.

MR. SAMUEL GIBSON, for 10 years superintendent of the Madison Street Cable Ry., of Seattle, Wash., resigned May 31st, having decided to retire. The employees of the company took this occasion to present Mr. Gibson with a watch chain and locket.

MR. J. C. BONNER, of Toledo, O., inventor of the Bonner rail wagons for facilitating the handling of freight on electric railways, has been appointed by President McKinley collector of customs for the district of Miami, O., with headquarters at Toledo. Mr. Bonner is a staunch Republican.

MR. L. H. FLANDERS, who has been an instructor in the mechanical laboratory of the Armour Institute of Technology, Chicago, has accepted a position in the Gas Engine Testing Department of the Westinghouse Machine Co., Pittsburg. The vacant instructorship will be filled before the opening of school in September.

MR. LOUIS H. MOUNTNEY, superintendent of the Portsmouth (Va.) Street Ry., resigned on June 1st to take a similar position with the Springfield (O.) Railway Co. Just before leaving Portsmouth the employees of the road presented him with a handsome dress suit case, as a testimonial of their kindly feelings and good wishes.

MR. S. S. NEFF has resigned as superintendent of the Union Elevated Railroad Co., of Chicago, (the Loop) to accept a position with the Boston Elevated Railway Co. Before entering elevated railway work Mr. Neff was with the Great Northern as division superintendent of the Pacific Coast lines, and more recently chief engineer and superintendent of the Lake Superior & Ishpeming Ry.

MR. H. P. WELLMAN has been appointed general superintendent of the Ohio Valley Electric Railway Co., which is a consolidation of the Ironton (O.) Electric Light & Railway Co., the Ashland (Ky.) & Catlettsburg Street Railway Co., and the Consolidated Light & Railway Co., of Huntington, W. Va. His headquarters will be at Ashland, Ky. Mr. Wellman is the inventor of the electric headlight that bears his name.

MR. J. B. CAHOON, who has just been elected president of the National Electric Light Association, is also a street railway manager of prominence. He left the employ of the General Electric Co. in 1895 to become general manager of the electric light, gas, water and street railway plants at Elmira, N. Y., and was engaged for the next five years in developing these properties at an expense of over half a million dollars. He is now located at Syracuse, N. Y., as a consulting engineer. Mr. Cahoon is a veteran companion of the Military Order of Foreign Wars, by reason of service during the Spanish-American War.

MR. W. G. M'DOLE, auditor of the Cleveland (O.) Electric Railway Co., on May 19th accepted an appointment to the vacancy on the Street Railway Accountants' Association's permanent committee on the "Standardization of Construction and Operating Expenses;" this vacancy occurred on the withdrawal of Mr. H. J. Davies from street railway work, and was to be filled by the other members of the committee. Mr. McDole has an enviable reputation as a hard worker and has been a regular attendant at the conventions of the association; he is thoroughly familiar with all the details of street railway accounting and will add to the strength and influence of the committee. This committee now consists of Messrs. C. N. Duffy, W. F. Ham, H. L. Wilson, J. F. Calderwood and W. G. McDole.

OBITUARY.

MR. G. E. HERRICK, of Cleveland, died in New York on May 28th of pneumonia, aged 72 years; he was interested in the first street railways of Cleveland.

THE FRIENDS OF Mr. Charles S. Leeds, president of the Suburban Construction Co., Chicago, will regret to learn of the death of his wife on June 5th, which resulted from an explosion of gasoline at her home.

MR. H. J. TERMOHLEN, electrician and shop foreman of the Rockford (Ill.) Railway, Light & Power Co., was instantly killed while getting off a train on the C. & N. W. R. R. near Freeport, Ill., on May 15th. He leaves a wife and one child.

DR. TRUMAN W. MILLER, one of the foremost surgeons and physicians in the Northwest, died at his home in Chicago on May 31st. He was connected with a number of medical institutions and was surgeon in chief for the Chicago Union Traction Co.

MR. F. W. WOOD, manager of the Los Angeles (Cal.) Railway Co., died of consumption on May 19. Mr. Wood was born in 1853, being a native of Wisconsin, and when 16 years old entered into railroad work, being with the Kansas City & Memphis Ry. and the Chicago & Northwestern Ry. In 1873 he removed to California and since 1874 has resided in Los Angeles. His street railway career began in 1886 with the Temple Street Cable Ry., of Los Angeles, of which he was soon appointed manager. From that time until his death Mr. Wood has been connected with the street railways of Los Angeles.

NEW PUBLICATIONS.

DIRECTORY OF GRADUATES from University of Pennsylvania.—This book includes the names of all graduates from the civil, mechanical, electrical and chemical engineering courses, since their establishment at the University and will be sent on application.

CATALOG OF THE RAILWAY DEPARTMENT, of the International Correspondence Schools, at Scranton.—The course described in this pamphlet is under the management of Mr. W. N. Mitchell, Manhattan Building, Chicago, Ill., and is intended for all grades of railroad employes who desire to secure for themselves higher positions than they are now able to fill. The catalog contains a number of fine colored plates reproduced from illustrations in the instruction papers of the International Schools and showing sections through the air-pump, and valves of an air-brake system.

THE APPLICATION OF MECHANICAL DRAFT TO STATIONARY BOILERS. A paper read before the New England Cotton Manufacturer's Association by Walter B. Snow.—This paper has been reprinted in pamphlet form and may be obtained of the B. F. Sturtevant Co., Boston, with the engineering staff of which company Mr. Snow is connected. The author points out the low efficiency of chimneys as devices for moving bodies of gases and then takes up the various methods of applying mechanical draft as a substitute for, or auxiliary to, the chimney, with discussion of the method of arrangement and the cost. Drawings and the financial results of a number of installations add to the value of the paper.

INVESTOR'S MANUAL. Issued annually by the Economist Publishing Co., 115 Monroe St., Chicago. Free to subscribers to the Economist; single copies 50 cents.—In 1896 the Economist published its "Street Railway Supplement" which gave complete histories of the street railway corporations of the city, together with maps of their respective systems. The following year it began the annual publication of its "Investor's Manual" which presented in convenient form all the important facts and statistical tables relating to the principal corporations of Chicago whose securities were listed on the Chicago Stock Exchange. The succeeding issues of the Manual have been enlarged in scope and that for 1900, in addition to the usual full treatment of Chicago companies, includes data for the principal corporations of Kansas City, Omaha, Milwaukee, Minneapolis and St. Paul, and also a number of others. The total number indexed is about 400. The data are particularly full on the Chicago street railways, and include maps.

A BRIEF HISTORY OF MATHEMATICS. Authorized translation of Dr. Karl Fink's *Geschichte der Elementar-Mathematik*, by Wooster Woodruff Beman, professor of mathematics in the University of Michigan, and David Eugene Smith, principal of the State Normal School at Brockport, N. Y. The Open Court Publishing Co., Chicago. Cloth, 333 pages. Price, \$1.50.—This book, as explained in the author's preface to the German work which was published in 1890, is intended to give students of mathematics a historical survey of the elementary parts of the science and enable teachers to review connectedly points already familiar for the purpose of utilizing them in suitable comments. The English title given by the translators gives a better idea of the scope as the work contains much that is not included in the elements as generally understood. The work is divided into five chapters treating, respectively, of Number-Systems and Number-Notations, Arithmetic, Algebra, Geometry, and Trigonometry. Each of these branches is dealt with separately with the view of enabling the reader to get a quicker and surer general survey of the subject. Dr. Fink's book is believed to be the most systematic attempt yet made to write a compendium of mathematics suitable for the use of those who have not time or the knowledge of foreign languages necessary to study larger treatises, and this translation will be welcomed by English readers. Unlike most recent works of this character it does not contain a store of anecdotes which, while interesting to read, are of no historical value. The biographical notes, constituting an appendix, have been arranged alphabetically, making them more convenient for reference. A well-arranged table of contents and a complete index make the book easy to use.

REORGANIZATION AT LITTLE ROCK, ARK.

May 24th the stockholders of the Little Rock (Ark.) Traction & Electric Co. held their annual meeting and effected a reorganization, electing J. A. Woodson, Oscar Davis, Charles F. Penzel, A. Brizzolari, W. W. Dickinson, J. W. Blackwood and S. W. Fordyce as directors. The following day the directors chose officers as follows: President, J. A. Woodson; vice-president, Oscar Davis; secretary, George B. Rose; treasurer, Charles F. Penzel. The secretary and the treasurer were re-elected.

The new president states that in event a renewal of its franchises can be secured the company will at once expend about \$100,000 in improvements and renewals.

A WELL-KNOWN PAINT HOUSE.

The paint and varnish business of the Heath & Milligan Manufacturing Co., 170-172 Randolph St., Chicago, has been established since 1851. The company makes paints of the highest grade and its coach color department is one of the most complete in the United States. The house makes a specialty of catering to the street railway trade direct, and its wholesale distributing agents in every large city from New York to San Francisco have occasion to supply many of the largest street car companies in America with colors, etc. These materials have proved very satisfactory. The various departments are under the management of men who have been associated with the firm for many years and experience means a great deal in the making of paints.

SPECIAL ATTRACTIONS FOR JULY 4th.

The Fourth of July is usually regarded by street railway managers as the red letter day of the year as it is essentially the family outing day of the calendar with all classes of American citizens and it has become a custom with many companies to arrange for this occasion special programs at their parks and pleasure resorts to cater to and encourage this desire of the people to go somewhere and have a good time. Of course a display of fireworks in the evening, more or less elaborate as fits the size of the crowd to be expected, is the main feature of the day, but it is possible to arrange other attractions for the morning and afternoon hours in such a way as to sustain interest for a longer period and in some instances encourage double riding.

Mr. Chas. Rosencrans, manager of Pleasure Bay Park, Long Branch, N. J., sends the following good program which will be carried out at his resort. From 2 p. m. to 3 p. m. free vaudeville; 3 to 4, grand musical concert; 4 o'clock, balloon ascension and parachute leap; 8 to 10, grand vaudeville entertainment; 10:30 p. m., grand fireworks display.

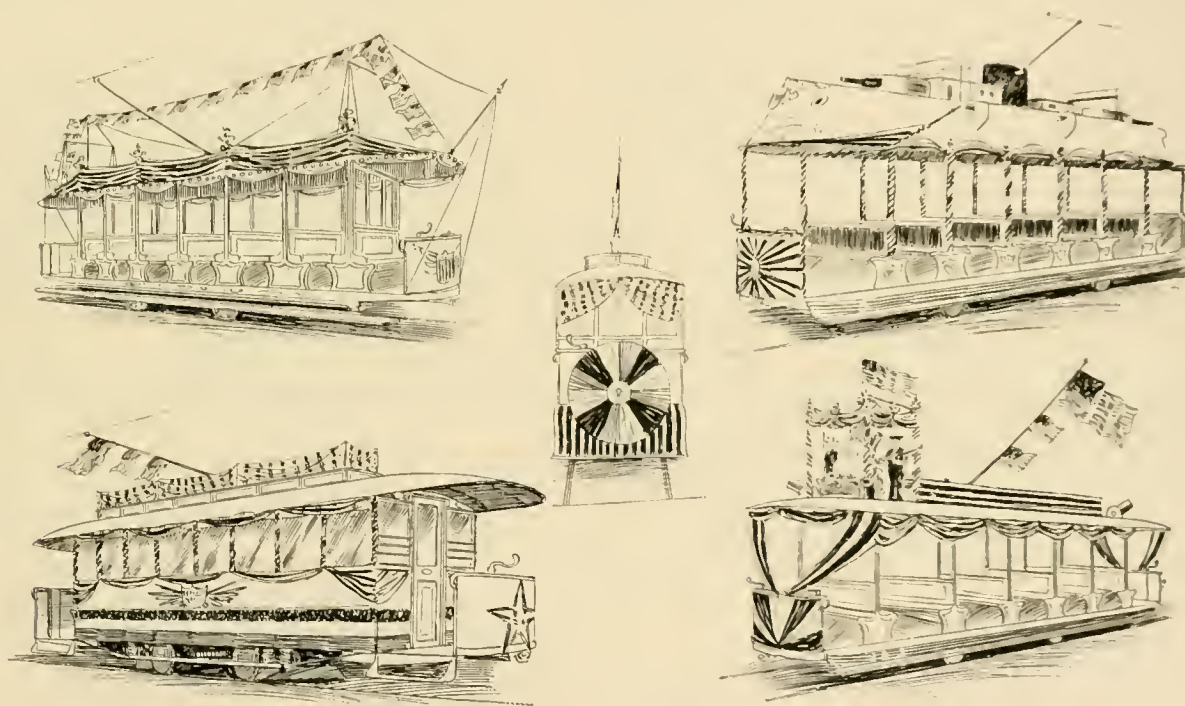
Balloon ascensions, parachute leaps, high diving and tight rope walking always interest a crowd for a short time and will prove profitable drawing cards. Exhibitions of this nature can be repeated at intervals of say three or four hours during the day with satisfactory results. Bicycle races are good but require a special track. Grounds for foot races and amateur athletic contests are

A capital idea for a combination fireworks display and illuminated water parade will be carried out by Mr. W. B. Baker, manager of the Waupaca (Wis.) Electric Light & Railway Co. At his park is a beautiful body of water and on this a small steamer will be anchored about a quarter of a mile from the shore. Around this steamer will circle a dozen or more private steam and naphtha launches, decorated with lanterns and each towing three row boats, also decorated and illuminated. The movement of the parade will be controlled by signals from a flagship. Men will be stationed on the steamer and in each row boat with colored fire, roman candles, flower pots, skyrockets, etc., and at a given signal the display of fireworks will commence. A band will be placed on the steamer.

It is a good idea to give the exhibition of fireworks on the water, in some such way as this wherever it is possible. Without much extra expense a fight between two home-made battle-ships, a "Battle of Manila" or the "Destruction of Cervera's Fleet" can be easily arranged and these panoramas can be made as elaborate as desired. Blowing up the Merrimac is something of a chestnut but would probably bear a revival for this occasion.

Where water is not available the same amount of fireworks will make a much more telling effect if advertised as a "Battle of San Juan," "Storming a Block House in the Philippines," or some other similar event.

A street railway company can make a very good impression on the citizens of a town by a liberal display of bunting and flags on the cars, and the occasion can be made an object lesson to the peo-



SUGGESTIONS FOR DECORATING CARS.

more easily procured and when the participants are locally known, such events will not fail to bring crowds. It is often possible by means of a little tact and engineering on the part of the manager to take advantage of the good natured rivalry existing between two local schools or societies, or between two neighboring towns and arrange contests of this kind by approaching the proper parties and offering inducements in the shape of grounds free or even prizes for the victors. Novelty contests as three-legged races, backward walking races, steeple-chases and tub-races will arouse interest especially when the contestants are students from rival schools or rival classes in the same school. If it is thought advisable to attempt something of this kind every means should be taken, by posters in the cars and in other ways to appeal to and arouse the local spirit.

A good suggestion is made by Mr. J. F. Porter, president of the Alton (Ill.) Railway, Gas & Electric Co. The population on his line does not exceed 20,000 people so no effort will be made to furnish expensive attractions, but his company has granted the privileges of its park for the day to a local organization which will give a picnic, advertising the event throughout the town and surrounding country. The company is to furnish a brass band and fireworks.

ple to prove that the corporation does occasionally think of other things than the declaring of dividends. Cases are on record where a showing of patriotism or interest in local or national events on the part of the company in some such way as this has been instrumental in creating a more friendly public sentiment toward the road and its managers.

Where bunting is used at the parks or on the cars precautions should be taken against possible fires. Most draping of this nature can be rendered practically non-inflammable, without injury to the fabric or color, by dipping in a solution composed as follows: Phosphate of ammonia, 1 lb.; chloride of ammonia, 2 lb.; water, 1 1/2 gallon.

The extent to which the decorating of cars is carried will of course depend on the taste of the individual manager and also the state of the company's treasury. Two or three tastefully decorated cars run over the lines at frequent intervals during the day, and two small flags on all the other cars will in many cases serve the purpose.

We give herewith a few suggestions that may help the manager in dressing-up rolling stock for this occasion. When decorating in

this way it should be remembered that a pleasing effect can be secured by placing on top of the cars, boys and girls in tableaux, as for instance a little girl in red, white and blue and seated on a throne as Columbia, with boys dressed to represent the U. S. army and navy on either side. Three boys with fife and drum as in the famous painting "Yankee Doodle" make another good group. Boys or men made up to imitate prominent characters connected with the Spanish war or American history, as Dewey, Sampson, Washington, Lincoln, etc., will usually awaken enthusiasm. Disguises of this kind are obtainable at wig-makers or costumers in almost any enterprising city.

The Owosso (Mich.) & Corunna Electric Co. writes us as follows concerning plans for July 4th: "We have found by experience that to call the masses out for a Fourth of July celebration, the old fashioned sports are the best; a 10-cent bowery dance all day; games such as a tub race (our park is situated on a pretty river) or catching geese let loose in the water; having a greased pole extended from river bank out over the water with flag tied to the end and giving a prize to the one climbing out and getting the flag; a watermelon or pie eating contest; day fireworks in the afternoon and night fireworks in the evening; also a good vaudeville show in the evening."

NEW ELECTRICAL PLANT IN QUEBEC.

Commercial Agent Johnson at Stanbridge, Que., writes the State Department as follows:

"The Chambly Water & Power Co., located 25 miles northwest of Stanbridge, is about to add very largely to its present plant at Chambly. It intends to develop additional power at St. Therese Rapids, some 3 miles farther up the river. At the present time, the Chambly works have 7,500 h. p., but they will be made capable of developing 20,000 h. p. The works at St. Therese will give an additional 10,000 h. p. The extension of the old works will, it is expected, be completed this summer, while the new works will take some 18 months to finish."

SPECIAL CAR IN CLEVELAND.

The Cleveland Electric Ry. has recently put in service a beautifully finished special car intended for the use of private parties who wish to take pleasure rides about the city or for theater parties, receptions and other entertainments. The prices are as follows: Per day on the Cleveland Electric Ry. tracks, \$18; per afternoon, \$12; per evening, \$15. Special arrangements will be made for excursions to points out of the city that can be reached over the interurban lines. The special car business of the company is in charge of Mr. C. F. Bates.

A ROAD WANTED IN MICHIGAN.

A dispatch from Ionia, Mich., states that an electric line connecting that town with Crystal Lake would prove a profitable investment. The lake is in Montcalm County, seven miles from the nearest railroad station and about 18 miles from Ionia. It is about three miles long and one mile wide in the widest part. Many people have cottages near the lake and hundreds of others camp there during the summer.

The road would pass through a thickly settled farming country and four small towns, three of them having no communication with the outside world except by wagon road. As all goods are teamed to these towns the freight business of this electric road would be a large item and the summer travel would be large.

A regular coal carrying service will be a feature of the Saginaw Southern Electric R. R., which is to be built from Detroit to St. Charles, Chesaning and Durand, Mich., touching about a dozen coal mines en route.

About 50 linemen and repairmen employed by the United Railways & Electric Co., of Baltimore, are out on strike for higher wages. The company has succeeded in filling practically all the places of the old men and is suffering but little inconvenience.

THE COLOR LINE IN GEORGIA.

The city council of Augusta, Ga., has passed an ordinance requiring the street railway company to seat colored passengers in the two rear seats, reserving the rest of the car for white passengers, but allowing whites to occupy one or both of the rear seats if there be more white passengers than can be accommodated in the seats reserved for them and one or both of the rear seats be vacant at that time, and also of allowing colored passengers to occupy more than the two rear seats if the two rear seats are filled and there are vacant seats in the front, but on no account whites and colored passengers to be allowed to occupy the same seats. Provision is also made to allow the street car company to reserve the two rear seats for smokers, in which case the two seats immediately in front are to be reserved for colored people.

Employees of the company are authorized by the state laws to assign passengers to seats and have police powers to carry out the section. The company already had regulations differing but little from the ordinance recently passed. This rule as to seating passengers does not work smoothly as was shown by the arrest, recently, of a white passenger who refused to take the seat assigned to him because his clothes were soiled and he did not wish to sit near ladies.

The present agitation of the question is due to the fatal shooting of a white man by a negro because the former would not give up his seat to a colored woman; the negro was lynched.

Negroes have boycotted the cars and the public sentiment is in favor of entirely separate cars for the two races.

NEW ROAD IN MASSACHUSETTS.

A new electric line is approaching completion in Massachusetts and it is hoped to have it open by July 1st. The road extends from Lawrence to Reading, 10½ miles; the track is laid with 60-lb. rails. The cars are of the 15-bench open type equipped with G. E. 67 motors. The power house has Cahall boilers, two 350-h. p. engines made by the Slater Engine Co., Warren, Mass., and two 225-kw. General Electric generators. The officers are: President, C. F. Woodward; vice-president, M. J. Warner; superintendent and purchasing agent, C. D. Shepard.

NORTHWESTERN ELEVATED, CHICAGO, TO EXTEND SERVICE.

There is now under consideration by a committee of the Chicago city council a plan whereby the residents of Evanston and other northern suburbs of Chicago can have rapid transit. An agreement has been reached by the Northwestern Elevated and the Chicago, Milwaukee & St. Paul companies by which the former can use the suburban tracks of the latter north of Wilson Ave., the terminus of the elevated line. There is an incline at this point to reach the surface yards of the company and it would be a very simple matter to connect with the St. Paul tracks.

President Louderback, of the Northwestern Elevated, says concerning the plan:

"We are anxious to have a complete express-train system through Evanston finished as soon as possible. Citizens along the north shore are anxious to have this system and we want to give it to them. We will do anything to accommodate the people. This extension would prove of immense benefit to north-shore citizens, who would get rapid transit and cheap fares, instead of being obliged to depend upon the suburban train service which they now have."

QUOTATIONS ON TRACK MATERIAL.

Steel rails of standard sections in lots of 200 tons and over are quoted f. o. b. Pittsburg, \$35. Chicago prices for T-rails in 60 ft. lengths, \$37; in 30 ft. lengths, \$35. Angle bars are quoted at \$1.80; spikes, \$2.20; bolts, \$2.90. Relaying T-rails are selling at Pittsburg at \$28 per ton. Girder rails are quoted at \$42 to \$44 for 30-ft. and 60-ft. lengths.

Cedar ties may be purchased at Menominee, Mich., at the following prices: 5 x 5½ in. x 7 ft., 25 cents; 5 x 6 in. x 7 ft., 28 cents. Yellow pine ties are sold at New York as follows: 7 x 9 in. x 8½ ft., 65 cents; 6 x 9 in. x 8 ft., 60 cents; 6 x 8 in. x 8 ft., 55 cents.

HALF FARES.

The Johnstown (Pa.) Passenger Railway Co. will build a new line to Windler.

The Denver City Tramway Co. is now having to fight the news-boy-transfer evil.

It is confidently predicted that the Grand Rapids (Mich.), Holland & Lake Michigan electric line will be in operation by October 1st.

Thirty-five new open cars were delivered to the Syracuse (N. Y.) Rapid Transit Co. last month.

Construction work on the line of the Dunkirk (N. Y.) & Point Gratiot Traction Co. was begun June 4th.

The Syracuse (N. Y.) Rapid Transit Railway Co. has commenced building a theater at its park; it will seat 1,200 people.

Construction work was finished last week on the Montville (Conn.) Street Ry. between Norwich and New London.

The name of the Collins Park & Belt Railway Co., of Atlanta, Ga., has been changed to the Atlanta Rapid Transit Co.

The Toledo Traction Band on Decoration Day surprised the inmates at the infirmary by giving a concert for their benefit.

About \$180 worth of ground return wire was stolen from the tracks of the Northern Ohio Traction Co. at Akron, on the night of May 18th.

An effort is being made by a few dissatisfied citizens of Columbus, O., to have the common council revoke the franchises of the Columbus Railway Co.

The property of the Toledo (O.), Fremont & Norwalk Electric Railway Co. has been appraised for taxation at \$1,000 per mile in its unfinished condition.

The trial of the persons charged with conspiring to depress the market value of Brooklyn Rapid Transit securities has been postponed until June 18th.

The Grand Rapids (Mich.) Railway Co. will cast-weld its track joints, and is now building a sand blast machine for cleaning the rail ends, and a portable cupola.

Three men were convicted last month on a charge of stealing from the Chicago Consolidated Traction Co. several rails that had been piled along the tracks.

A Chicago street car recently collided with and overturned a wagon loaded with 17 carboys of sulphuric acid; the fire department was called out to flush the street.

An effort is being made to have the Toledo Traction Co. carry firemen free, but this the company refuses to do unless the city makes certain desired concessions.

The students of the Kentucky State College at Lexington have completed a survey for an electric railway to connect Nicholasville and Lexington, a distance of 12 miles.

Several altered bills have been passed on Cleveland street car conductors. The bills are U. S. treasury notes of \$2 denomination, which have been cleverly raised to \$5.

The General Electric Railway Co., of Chicago, has again been enjoined from laying its tracks in Plymouth Place and across the tracks of the Chicago & Grand Trunk Ry.

Thieves at Cleveland last month stole six gongs from a number of new street cars that had been left standing on a railroad siding. They also stripped the cars of brass trimmings.

Gross passenger earnings of the Chicago Union Traction Co. for May were \$647,347, an increase of \$25,465 over the earnings of the North and West Chicago systems in May, 1899.

Owing to an accident on the lines of the Beaver Valley Traction Co., of Beaver Falls, Pa., a coroner's jury recommends that fenders be placed on all cars belonging to the company.

The Columbus (O.) Street Ry. has a rule that only two policemen may ride free of charge on any one car; this does not apply to members of the force above the rank of patrolman.

Mr. A. G. Grant, owner of the Grove City & Green Lawn Street Ry., of Columbus, O. has obtained permission to change the name of the road, and alter the gage to make it 4 ft 8½ in.

On May 23d, a freight train on the Baltimore & Ohio R. R. crashed into a Philadelphia electric car, containing more than a hundred workmen. Four of the passengers were injured.

The Plattsburgh (N. Y.) Traction Co. reports for the quarter ending Mar. 31, 1900: Gross receipts, \$2,319; operating expenses, \$2,674; deficit, \$355; fixed charges, \$1,470; net deficit, \$1,825.

Earnings of the Market Street Railway Co., of San Francisco, for the year ending Dec. 31, 1899, were: Gross receipts, \$3,674,127; total expenses, \$3,178,006; dividends paid, \$446,808; surplus, \$49,312.

President Fricke, of the Pennsylvania & Ohio Railway Co., Ashtabula, O., recently entertained the city officials of Ashtabula and Conneaut; after a trip over the line they were his guests at dinner.

On the queen's birthday the Montreal Street Ry. had one of the busiest days it has ever experienced. The total receipts were \$6,000, an increase of nearly \$2,000 over the corresponding day last year.

Conductors and motormen of the Decatur (Ill.) Traction & Electric Co. last month received handsome new uniforms. On the collar of each coat in bright gold letters are the initials "D. T. & E. Co."

Through the courtesy of the Metropolitan Street Railway Co., of New York, 100 members of the New York Electrical Society on May 25th inspected the new power house at 95th St. and the East River.

At a recent meeting of the United Railways & Electric Co., of Baltimore, it was decided to pay the semi-annual interest of 2 per cent on the income bonds, and a dividend at the same rate on the preferred stock.

At the opening of the Ocean Electric Ry. from Far Rockaway, Long Island, to the ocean, citizens insisted upon drawing the first car themselves, in order to express their satisfaction over the completion of the line.

Richmond, Va., proposes to levy a graduated tax on the gross earnings of electric railways, 3½ per cent up to \$200,000, 5 per cent up to \$300,000, 7 per cent up to \$400,000, and 10 per cent when in excess of that sum.

A motor car that was pushing a gravel car up a steep hill at Akron, O., in some unaccountable way became unmanageable and ran down the hill, causing the death of three men and serious injuries to three others.

The Supreme Court of Pennsylvania decides the city of Pittsburgh has the right to exact bridge tolls from traction companies under old contracts, even though the bridge has been made free to the general public.

On Sunday, May 13th, nearly 2,000 people were carried by the Columbus, Grove City & Green Lawn electric line between Columbus and Grove City, the occasion being the opening of Buelah Park at the latter point.

Two companies are endeavoring to secure franchises for roads from Grand Rapids, Mich., to Grand Haven. One company is promoted by T. F. Carroll, of Grand Rapids, and the other by J. J. Cilley, of the same city.

The Newark (N. J.) & Hackensack Traction Co. on the night of May 23d stole a march on the North Jersey Street Railway Co. by building tracks across a strip of disputed land during the hours between midnight and dawn.

A committee has been appointed by the Little Rock (Ark.) common council to report upon the charge that the Little Rock Traction & Electric Co. had, during the recent strike, violated certain provisions of its charter.

The Toronto Elevated Railway Co. has been organized to build elevated roads in the city of Toronto, Ont. It is hoped in this way to nullify the exclusive franchises for the surfaces of the streets owned by the Toronto Street Ry.

The commissioners of Madison County, O., have granted a franchise to the National Traction Co. Objection to the action was made by the Columbus, London & Springfield Railway Co. which already has franchises for Franklin County.

The Louisville (Ky.) Ry. is enjoying the most prosperous period in its history. It is earning 7 per cent on its common stock and is paying but 4 per cent dividends, the surplus being held in reserve or turned back into the property in improvements.

Mr. John E. Mills, of Port Huron, Mich., informs us that the Lansing (Mich.), St. Johns & St. Louis Electric Railway Co. in which he is interested, has satisfactorily arranged all preliminary matters and the road will be completed this summer.

A street railway company in Ohio advertises its park in the local papers as follows, the notice being run in the reading columns:

FREE! FREE! FREE!

Bring your baskets and spend Sunday at Cascade Park.

Contracts for the erection of a power house and car barn at French Village, Ill., have been let to C. H. Way, of East St. Louis, by the Mississippi Valley Transit Co., a new company recently formed to build a road from French Village to Collinsville.

The Metropolitan Street Railway Co., of New York, reports gross earnings from passengers for the quarter ending Mar. 31, 1900, at \$3,268,200, an increase of \$418,365 over the first quarter of 1899; operating expenses were \$1,572,436, an increase of \$101,799.

Plans for an extensive electric railway system which will connect all the towns of the Monongahela Valley in western Pennsylvania have been perfected. Among the promoters are L. G. Woods, J. H. Gross, John Hoffman, J. H. Mellon, all of Pittsburg.

A "Street Railway Stake" was one of the features at the Nashville (Tenn.) race tracks recently. The Nashville Railway Co. donated a portion of the prize money as a matter of advertisement for bringing the street railway lines prominently before the public.

As soon as a franchise is secured from the British Columbia parliament, work on a tunnel through Chilcoot pass will be begun by the Chilcoot Co., which it is said, will expend \$2,000,000 in the work of building an electric railway from Dyea to Whitehorse.

Because the Niagara (Ont.), St. Catharine's & Toronto Ry., recently operated by steam, has equipped its lines with electricity, the Michigan Central R. R. will no longer exchange passenger and freight traffic, it being the company's policy not to deal with trolley lines.

Rumor has it that the North Jersey Street Railway Co. is negotiating for the purchase of the Camden, Gloucester & Woodbury Ry., the Elizabeth Street Ry., and other street railway properties in Eastern New Jersey. The officials interested have thus far denied the reports.

The Bay City (Mich.) City Council contends that cheaper fares would increase the gross receipts of the local street railway company. The Bay City Consolidated Railway Co. in order to test the truth of the statement will sell six tickets for 25 cents, for a limited period.

The Chicago City Railway Co. will issue \$500,000 new capital stock on October 1st. Stockholders of record September 15th will have the privilege of subscribing at par for the new shares. The directors of the company have also declared the quarterly dividend of 3 per cent, payable June 30th.

The Grand Rapids (Mich.) Railway Co. has issued a 16-page folder entitled "How to See Grand Rapids." A map of the lines occupies two of the pages, which are $3\frac{1}{2} \times 6\frac{1}{2}$ in., and on each of the other pages is a half-tone cut, $4 \times 2\frac{3}{4}$ in., showing views at the resorts reached by the company's routes.

President Roach, of the Chicago Union Traction Co., has rescinded two important rules of the company. One of these required employes to take out an indemnity bond. The men hereafter may go where they please for uniforms and the money paid in by each man as an indemnity bond has been returned.

By the recent completion of a short stretch of track between Roselle and Elizabeth, N. J., it is possible to make the trip from New Brunswick to Jersey City by trolley in 4 1-3 hours, the fare being 55 cents or 35 cents cheaper than the Pennsylvania R. R. charges for the same trip. The distance is 32 miles.

NEW SUPPLY HOUSE.

The firm of Fowler & Robert, with headquarters at 149 Broadway, New York, reports that it is now making and selling all the supplies formerly made by the Lewis & Fowler Manufacturing Co., and the reorganized corporation, the New York Street Railway Supply Co., of Brooklyn. One of its leading specialties will be the Lewis & Fowler registers, new and repair parts for same including dials, register drums, springs, castings, pawls, register locks and keys, and ringing devices (strap or rod). The firm will also rebuild Lewis & Fowler registers, incorporating the numeral totalizer recording up to 100,000.

Other supplies carried by the new house will include repair parts for Lewis & Fowler electric snow sweepers; Lewis & Fowler car heaters, grates, fire brick, etc.; all styles car trimmings, curtains, etc., for Lewis & Fowler and other cars; ratchet brake handles; upper and lower brake guides, car gongs, bronze nuts for dash and body grab handles, roller sheaves and brackets, gray iron castings, brake shoes, etc. The members of the firm are J. W. Fowler and L. E. Robert, formerly of the Lewis & Fowler Manufacturing Co. Both of these gentlemen have had 20 years' experience in the making and handling of street railway supplies and specialties.

RECEIVER FOR CHICAGO ELECTRIC TRACTION CO.

June 13th the United States Circuit Court appointed Mr. Charles Henrotin receiver for the Chicago Electric Traction Co. The application was by the Manhattan Trust Co., of New York, and United States Senator John Kean, of New Jersey, trustees for the holders of \$650,000 of gold bonds issued in 1889. Attorneys for the company concurred in the petition and we understand the proceeding is agreeable to all parties in interest. The receiver will complete the substitution of the overhead trolley for the storage battery system of traction and operate the road.

MIDNIGHT FLYER TO ST. LOUIS VIA THE WABASH ROAD.

On and after June 3d a new Wabash train will leave Chicago at 11:30 p. m. and arrive at St. Louis 7:56 a. m.; returning this train will leave St. Louis 11:30 p. m. and arrive Chicago 8:00 a. m. Two other fast trains via the Wabash if this does not suit you. All equipment up-to-date. Write or call for maps and time schedule. City Ticket Office, 97 Adams St., Chicago.

ECHOES FROM THE TRADE

THE SPEER CARBON CO., of St. Marys, Pa., believes that good carbons can be sold at reasonable prices, and it is putting its belief into practice.

THE PECKHAM TRUCK & MOTOR CO. has an exhibit at the Paris Exposition comprising six types of single and double trucks and two types of the Price friction brake.

THE R. WOODMAN MANUFACTURING & SUPPLY CO., of Boston, Mass., reports that it is now filling some very large orders for punches and badges for the street railway trade.

WELLS PORTABLE LIGHTS are being used in large numbers by the British army in South Africa, and at St. Helena, for lighting up the enclosures where Boer prisoners are kept and in construction work.

THE ELECTRIC RAILROAD SYNDICATE, capital \$1,000,000, has been incorporated in Iowa to build and equip electric lines. Stephen H. Emmens and Newton W. Emmons, of New York, are two of the directors.

THE BURT MANUFACTURING CO., of Akron, O., has made recent shipments of Cross oil filters to the Carnegie Steel Co., the American Steel Hoop Co., American Sheet Steel Co. and the American Tin Plate Co.

THE ELECTRIC TRIPARTITE STEEL POLE CO., of Newark, N. J., with a capital of \$100,000 has been incorporated to build steel poles for electric railways. W. E. Page, of Franklin, and S. C. Martin and G. V. A. Conger, of Belleville, are interested.

THE EDWARD P. ALLIS CO., of Milwaukee, reports among its large orders received last month, one from the Cleveland Electric Railway Co. for a 3,000-h. p. vertical cross compound engine, and one from the Midvale Steel Co. for a horizontal cross compound engine of 1,000 h. p.

MR. CHARLES AUSTIN BATES, the well-known advertising expert, is sending out a small pamphlet in colors, illustrating the Charles Austin Bates Building to be erected at Longacre Sq., New York. The building will be 17 stories high and will be devoted entirely to Mr. Bates' advertising business in all its branches.

THE INTERNATIONAL CORRESPONDENCE SCHOOLS at Scranton were first thoroughly organized and placed upon a permanent basis in 1891 with about 1,000 enrolled scholars. In the short period of nine years, the schools have enrolled 175,000 students, which number is increasing at the rate of 9,000 per month.

M'INTOSH, SEYMOUR & CO., of Auburn, N. Y., announce a change in the copartnership. Mrs. J. Elizabeth McIntosh has sold her interests and severs her connection with the firm. It is also announced that Messrs. William B. Morrison and William I. Ferrey have each purchased an interest in the business and have become active partners.

THE HYDRAULIC PUMPS made by the Watson-Stillman Co., 204-210 East 43d St., New York, are described in a new catalog issued by the company. A special feature of these styles is the placing of all valves above the cistern top, where they may be examined or repaired without displacing any other parts than the bonnets over each one.

KOHLER BROTHERS, of Chicago, have the contract for installing 48,000 ft. of 1,500,000-c. m. copper feeder cable for the South Side Elevated R. R. This constitutes an additional feeder line from the power house to the Union Loop and to the terminus at Stony

Island Ave. and 63d St., and was necessary because of the larger number of cars operated. G. W. Knox, manager of the railway department for Kohler Bros., has charge of the work.

THE GREEN ENGINEERING CO., of Chicago, has recently closed orders for Green traveling link grates as follows: Metropolitan Street Railway Co., Kansas City, Mo., 3,000 h. p.; St. Louis Transit Co., 7,000 h. p.; Sharon Steel Co. (second order), 5,000 h. p. During the last eight months the company has made sales of grates for 40,000 h. p. of boilers.

THE NEW PROCESS RAW HIDE CO., of Syracuse, N. Y., has just published an interesting booklet on its gears, pinions and bushings which are the result of 10 years of experience and experiment. The catalog contains a number of very strong testimonials and bears the company's motto: "As is steel to iron, so is 'New Process' raw hide to all other raw hide."

A. L. IDE & SONS, of Springfield, Ill., have closed contracts with the Pueblo (Colo.) Traction & Electric Co. for a 350-h. p. four-ported tandem compound Ideal engine to be direct connected to generator. The firm of Ide & Sons is publishing several new catalogs and pamphlets on Ideal engines that will be of interest and value to all engineers and steam users.

THE SIMONDS MANUFACTURING CO., of Pittsburg, reports that its gear business has grown to such proportions as to make it necessary to run the works day and night. The company is now installing new and improved gear cutting machinery, which will increase its factory output 30 per cent, and enable it to take still better care of its customers than it has in the past.

THE JACKSON & SHARP CO. has made the first delivery on an order for 40 42-ft. open cars from the United Power & Transportation Co., of Philadelphia. The company has also made the final shipment of an order for 20 cars to Seattle, Wash. To protect these latter cars en transit, they were each enclosed in a specially constructed box resembling an ordinary box freight car.

THE INTERNATIONAL BOILER COMPOUND CO., maker of solid, liquid and powdered boiler compounds, claims that its compositions prevent and remove scale, preserves the iron, increase the capacity of the boiler, and save a large percentage of fuel. It is also guaranteed that International compounds are free from all acids or other materials effecting a corrosive or injurious reaction on the boiler metallic surfaces.

THE MICA INSULATOR CO. has branch offices where its goods are carried in stock at Cincinnati, under the management of the Monroe Brass & Wire Co.; at St. Louis, under the management of A. S. Partridge; at Cleveland, with the George Worthington Co.; and at San Francisco, under the management of the Brooks-Follis Electric Co. These connections enable the company to quickly and easily distribute its materials in the respective territories.

THE GREEN FUEL ECONOMIZER CO., of Matteawan, N. Y., has been awarded a contract for what will be the largest installation of economizers ever attempted. The order is given by the Manhattan Railway Co. for its 100,000-h. p. plant in process of erection at 74th St., and East River, New York City. This order speaks well for the confidence held by the Manhattan engineers that the Green Fuel Economizer Co. is able to live up to all its guarantees.

J. A. FAY & CO., of 557 to 577 West Front St., Cincinnati, makers of wood-working machinery, have just issued a very handsome and complete illustrated catalog of 394 pages, showing the different machines they build, and they will be pleased to forward on application a copy to any firm or individual who is interested in this

class of machinery. A large number of the machines described have been patented in 1900, and embody the latest designs and inventions in the wood-working industry.

MR. THOS. G. GRIER, for a number of years advertising manager of the Western Electric Co., Chicago, has resigned and taken offices in the Williams Building, 200 Monroe St., Chicago, where he will represent several well-known houses, including the Nungesser Electric Battery Co., of Cleveland, the Wirt Electric Co., of Philadelphia, and the Dicke Tool Co., of Downer's Grove, Ill. The "Review" joins with Mr. Grier's many business acquaintances in wishing him complete success in his new work.

MR. F. J. DOWN, founder of the firm of Laing, Wharton & Down, of London, has severed his connection with this concern to establish a business of his own in London, for supplying electric traction and lighting specialties. Mr. Down has been connected with the electrical industry for 17 years and has the credit of first introducing into Europe, the Thomson-Houston system, and Okonite cables. He also obtained for Laing, Wharton & Down the European agencies of J. G. Brill Co., the Walker Co., and the Forest City Electric Co. His many friends in America and Europe will wish him every success in his new undertaking.

THE J. G. BRILL CO. has recently issued a circular, No. 65, descriptive of its sprinkling cars. The principal advantages of sprinkling the tracks are three in number: the increased pleasure riding which follows with abatement of the dust nuisance, the decreased wear of bearings by keeping the grit and dust out of them, and the improved electrical contact between wheels and rails when the latter are washed clean or are damp. These have been widely recognized by the managers of both urban and interurban roads. The Brill company is now making single truck sprinkling cars of 1,800 or 2,500 gallons capacity, the latter being the standard, and double truck cars of 5,000 gallons capacity.

MR. C. J. SMITH, known as Smith of New York, maker of car head lights and lamps, returned last month from a three months' trip abroad, having visited in order, Italy, Germany, France, England and Ireland, and secured substantial orders for his line of goods. Mr. Smith reports increased activity in street railway building in all these countries. He says that in Rome and throughout France the street railway business is being developed largely by Belgian engineers and very much of the equipment is of Belgian make. The office and shops of the Smith lamp works, at 350 Pearl St., have recently been improved by the placing of plate glass fronts on two sides of the ground floor; new floors have been laid and new machinery of modern design has been installed in place of part of the old equipment.

AN ENGINE BUILDERS' ASSOCIATION has been formed among the prominent builders of automatic cut-off engines in the United States. The objects of the organization are the promotion of the interests of the engine trade by the advancement of engineering knowledge among steam users; cultivating a better acquaintance among members of the engine building fraternity; co-operation in matters of mutual interest; comparing and standardizing methods; and improving the condition of employes and the service to the public. The officers for 1900 are: President, J. E. Sweet, Straight Line Engine Co., Syracuse, N. Y.; vice-president, W. M. Taylor, Chandler & Taylor Co., Indianapolis; treasurer, H. L. Ide, A. L. Ide & Sons, Springfield, Ill.; secretary, S. F. Bagg, Watertown Engine Co., Watertown, N. Y.

THE MORRIS ELECTRIC CO., 15 Cortlandt St., New York, has within the past few weeks received orders from foreign countries for electrical equipments and supplies aggregating \$500,000 in value. These include the contract from the Havana (Cuba) Electric Railway Co. for feed wire to the value of \$200,000; 45,000 ft. of iron stranded wire and 100,000 ft. of plain wire; 2,200 iron trolley poles, valued at \$85,000; 60 carloads of terra cotta conduits; and all the brackets and other supplies for 54 miles of overhead work. Other orders have been received from the Mexico City Electric Ry., the Lisbon Tramways Co., of Lisbon, Portugal, I. & O. Braniff & Co., of Mexico, Sao Paulo (Brazil) Electric Light & Power Co., Buenos Ayres (A. R.) Electric Tramway Co., Laing, Wharton & Down, Ltd., of London, and from South Africa and Italy.

SANS SOUCI PARK OPENED.

Sans Souci Park, Chicago, was opened for the summer season on May 27th. Although the weather for the first week was stormy the average attendance since the opening day has been very satisfactory, proving that this South Side resort is as popular as ever. The attractions for the first part of the season include light vaudeville, Chicago Marine Band, a camp of Indians, shooting galleries, temple of palmistry and others. The most noticeable change about the park is the removal of the circular band stand that was formerly located near the front of the Casino and the erection of a new one at the west side of the grounds. This arrangement greatly improves the general appearance of the park. The park during the coming season will be under the management of Mr. Alfred Russell. Sans Souci was described in the "Review" for Mar. 15, 1899, page 202, and June 15, 1899, page 422.

INCREASED WAGES FOR EMPLOYEES.

The Milwaukee Electric Railway & Light Co. on June 1st voluntarily increased the pay of motormen and conductors approximately one cent an hour. Under the old scale the men for the first six months received 15 cents per hour; for the second six months, 16 cents; for the second year, 17 cents; and an increase of one cent per hour for each succeeding year until after the fifth year of their service when they earned 20 cents per hour. The new rule gives the men 17 cents per hour during the first year, 18 during the second, 19 during the third and 20 during the fourth year and thereafter. About 600 men are affected by the change.

Employes on the Albany division of the United Traction Co., of Albany, N. Y., will hereafter receive the same wages as are paid to the Troy division men. The scale is 20 cents an hour for regulars and 18½ cents for all trippers.

The Columbus (O.) Railway Co. on May 23d raised the wages of its 400 motormen and conductors as follows: the three-months men from 15 to 15¼ cents per hour; the nine-months men from 15¾ to 16¼ cents. Employes that have been with the company for one year or over will receive 17¼ cents per hour.

A new scale of wages has been put in force by the receivers of the Superior Rapid Transit Co., of West Superior, Wis. The men formerly received 14 and 15 cents per hour according to the term of service, but will now be paid 17 and 18 cents per hour.

The Sacramento (Cal.) Electric Street Ry. on June 1st increased the wages of its trainmen. Hereafter, men who have been in the service less than two years will receive 18 cents per hour; those who have served for more than two and less than five years, 19 cents; for from five to eight years, 20 cents; more than eight years, 21 cents.

The Pawtucket Street Railway Co., of Providence, R. I., has reduced the number of hours of work required of employes from 12 to 10½ per day. No reduction is made in wages.

C., H. & D. HOMESEAKER'S EXCURSION.

On June 19th the C., H. & D. Ry. will sell special excursion tickets to those desirous of seeking homes in the West, South and Northwest. Call on nearest C., H. & D. agent for particulars.

THROUGH COLORADO.

The "Scenic Line of the World," the Denver & Rio Grande R. R., offers to tourists in Colorado, Utah and New Mexico the choicest resorts, and to the trans-continental traveler the grandest scenery. Two separate and distinct routes through the Rocky Mountains, all through tickets available via either. The direct line to Cripple Creek, the greatest gold camp on earth. Three trains each way daily with through Pullman palace and tourist sleeping cars between Chicago, Denver, San Francisco and Los Angeles, and Denver and Portland. The best line to Utah, Idaho, Montana, Oregon and Washington via the "Ogden Gateway." Dining cars (services a la carte) on all through trains. Write S. K. Hooper, G. P. & T. A., Denver, Colorado, for illustrated descriptive pamphlets.

CHAS. J. MAYER, President. A. H. ENGLUND, Sec'y & Treas.

THE MAYER & ENGLUND CO.

10 SOUTH TENTH STREET, PHILADELPHIA, PA. NEW YORK OFFICE: 85 LIBERTY STREET.

CABLE ADDRESS: "MAYLUND" Philadelphia. A. B. C. Code, 4th Ed.

Electric Railway Material and Supplies of Every Description.

We are exclusive Territorial Representatives of the following leading Manufacturers of Railway Materials:

R. D. Nuttall Co., Gears, Pinions, Bearings, Trolleys, Etc.	Allegheny, Pa.	The International Register Co., Single and Double Fare Registers.	Chicago, Ill.
Van Wagoner & Williams Hardware Co., Dropped Forged Copper Commutator Segments.	Cleveland, O.	W. T. C. Macallen Co., Standard Overhead Insulating Material.	Boston, Mass.
The Protected Rail Bond Co., "Protected" Flexible Rail Bonds.	Philadelphia.	Bradford Kelting Co., "Monarch" Insulating Paint.	Cincinnati, O.
American Electric Heating Corporation, Electric Car Heaters of Every Design.	Boston, Mass.	Sterling Varnish Co., Sterling New Process Insulating Varnish.	Pittsburg, Pa.
Chisholm & Moore Manfg. Co., Moore's Chain Bolts.	Cleveland, O.	Garton Daniels Electric Co., Garton Lightning Arresters.	Keokuk, Ia.
New York & Ohio Co., "Packard" Incandescent Lamps.	Warren, O.	D. & W. Fuse Co., Enclosed Non-Arching Fuses.	Providence, R. I.

Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

We carry the largest stock in this country of Strictly Electric Railway Material.

We are now occupying our entire building, five floors and basement.

Special Attention Given to Export Business.

Send for Catalogues.

NEWS NOTES.

FRANCHISES ASKED.

COLUMBUS, O.—The Central Market Street Railway Co., which has been newly organized, has filed an application for franchises through Columbus streets with the city clerk. The application is signed by Dr. S. B. Hartman, who is the principal promoter of the enterprise.

CAMDEN, N. J.—F. R. Hamsell, G. H. B. Martin and W. F. Eidell have incorporated the United States Electric Railway & Light Co. to construct and equip electric railways. The company is capitalized at \$125,000.

FOND DU LAC, WIS.—The Wisconsin Rapid Transit Co. has been incorporated with a capital stock of \$25,000 by H. G. and C. D. Smith and R. S. Wilkins. Its principal promoter, C. D. Smith, of Fond du Lac, is also interested in the proposed electric line to connect Fond du Lac with Algoma.

EAST LIVERPOOL, O.—J. F. Spence and H. G. Folts of Lisbon and Morris French of East Liverpool are reported to be promoting an electric line to connect East Liverpool with Salem by way of Lisbon. Surveys of the proposed route have already been made.

KENOSHA, WIS.—It is reported from Kenosha that Alderman John Serhson of the street railway committee of the City Council has been authorized by Patrick Maynes and Gustave L. Clauson, of Chicago, to make an offer of \$25,000 for the street railway franchise through the city. It is believed that if the company will give proper bonds the proposition will be accepted. It is also reported that the Milwaukee Electric Railway & Light Co. and the Chicago & Milwaukee Electric Co. beside others not yet named, will be contestants for the franchise.

GEORGETOWN, MASS.—The Essex County Street Railway Co. petitions for a franchise to make extensions of its line in South Georgetown, thereby connecting with the Haverhill, Georgetown & Danvers line, the ultimate purpose being to furnish direct service from Haverhill to Salem.

DES MOINES, IA.—The Des Moines & Northern Iowa Railway Co., capitalized at \$50,000, has been incorporated to build an electric railway from the southern to the northern boundaries of Iowa, through Des Moines. Incorporators are Arthur Reynolds, N. E. Coffin, J. H. Blair, J. H. Phillips and I. K. Wilson, all of Des Moines.

PERU, IND.—Nat Covington of Peru has applied for a franchise for an electric line 20 miles long to connect Peru and Converse, by way of Peoria, Santa Fe, McGrawsville, Amboy and North Grove. The project is said to meet with popular approval and will be pushed rapidly to consummation. The plans include a summer resort at the Cliffs, midway on the route. Mr. Covington until recently was the owner of the local electric lighting plant.

SPRINGFIELD, MASS.—Articles of incorporation for the Hartford (Conn.) & Springfield (Mass.) Street Railway Co. will be applied for. The company has been organized under the laws of Massachusetts with a capital stock of \$50,000. A temporary board of directors has been chosen, comprising John Oldroyd, of Agawam; H. Stacy, C. F. Munder and H. S. Anderson, of Springfield; Thos. C. Perkins, of Hartford; Fred Hines, of Newton, Mass., and

Charles H. Wilson of Brookline. Franchises will be applied for at once in Springfield and Agawam.

KANSAS CITY, KAN.—The Kansas City & Olathe Electric Railway Co., capitalized at \$1,000,000, has been incorporated and projects an electric railway between Kansas City and Olathe. F. R. Ogg, H. C. Livermore, J. S. Pettijohn and H. G. Hodges, of Olathe; James E. Tyron and G. T. Moore, of Kansas City, and D. B. Dyer, of Augusta, Ga., directors. The main office of the company will be located at Lenexa, half way between Kansas City and Olathe.

HEMPSTEAD, L. I.—Articles of incorporation have been filed by the Queens Borough & Nassau Electric Railway Co., which proposes to operate a seven-mile electric line from Hempstead to the former village of Queens. The capital stock is \$150,000. Daniel Noble, Long Island City, and Henry P. Keith, of Hempstead, are among the directors.

COLUMBUS, O.—The Columbus, Mechanicsburg & Urbana Railway Co., through H. A. Axline and Colin McDonald has made application for a franchise from Columbus, through Dublin to the county line. The application stipulates that work on the line shall be commenced before Sept. 15, 1901.

HAVERHILL, MASS.—Col. Charles F. Woodward, of Wakefield, is interested in the organization of the Haverhill & Andover Street Railway Co. with a capital stock of \$80,000. It is proposed to build an electric railway from Haverhill to Andover via North Andover, connecting with the Lowell, Lawrence & Haverhill Street Ry. at the three points mentioned, as well as the new line being built between Andover and Reading.

LIGONIER, IND.—Hon. P. A. Randall of Fort Wayne, Ind., is promoting a project to build an electric railway to connect Ligonier and Fort Wayne. It is reported that the project receives the support of the business men of both cities.

BEATRICE, NEB.—It is reported that the Beatrice Electric Co.'s street railway in that city will again be put in operation. E. J. Sullivan, manager. The Kansas City & Oklahoma Construction Co., having headquarters in Kansas City, also projects building a street railway in Beatrice. A franchise has been applied for.

ROCKVILLE, MD.—The Rockville & Washington Electric Railway Co. proposes to extend its line into the corporate limits of Rockville. A franchise will be applied for by the company's attorney, H. Maurice Talbot, of Rockville.

NEWARK, N. Y.—The Newark & Marion Railway Co. has been incorporated with a capital stock of \$100,000, to construct an electric railway from Newark to Marion. The road will be eight miles in length. The directors of the company are: Ernest V. Pierson, Frank D. Burgess, W. H. Nicholas, William H. Kelly, of Newark; Caleb L. B. Tylee, William C. Snow, Clinton N. Tylee, of Penn Yan, and Henry R. Sil, of Bluff Point, N. Y.

LENOX, MICH.—An electric railway, 44 miles long, is projected to be built from Lenox through Memphis, Emmett, Brockway, Yale and Peck to Sanilac Center. Franchises have been applied for. G. R. Lovejoy, of Lenox, is the principal promoter.

WHITINSVILLE, MASS.—The Uxbridge & Blackstone Street Ry. is being organized and will apply for a franchise to build an electric line from Whitins-

ville to Millville, a distance of nine miles. The company is capitalized at \$80,000. John E. Sayles, of Uxbridge; M. P. Burbank, of Whitinsville, and T. S. Johnson, of Worcester, are interested.

NIAGARA FALLS, ONT.—The Falls View & Chippewa Electric Railway Co. is being organized, and proposed to build a line between the cities named. B. R. Paine, Niagara Falls; Martin Comstock, Buffalo; and Edward Baxter, Fort Erie, are the promoters.

POTTSVILLE, PA.—The Pennsylvania Railroad Co. projects the building of an electric branch from Pottsville to Primrose and from Minerville to Forestville, a total distance of 12 miles.

KANSAS CITY, KAN.—The projected Kansas City, Rosedale & Argentine electric railway is being promoted by ex-Congressman Mason S. Peters, who will apply for a franchise.

RUSHVILLE, IND.—The Indianapolis, Morristown & Rushville Traction Co. proposes to parallel the Cincinnati, Hamilton & Dayton Ry. between Indianapolis and Rushville with an electric line. J. H. Mahoney, ex president of the Indianapolis city council; Edward W. Little and Dr. J. N. Navin are interested. The company has a right of way to Rushville and will put surveyors to work as soon as the franchise is granted.

AMSTERDAM, N. Y.—The Amsterdam & Haganan Traction Co. has been incorporated with a capital stock of \$200,000 to build a five-mile line from Amsterdam to Haganan. Among the directors are William K. Archbold and Robert R. Reid, of New York; Robert E. Drake, of Syracuse, and Lewis E. Harrower, of Amsterdam.

MANCHESTER, ME.—It is reported that A. F. Gerald, of Fairfield, who has just completed the Togus, Me., street railway, is promoting a project to connect Bangor, Manchester and Winthrop by an electric line.

VALLEJO, CAL.—J. N. Patterson has petitioned for a franchise for a street railway, to be operated by electricity or other power, in Vallejo. Application for a franchise was made through L. G. Harrier, attorney.

HOMESTEAD, PA.—The Homestead Belt Line Street Railway Co. has been organized and will apply for a franchise to build a four-mile electric line through the city. T. L. Parry, president; Louis Rott, secretary; H. P. Wiggins, John E. Jones and J. F. Milliken, directors.

FLORENCE, TENN.—The Florence Street Railway, Lighting & Power Co., capitalized at \$150,000, has been incorporated and proposes to build an eight-mile electric line in Florence, three miles of which will be completed and in operation within 15 months. A franchise has been granted E. A. Schubert and others, of Fostoria, O.

HOT SPRINGS, ARK.—The Commercial Club of Mena, Ark., is promoting an electric line to connect Mena and Hot Springs. J. H. Hamilton, N. M. Terry, and J. D. Shaver, of Mena, have been appointed as a committee to make preliminary arrangements for the road's construction.

DAYTON, O.—The Dayton & Northern Traction Co. has been incorporated with a capital stock of \$400,000 and proposes to build an electric line from Dayton via Brookville & Arcanum to Greenville. Dr. L. E. Lowes, of Dayton, is the principal promoter.

TOLEDO, O.—The Valley Electric & Power Co., capitalized at \$100,000, has filed incorporation papers, application being made by W. B. Taylor, G. K. Detwiler, A. K. Detwiler, H. E. King and T. H. Tracy.

FAIRMONT, W. VA.—H. S. Sands, of Wheeling, and C. S. Sands, of Clarksburg, W. Va., are promoting an electric railway to be built in Fairmont.

RICHMOND, VA.—J. H. Mulholland, of Richmond, is securing capital for the construction of a seven-mile double track electric line to be known as the Westhampton Park Ry.

COLUMBUS, O.—The Suburban Electric Railway Co., of Columbus, capitalized at \$150,000, has been incorporated by P. Jones, G. W. Dunn, E. Denmead, A. L. Thurman and A. W. Field.

COPENHAGEN, N. Y.—A. L. Stoddard, of Whitesboro, N. Y., is reported to be promoting an electric railway from Copenhagen to Lowville, the power to be furnished from High Falls.

ELIZABETH, N. J.—Henry H. Isham is promoting a new electric railway in Elizabeth to be known as the Suburban Line. Mr. Isham was the organizer of the Elizabeth street railway, subsequently acquired by United States Senator John Kean.

NEW YORK, N. Y.—The Elm Street Connecting Railway Co., capitalized at \$20,000, has been incorporated and proposes to build a line 6,000 ft. long in Elm St. Any power but steam may be used. Charles E. Warren, Sharon Graham, William A. Dibbs, Mark J. Martin and Henry L. Jeffries, of New York City, and D. E. Clifford Moorehead, of Jamaica, L. I., are among the directors.

PROVIDENCE, R. I.—The Providence & Fall River Street Railway Co. has been incorporated with a capital stock of \$200,000, fully subscribed, and proposes to build an electric line between Providence, R. I., and Fall River, Mass., a route which will aggregate 14 miles of railways in Massachusetts. The promoters are James T. Shaw, of Brookline, Mass., E. P. Shaw, of Newburyport, and E. P. Shaw, Jr.

BANGOR, ME.—It is reported that the Penobscot Central Railway will be extended this summer to Pushaw and other neighboring resorts. E. J. Emery, purchasing agent.

WASHINGTON, D. C.—The Washington City Transportation & Power Co., capitalized at \$5,000,000, has been incorporated in West Virginia by M. A. Nobles, Samuel M. Hineman, John J. Boardman, Thomas W. Jenkins and Herbert McCann, all of Philadelphia. It is proposed to build a rapid transit system in the city of Washington and suburbs.

CAMDEN, N. J.—The project of the Camden & Suburban Railway Co. to extend its line in Haddon Ave., thus affording a direct service from Camden to Haddonfield, has been revived and franchises for a double track extension have been applied for. Property owners along the route have also presented petitions to the city council praying that the franchise be granted. W. E. Harrington, manager.

BALTIMORE, MD.—The United Railways & Electric Co. has an application before the city council for certain extensions within the city, and the right to double track a portion of its route. William A. House, manager.

ROHERSTOWN, PA.—William F. Sadler, Jr., secretary of the Trenton (N. J.), Lawrenceville & Princeton Railroad Co., represents a New York syndicate which proposes to build a number of electric lines through Lancaster County, Pa. Application for franchises has been made, and the routes partially surveyed. The first of the projected railways will connect Rohers-town, Silver Springs, Mount Joy, Elizabethtown, Columbia and Marietta.

CLEVELAND, O.—The Portage Lake Traction Co., of Cleveland, has been incorporated with a capital of \$10,000, by David M. Glasscock, Carl H. Nau, Henry Laneefield and Charles L. Stocker. An electric line will be built to connect Cleveland, Ravenna and Kent.

COLUMBUS, O.—Hon. Paul Jones, whose connection with the newly incorporated Suburban Electric Railway Co. was noted in the "Review" bulletin June 4th, is reported to be also promoting a new interurban line to extend from Hilliards to Columbus by way of Arlington.

TOLEDO, O.—The Victory Park Railway Co. has been incorporated with a capital stock of \$50,000, to operate an electric railway on Put-in-Bay Island. Frank Caughlin, Charles W. Ryan and Frank J. Arbuckle, Toledo, incorporators.

HAMILTON, O.—The Hamilton & Lindenwald Electric Transit Co. proposes to operate a line through East Hamilton, and has applied for the necessary franchises. Consents of property owners have been secured. Ira S. Milliken, purchasing agent.

JOLIET, ILL.—The Joliet Railroad Co. has petitioned the city council for franchises through certain streets of Joliet and the right to locate additional switches, tracks and turnouts, for which privileges it proposes to pay the city \$5,000. F. E. Fisher, general manager.

WAUKEGAN, ILL.—The Waukegan, Fox Lake & Western Railway Co., capitalized at \$100,000, has been incorporated. R. D. Wynn and Richard Cole, of Waukegan, are believed to be promoting the line.

CHICAGO, ILL.—The Illinois & Rock River Railway Co., capitalized at \$1,000,000, has been incorporated by Ephraim Banning, Thomas Banning, T. C. MacMillan, A. F. Milliken and G. E. Plumb, all of Chicago. It is the immediate intention of the company to build a 64-mile railway along the Rock River from Sterling to Rockford, which will later be extended into Wisconsin through Beloit and Janesville, to aggregate about 125 miles. Either the overhead trolley system or compressed air will be used, and if the former, motors of unusual size will be purchased. The transportation of freight will be an important feature of the business, and it is desired to have the Sterling-Rockford line in operation by early spring. Surveys of the route have already been made. It is announced that G. E. Plumb will be president and Ephraim Banning counsel for the company. Mr. Plumb may be addressed at 205 La Salle St., Chicago.

LIBERTYVILLE, ILL.—The Chicago, Fox & Geneva Lake Electric Railway Co., capitalized at \$100,000, has been incorporated by F. V. Bissell, Oak Park, Ill., and Clayton Cunningham, Charles A. Hill, K. S. Holmes, Albert A. Patterson and George D. Hale, Jr., Chicago, who also comprise the board of directors. An electric railway will be constructed from the east line of Lake County, Ill., to a point in McHenry County on the Illinois-Wisconsin state line. Headquarters of the company will be established at Libertyville.

OGDEN, UTAH.—The Ogden Rapid Transit Co., capitalized at \$100,000, has been incorporated to build street railways in Ogden and suburbs, using electricity, compressed air or other motive power. D. Dee, George H. Matson, J. W. F. Volker and David Eccles are promoters.

RIGHTS OBTAINED.

LANCASTER, PA.—The Conestoga Traction Co. has secured all rights of way for a 15-mile extension of its line from Lancaster to Ephrata and construction will be commenced at once. It is estimated that the line will cost \$200,000. Frank S. Given, manager.

DUQUESNE, PA.—A charter has been issued to the Duquesne & Dravosburg Street Railway Co., capitalized at \$12,000, to build an electric line two miles long from Duquesne through the borough of Dravosburg. The promoters are L. G. Woods, Pittsburg, president; J. H. Gross, John Hoffman, J. H. Miller and John F. Rodgers, all of Pittsburg.

SALT LAKE, UTAH.—The Salt Lake Valley Railway Co., whose incorporation and project to build an electric railway to Ogden, Utah, were noted in the "Review" bulletin February 16th, has secured a franchise from the city council at Salt Lake to operate the proposed line in that city. T. W. Naylor and William P. Hemphill of Salt Lake are concerned.

ALLEGAN, MICH.—The township board has granted a franchise to David Cornwall of Monterey and Milton D. Owen of Allegan for an electric railway through the township. The projectors also hold franchises through Monterey and Salem, and have applied for rights through Ottawa County. They propose to build a 21-mile line to connect with the projected Grand Rapids-Holland Ry., to carry both passengers and freight, through a populous district remote from steam railways. The franchises include the right to establish electric light and telephone lines through the same territory.

LEAVENWORTH, KAN.—A franchise has been granted the Leavenworth Electric Railway Co. to make several extensions of its system in Leavenworth for the purpose of bringing the Kansas City-Leavenworth Railway Co. into the business district of the city. E. E. Coombs, manager.

HARRISON, N. Y.—The Larchmont (N. Y.) Horse Railway Co. has been granted a franchise to extend its line through Harrison to connect with the Port Chester Ry. on the east. It has been announced that the Larchmont lines will be operated by electricity in the place of horses. E. F. Campbell, superintendent, Larchmont.

WALTHAM, MASS.—The Waltham Street Railway Co. has been granted a location of tracks through South Weston, Main, Prospect, Crescent, Maple, Moody and High Sts. to the Newton line. The road is to be completed before Dec. 1, 1900.



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The Brooklyn Rapid Transit Co. is to be congratulated upon its success in securing the conviction of three of the men charged with conspiring to depress the market value of its securities by circulating false reports. While the sentences imposed on the men were very light, and their punishment in no sense commensurate with the damage done by them, yet the example will probably deter others from similar conduct.

The decision of the Supreme Court of New York, mentioned in our issue of March, 1899, dismissing an action brought to prevent electric lines on Long Island from running freight and express cars, has been affirmed by the Court of Appeals. In the decision of the Supreme Court Judge Marcan used this language: "The public having discovered that the transportation of freight can be made more economically than by former methods there is no meritorious reason why it should not enjoy that advantage."

Apropos of Mr. Lindley's recommendation that electric railways should be brought under the jurisdiction of the state railroad commissioners and required to file periodical reports, as are the steam railroads, it is stated that in those states where this has been done—Massachusetts, Connecticut, Rhode Island, New York and Pennsylvania—the electric railways are prosperous, the relations between the railways and the municipal and state authorities most amicable and the agitation for municipal ownership less violent.

Our English contemporary, *Lightning*, of London, discusses the comments in our April issue on the reduced rates put in effect by the Hamilton & Lindenwald Electric Transit Co., of Hamilton, Ohio, and also our review of the decisions of the United States courts in the various cases where they have passed upon the validity

of law for compelling a reduction in street railway fares. The editor of *Lightning* unfortunately made the error of locating the Hamilton & Lindenwald road in Ontario instead of Ohio, and consequently his strictures on the ultra conservatism of Americans are misplaced. We really have no desire for Canadians to regulate their conduct in accordance with the "intricacies of the much vaunted American constitution." Ohio companies have to do this, however.

The daily press of Detroit is full of comments on the fact that the street railway companies of that city which wanted to sell to the Pingree commissioners for \$16,800,000 now object to the valuation of \$10,247,000 placed on the property by the assessors. The valuation for taxation last year was \$2,600,000 and the value as reported by the companies' officers in March last was \$1,101,115. Of course if the properties were worth the price asked for them a year ago they are worth as much now, but it must be remembered that the company has debts as well as assets. The bonds issued by the three "Johnson" companies aggregate \$15,465,000, so that when this sum is subtracted from the selling valuation of \$16,800,000 the difference, \$1,335,000, is not far from the valuation as returned. The assessment of \$10,247,000 is an attempt to tax the company on its debts, an unreasonable proceeding since the owners of the bonds are also subject to taxation on the same property.

About once every so often we see that a legislature or a city council has a bill under consideration providing that passengers in street cars who cannot find seats shall only pay 2½, or 3 or 4 cents as the case may be. Such bills seldom get farther than a committee, and it is not often that the street railway men find it necessary to present arguments to show the absurdity of such plans to meet the conditions they are supposed to remedy. The "low rate for standing passengers" idea appears to have taken a firmer hold on the San Francisco supervisors than is usually the case and Mr. Clayton, secretary of one of the companies affected, considered the passage of the ordinance so imminent that he appeared before the committee having it in charge and presented a long argument against it. The main points Mr. Clayton made are abstracted on another page of this issue and will prove of value to others who may be similarly situated in the future.

There is only one remedy for the crowded street car, and that is to adopt the European practice of limiting the number of passengers permitted to board the car. But this remedy is worse than the disease, as the more progressive English companies are beginning to realize.

The paper on "The Functions of Modern Tramways" read before the gathering of English tramway managers at the exhibition in London, throws an interesting side light on several conditions on the other side. Mr. John Young, who is the manager of the Glasgow system, refers to the democratic tendency of the modern tramway and predicts the same solution of social evils resulting from tenement crowding as has been worked out here. He pointedly remarks the lack of consistency on the part of city authorities which allow the speed of a hutch's cart to be restricted only according to the judgment of a policeman, while gentlemen may drive their dogcarts at 12 miles an hour and autos at 14 to 16 miles, while the electric car, by far the most easily controlled of any of these, is restricted to eight miles an hour. He rightly states that under this condition the modern tramway cannot confer its greatest benefits.

He also combats the popular idea over there as to the congestion of streets by the running of cars, and describes Broadway in New York under the system of bus transportation and with its present improved transit. In Glasgow electric cars stop at points designated by signs which are on an average of 600 feet apart.

In reference to the increasing of American trade abroad much has been said concerning the necessity of sending letters, catalogs and other printed matter in the language of the country it is desired to canvass, but too much emphasis cannot be laid on this requirement, as United States consuls continue to report they are constantly receiving for distribution from American firms handsome and expensive catalogs, which are absolutely worthless for the reason that they are printed in the English language. Makers of electric railway materials desiring to extend their foreign trade

should particularly consider this point and put forth every effort to approach foreign tramway managers under the conditions to which they are accustomed, for English and European dealers are making strenuous endeavors to regain some of their lost prestige in this field and secure for themselves the business that has been coming to America. The Germans seem to be taking the lead in this respect and are exhibiting an activity that would do credit to Americans. The German way, when introducing goods into a new district or country, is first to mail to every possible buyer letters and attractive catalogs in the proper language; and they invariably send a representative to complete the work. It is the necessity of taking this latter step that prevents many of our medium sized supply houses from enjoying an export trade which they unquestionably would have if their goods were better known by foreign managers.

The difficulty has been partially overcome in a number of cases by making agency connections with established dealers in the countries it is desired to reach and by various commercial bureaus, but arrangements of this kind, while good if they are the best that can be made, are never as satisfactory as direct personal representation by special agents. To secure this personal representation, it has been suggested that a few of the smaller houses not in direct competition with each other could with profit club together to support one good traveling representative speaking Spanish, French and German, who would carry samples and be able to explain fully the merits and advantages of the goods he was handling. Some pooling of interests in this way could be made of advantage to all concerned and especially so when dealing with territory where the possible business has not yet reached large proportions.

Again, it should be remembered that it is usually hard for a foreigner to understand the somewhat complicated American system of discounts and when prices are quoted in letters or catalogs they should always be given net. It is also well to add as full information as possible relative to the cost of shipment in order that the enquirer may compute just how much the material will cost delivered at his door.

It must also be remembered that foreigners usually expect long credit, often from four to six months, and if a firm is not prepared to give this it is almost useless for it to attempt an export business. Ratings may be secured through the consular service or from any one of a number of established rating agencies.

It is usually considered that the discussion of political questions is entirely outside the province of a technical journal and this is true of the ordinary political issues. Silver is not an ordinary issue. It is a matter of small moment to the street railway man, as such, whether the United States retains the Philippines or annexes Cuba, though doubtless he has convictions on those subjects. The tariff was defined by General Hancock to be a local issue, and many of both parties now agree with him though the statement lost him many votes at the time it was made. Pensions and militarism and the Boer war may furnish much good campaign material from the politician's standpoint, but they are outside our field. It may even be said that any or all of the issues between the two great political parties of this country, with the single exception of the silver question, might be decided either way and after a comparatively short time for the country to become adjusted to the new conditions the street railway industry would not be in the least affected. But this is not true of silver.

The avowed objects to be secured by the free coinage of silver at the ratio of 16 to 1 are two: First to enable debtors to scale debts contracted on a gold basis. Second, to increase the prices of all commodities. The merchant, the manufacturer, and the farmer, in event they succeeded in weathering the financial panic that would surely follow a change from our present gold basis, might not suffer from the appreciation of prices, because they could get more for the commodities they have to sell. How different is the street railway company, which would have to pay increased prices for all it bought and could only demand the old rate for the rides it had to sell. We all know how Milwaukee, Cleveland, Detroit, Indianapolis or San Francisco would look on a proposition to permit their respective street railways to charge a 10-cent fare.

The problem of paying the company's gold bonds would interest the officers and stockholders and cause them many sleepless nights, but the employes would suffer even more. The nominal sum available for wages, by far the largest item in the cost of operation, would be reduced because of the appreciation of materials and sup-

plies, and its purchasing power would be decreased. The street railway employe would surely suffer in two ways—he would be paid nominally less than at present and what he did get would be worth less in proportion than it now is. For these reasons we say that the great issue of the coming campaign as far as street railway men—from the president down to the track greaser—are concerned, is the silver question.

A few days ago the Democratic party declared its position in the following language:

"We reaffirm and indorse the principles of the national Democratic platform adopted at Chicago in 1896, and we reiterate the demand of that platform for an American financial system, made by the American people for themselves, which shall restore and maintain a bimetallic price level, and as part of such system the immediate restoration of the free and unlimited coinage of silver and gold at the present legal ratio of 16 to 1, without waiting for the aid or consent of any other nation."

The foregoing might be considered ridiculous were the advocates of these principles not in so deadly earnest. The silver plank quoted may be considered a symptom of the disease; the cause is hinted at in the following extract from an address delivered at Stevens Institute in 1898 by Col. H. G. Prout:

"For more than a century we have been taught that a capacity to do things fell upon us like a mantle with the Declaration of Independence, that the American does not need to be trained or disciplined to rule a nation, command an army, edit a paper or preach the gospel. * * * * This provincial conceit, born of ignorance and nursed by wrong teaching, is the greatest peril of the republic. If it is not restrained and cured it will ruin us.

"The Kansas farmer sits on his fence and spits and thinks and produces a system of finance, and his neighbors gather around, ignorant that the same thing has been tried and failed over and over again in the last five thousand years, and they shout, 'Behold the Kansas idea; behold the great American idea;' and they proceed to ruin the credit of the State, and one result is Bryanism."

After 56 days an agreement was concluded between the St. Louis Transit Co. and its former employes on July 2d which terminated the strike, but the settlement thus effected was only permitted to stand for a week and on July 9th the strike and boycott were renewed, but with no prospect of success as we go to press.

The agreement of July 2d was short, consisting of but six sections. The first section provided that the agreement made March 10th, last, and abrogated by the employes on May 4th, was to be continued in effect. The agreement of March 10th was that men who may have been discharged solely because they were members of the employes' union should be reinstated; that 10 hours, completed within 12 consecutive hours, should constitute a day's work, to be paid for at a uniform rate of 20 cents per hour; that men required to report at a specified hour should be paid from that time until relieved, those not put on duty receiving half pay until relieved; that shopmen, greasers, etc., shall be paid for overtime.

The last section of the new agreement related to the hiring of men by the company and provided that additional men as needed should be selected from a list of the men in the company's service on May 7th last; the men at work July 2d were not to be interfered with, and persons who had been guilty of any acts of lawlessness or violence were not eligible to this list. The fifth section provided that the company should meet any employe or committee of employes representing themselves, other employes, or an association of employes regarding matters of mutual interest. The other three sections recited that employes should be free to join or refrain from joining any association of employes, and provided that employes who should by threats or officials who should in any manner seek to induce a man to join or refrain from joining the union should be immediately discharged.

This agreement except in so far as it provided for what most persons would call merely a recognition of undisputed rights was nothing more than was secured by the agreement of March 10th. It is interesting to compare it with the demands made on May 4th, which were 26 in number. Four of these were covered by the agreement of March 10th; 7 related to minor questions of arranging work that could easily have been settled without trouble had they been presented separately; 1 provided for the submission of proposed time tables to the union for its approval; and the other 14 made membership in the employes' union compulsory and provided means for enforcing the agreement.

On the face of the agreement, therefore, neither the men nor the company had gained anything, unless the provision that while an employe might not use threats or force, an official might not use any influence whatever, be considered as a victory for organized labor. On the other hand the loss to both parties was enormous. The loss in wages alone to the men on a very conservative estimate amounts to more than \$200,000; the loss in gross receipts by the company is over three-quarters of a million, which means a loss of earnings from operation of over \$300,000. When there are added the cost to the city and county of maintaining order, or rather of trying to maintain order, and the losses suffered by business men, the cost of this strike becomes a matter of millions.

The total net income of the United Railways Co. (the lines operated by the St. Louis Transit Co.) for the year 1899, after deducting interest charges, amounted to only \$267,000. The directors of the company fully appreciated what a strike would mean to the stockholders, but the demands of the men left no choice but a fight and the loss had to be accepted, and it amounted to more than a year's profits.

The second strike—that of July 9th—has been ordered because it was alleged that the company had refused to keep faith as to re-employing the strikers. The company stated that no men other than those on the union's list had been put to work since July 2d, except those who had been contracted for and were virtually employes. This question the company offered to submit to the attorney for the strikers. Notwithstanding the protestations of the company that it had lived up to the agreement in spirit and letter, the strike and boycott were renewed.

The controversy having been thus unfortunately renewed, it is to be hoped that there will be no repetition of the disorder and violence accompanying the first strike.

A FEW HINTS ON CREATING PLEASURE TRAFFIC.

By J. W. Pickens, Excursion Agent, Columbus (O.), Ry. Co.

In conducting a successful street railway pleasure resort I do not think the manager should depend upon the population along his line alone for patronage, but he should endeavor to make his park draw from towns within a radius of 50 miles or even more. An excellent way to do this is to engage a man who has had experience in the railroad business and have him visit the surrounding towns and cities, calling on the secretaries of societies, superintendents of Sunday schools and other persons apt to be interested in giving picnics and outings, explaining to them the advantages of your park and booking their excursions wherever possible. The terms you can make will of course vary with different conditions. If the excursion is going to give you a large crowd that will patronize the street cars you can afford to give the use of your grounds free, but oftentimes societies will be glad to pay a reasonable amount for certain exclusive privileges at the park. A good scheme is to quote a lump sum for the grounds and for transporting a definite number of people in special cars from a railroad depot or other central point to the park and return. The Columbus Railway Co. is able to offer special inducements to out-of-town parties by an arrangement with the various steam railroads centering in Columbus, whereby special excursion rates are given to all fraternal orders, Sunday schools, churches and parties desiring to have an outing at either of our two parks.

It is best to have your traveling agent take the road not later than January 1st, and by the time of the opening of your resort he should have considerable business booked for the season. A great many managers make the mistake of opening their parks too early. Parks should not be opened before the first or middle of June, as the weather is not usually settled before that time, and a week of bad weather at the start is very discouraging.

In advertising for excursion business, illustrated booklets, setting forth the beauties of the park can be used with excellent results, but in getting out a book do not fill it with miscellaneous advertising matter. I have seen fine pamphlets in which the park illustrations were completely lost by reason of the number of advertising pages included. Of course, if you want to make your pamphlet earn money from the advertisements you can obtain for it, well and good, but if your idea is to advertise your park, then devote the book to the park, with possibly a few pages of local advertisements at the back to help pay the cost of cuts and printing. If you only

have 10 or 12 cuts, it is best to make your book of the size alone than to have 48 pages with twice the number of cuts, and fill the rest of the pamphlet with advertising matter.

Our attraction consist of a casino, merry-go-round, dancing pavilion, baby rack, cane rack, knife rack, bowling alleys and a toboggan slide. Our slide last year earned \$33 per day for three months. The cost for bath house, slide, toboggan and bathing suits was \$1,100.

Great care should be taken in the selection of attraction for the casino. I have found that vaudeville performances are the most profitable drawing cards I can obtain. Light opera will pay in a city of 200,000 population or over, but for summer resorts near small cities and towns vaudeville will prove the better investment. In order to conduct a park properly, and cater to the largest number of people, intoxicating liquors should not be permitted on the grounds.

NO STRIKE AT CINCINNATI.

After several conferences, the Cincinnati Street Railway Co. and its employes last month reached an agreement on all questions in dispute between them, and in view of the many strikes and boycotts that have been declared by street railway employes' unions during the past few weeks it is a pleasure to record this instance where a spirit of frankness and good will on the part of the company has been met with a like spirit on the side of the employes, and as a consequence, questions that threatened serious disturbances have been settled to the satisfaction of all concerned without straining the relations existing between the two parties.

Considerable dissatisfaction has of late arisen among the employes of the Cincinnati company, but the men decided against taking violent measures and to bring the questions at issue before the company, with the understanding that they did not desire to strike, but wished to have the points discussed and an amicable adjustment reached. President Kilgour courteously received his men and told them it had always been the policy of the company to do everything in its power for its conductors and motormen in the matter of compensation and lightening the burdens of their services, to an extent not inconsistent with the obligations and interests of the company. He then pointed out the injustice of one or two of the demands, but promised to give the matter the fullest attention. On June 9th he issued a long letter, of which the following is an abstract:

The Cincinnati Street Railway Co., after carefully looking over its business for the past fiscal year, terminating June 30, 1900, and comparing it with the year 1899, is satisfied that it can in justice to all parties in interest make an increase to its conductors and motormen in the matter of compensation. This increase will be in the form of a reduction of time of the working hours. Whereas heretofore and at the present the working hours have been 12 hours per day and compensation 16 2-3 cents per hour, with relief in the middle of the day for dinner and in the evening for supper, hereafter, the number of hours will be reduced to 10 1/2 hours, making the compensation 19 cents per hour. This will necessitate engaging 300 additional men to maintain the present service.

The company also modified its rules so as to permit employes to ride free on the cars when not in uniform by showing their badges. In addition to these changes it is said the company promised to arrange a system whereby employes will be paid a regular dividend on an amount equal to their annual wages at the same rate as the stockholders receive on their stock.

Shortly after the letter was issued President Kilgour received an appropriate testimonial from the men as an expression of their appreciation of his efforts in their behalf.

NEW ROAD IN COLORADO.

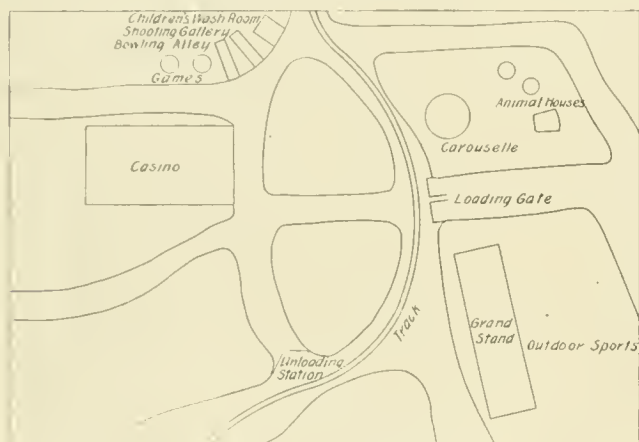
Mr. Thomas Carlon, of Denver, gives us the following information concerning the proposed Leadville (Col.) Street Ry.: It is the intention to connect Leadville with Stringtown, Bucktown, Malta and a noted pleasure resort at Evergreen Lakes; a good service will also be maintained in the city of Leadville. The road as now contemplated will be about eight miles long but will be extended later. A company will be incorporated in July and it is hoped to commence construction work by August 1st. Mr. Carlon's Denver address is No. 2737 Decatur St.

PARK ATTRACTIONS AT NASHVILLE, TENN.

The Nashville Street Ry leases 50 acres of fine park property situated seven miles out on one of its lines, and the company has gone extensively into the park attraction business, this department being under the supervision of a special manager, who engages all the vaudeville and musical attractions, and arranges special features for special occasions. The company does not deal with theatrical agencies exclusively, but advertises for and makes terms with suitable independent attractions wherever they can be found.

The resort, which is known as Glendale Park, is laid out as shown in the accompanying diagram. It contains a large two story casino, in which is a restaurant, a theater having seating capacity for 1,000, ice cream parlor, soda water fountain, etc. There are also ball grounds with grand stand which will seat 2,000, a carousel pavilion, a small zoo, shooting galleries and other side issues. Flower beds, rustic benches, shady walks, swings and good drinking water at convenient places add to the general attractiveness of the place.

The company engages for the season a brass band of 14 pieces, which gives free concerts every afternoon and evening, and an orchestra of 10 pieces for the vaudeville performances, which are given every evening, with matinees Tuesday, Thursday and Satur-



OUTLINE PLAN OF PARK.

day afternoons. The vaudeville attractions are changed at frequent intervals. Prices for reserved seats in the evening are 10, 20 and 30 cents, and for the matinee 10 and 20 cents. A number of free outdoor attractions are also given through the season, these consisting of high tight rope and trapeze acts, balloon ascensions, etc. The summer season opened April 15th and closes October 15th. The carousel was made by G. A. Dentzel, of Philadelphia, and has proved one of the best paying investments at the resort.

All correspondence in connection with the park and theater is written on special letter-heads, at the top of which appear the words in red ink, "Glendale Park," and just below in black ink are two or three lines describing the place. Down one side of the stationery is printed in display type the following notice, which gives an idea of the rules under which attractions are engaged:

"All parties contracting to play at this park are required to send billing and photos 10 days in advance. If this is not done you will consider your contract canceled.

"If you are in doubt of coming, do not write for time, as there are others who will be glad to come.

"Number of photos required—Enough for two frames, also lithos, etc., if you have them.

"If your act is not up-to-date you will be closed after the first performance, without pay."

The company operates a double track line to within one mile of the park, where the tracks separate into a large loop, on which the resort is situated, this arrangement giving excellent facilities for handling large crowds, as there is no delay in switching cars or turning the trolley pole. Mr. Yeatman C. Alley is manager of the park.

Mr. E. L. Sternberger and others of Jackson, O., are endeavoring to lease the bank of the Toledo canal, on which they propose to build an electric railway.

COPPER SAVING BY THE JOINT TRANSMISSION OF DIRECT AND ALTERNATING CURRENT.

Dr. Frederick Bedell presented a paper at the New York meeting of the American Association for the Advancement of Science, June 26th to 30th, in which he discussed the question of systems for the joint transmission of direct and alternating currents from the point of view of copper saving. The author states that no engineering obstacles arise to detract from the practicability and desirability of such a system. The requirement is a system of line distribution whereby independent alternating current and direct current generators may supply current to independent alternating and direct current apparatus, the alternating and direct currents being independent in their generation and utilization, and combined in their transmission.

That the two unlike currents may be transmitted over the same wire and in no wise interfere is thus explained: Suppose we have a direct current of 10 amperes and add thereto an additional ampere of like (direct) current. The whole current is now 11 amperes, which flows with uniform density in the conductor, so that the original current of 10 amperes has only 10/11 of the conductor for its use. An additional current of like kind, therefore, interferes with the original current. Let us now suppose that with an original direct current of 10 amperes, we have an added ampere of alternating current. Half the time this is of the same polarity as the direct current, and increases the current density in the conductor; but half the time the alternating current is opposite in polarity to the direct current, and during this time makes the total flow of current less and the current density less than for the direct current alone. In other words, the additional ampere of direct current interferes all the time with the original direct current; whereas the additional ampere of alternating current acts as a detriment for half the time, and as an assistance for half the time, these two effects tending to cancel.

Each current acts as if it had the whole conductor to itself, and hence the line loss depends on the sum of the squares of the two currents and not on the square of their sum. In a given conductor of resistance equal to R and two unlike currents I and i the losses are $R I^2 + R i^2$. If they were two like currents, the losses would be $R I^2 + 2 R I i + R i^2$.

Dr. Bedell presents tables showing the saving in line drop or in copper, showing that either may be as much as 50 per cent.

The conclusion is that since direct current can be transmitted on the whole more economically jointly with alternating current than separately, it follows that the radius of economic transmission of direct currents can be thus extended.

CONSPIRATORS FOUND GUILTY.

July 2d Alfred R. Goslin, Eugene L. Packer and Charles T. Davis were convicted in the criminal branch of the New York Supreme Court on the charge of conspiring to depress Brooklyn Rapid Transit stock. Henry Bogart, indicted for the same offense, was acquitted. It is alleged that one of the jury was offered a bribe of \$25,000 to hold out and prevent an agreement. The three men found guilty were sentenced on July 3d: Goslin was given six months in jail and a fine of \$500, and Packer and Davis each three months in jail and a fine of \$250.

FREIGHT ON STREET RAILWAYS.

The New York Court of Appeals has affirmed the decision of the Supreme Court rendered over a year ago in the suit brought by Mr. A. A. DeGrauw to prevent the Long Island Electric Railroad Co. from running special cars for freight and express. This is a victory for the railway company, whose plans are to transport freight over the trolley lines of Brooklyn, to and from the warehouses, factories, docks, and the like. The tracks will be used at night for that purpose.

A representative of the company states: "It is contemplated to extend the service over to Greater New York eventually. It is not possible to say when the project will go into operation, but work upon it will be rapidly progressed."

Power Station of the Northwestern Elevated Railroad, Chicago.

The power plant of the Northwestern Elevated Railroad Co., of Chicago, now approaching completion, is the sixth of the great stations for generating electric power which have been built by the Yerkes interests in developing the urban transportation systems of the north and west divisions of the city, and is no exception to the others in embodying the latest and best practice in all that is conducive to economical operation. The original plans for the mechanical features of this station were drawn by the late Mr. Salvador Potis, jr., who also designed the other Yerkes plants; the electrical

boiler rooms are at the same level, and the height from the floor to the bottom of the roof trusses, 38 feet 4½ inches, is the same in both rooms. The basement under the boiler room contains the smoke flues and the blow off piping, and the ash conveying machinery will also be placed there.

The three boiler feed water pumps, which are of the vertical duplex admiralty type made by the Henry R. Worthington Co., are in the basement just west of the stack.

South of the stack in the boiler room are two 2,000 horsepower Berryman feed water heaters; the condenser is between the stack and the partition wall of the building. The exhaust from the feed and air pumps is taken to these heaters, which may be connected in series or in multiple, one or both used, or both cut out.

One of the most interesting features of the boiler installation is the steam header which is shown in plan in Fig. 9. This header consists of six lengths of 28 inch wrought iron lap welded pipe



FIG. 1. EXTERIOR OF STATION.

equipment of the station was designed by Mr. J. R. Chapman, electrical engineer for the Yerkes elevated roads and for the Chicago Union Traction Co., and he has made some changes in the plans as first adopted. The engineer in charge of the work was Mr. Z. E. Knapp.

The building is on Fullerton Ave., near Southport Ave., about 3,000 feet west of the elevated structure and about midway between the two extremities of the line. It is of yellow brick with concrete roof and checkered steel floor. The outside dimensions of the building are 254 feet 10 inches by 112 feet; a longitudinal wall separates the boiler and engine rooms. The basement floor is 9 feet 4 inches below and the coping of the side walls 49 feet 6 inches above the street level. The basement is 12 feet 4 inches high, and extends under the entire building; it is finished in granitoid with a concrete floor. At the south end of the building the basement extends out to the curb line.

The boiler room is 50 feet 2 inches wide inside; it contains 12

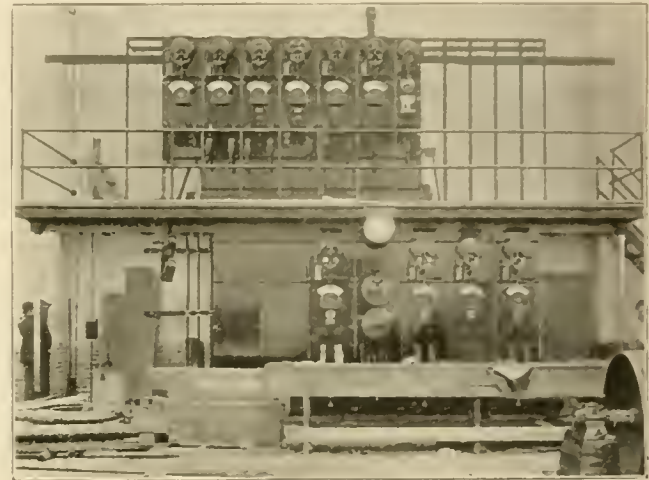


FIG. 2. SWITCHBOARD.

with the flanges welded on; it is divided into three sections each about 50 feet long, and each of these sections is anchored near its middle point as indicated in the drawing.

The space between two sections is about 14 feet and across this is the expansion connection made of four U's of 8-inch steel pipe. The four U's enter a multiple cross-header at each end, and these cross-headers are each connected to the adjacent section of 28-inch pipe by a 16-inch Chapman gate valve. The branches to the engines are 8-inch for the small engine and 12-inch for the large ones. An auxiliary steam header 6 inches in diameter and tapping each

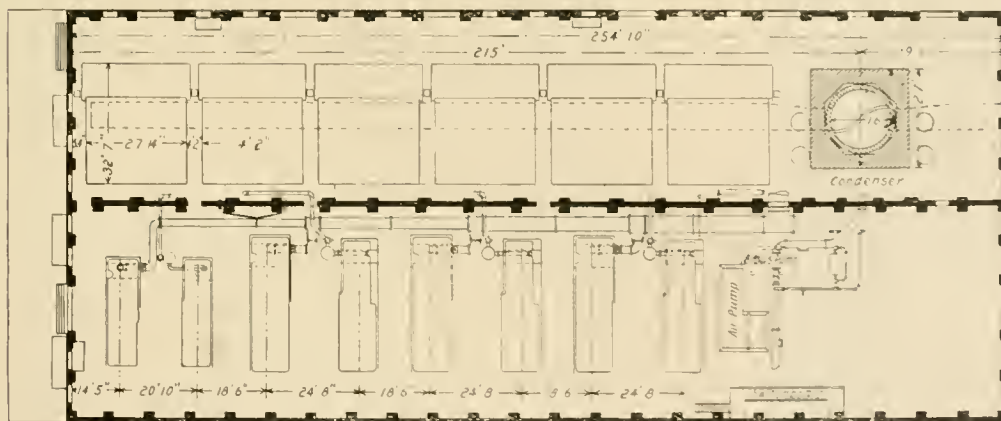


FIG. 3. PLAN AND ELEVATION OF STATION.

Babcock & Wilcox water-tube boilers set in batteries of two, with extended-front Murphy automatic smokeless furnaces. From the furnace front to the west wall is 13 feet, and behind the boilers is a passageway 4 feet 7 inches wide. The floors of the engine and

section of the main header is provided for the auxiliary machinery.

The feed water supply pipes are in duplicate and are carried on top of the boilers. The stems of those valves which are to be used habitually are connected through universal joints to long rods

which extend down to the front of the furnaces where they are within reach of the boiler room attendants.

The flue dampers being at the rear end of the boiler settings, Mr. Chapman designed an ingenious arrangement for manipulating

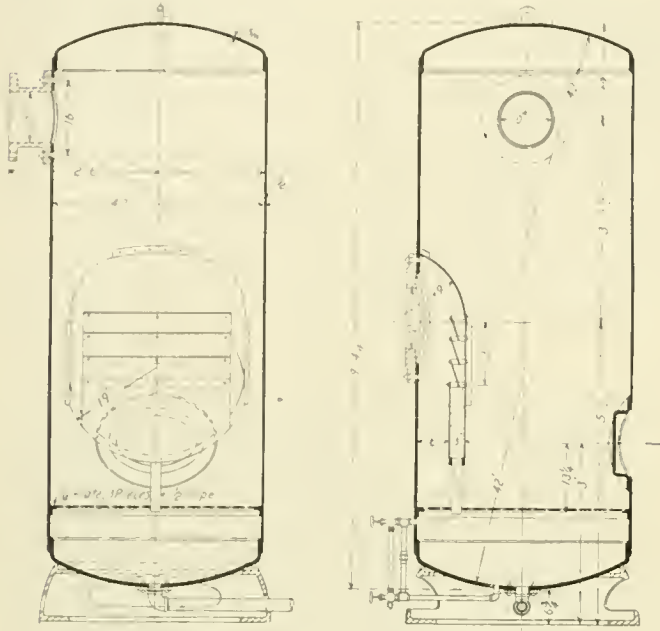


FIG. 4.—SECTIONS OF STEAM SEPARATOR.

them from the furnace front. The damper shaft from each boiler projects through the wall of the setting, and is fitted with a quadrant of gear teeth; meshing with the teeth of the quadrant is a worm, the shaft of which extends through the extended combustion chamber and in front of the boilers terminates in a handwheel.

The center line of the stack is 215 feet from the south wall of the building; when the extension ultimately contemplated is com-

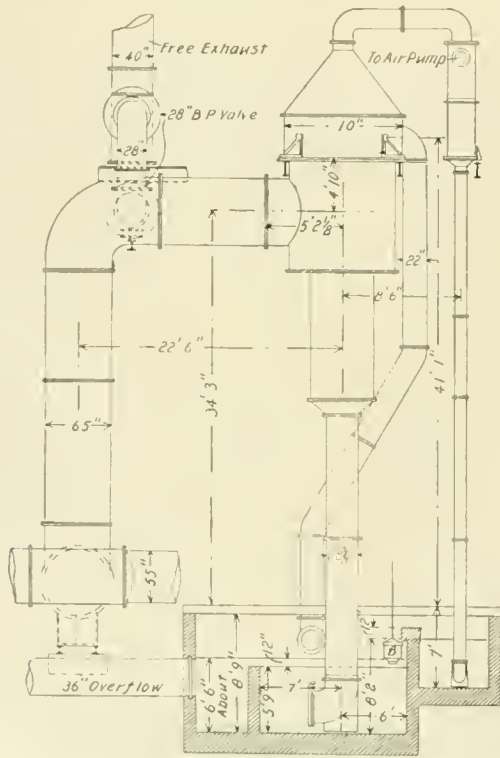


FIG. 5.—ELEVATION OF WEISS CONDENSER.

pleted the building will be 430 feet long, with the stack in the center. The stack is 27 feet square at its base and rests on a foundation of piling, driven 30 inches between centers, on top of which is a concrete footing 31 feet square and 5 feet thick.

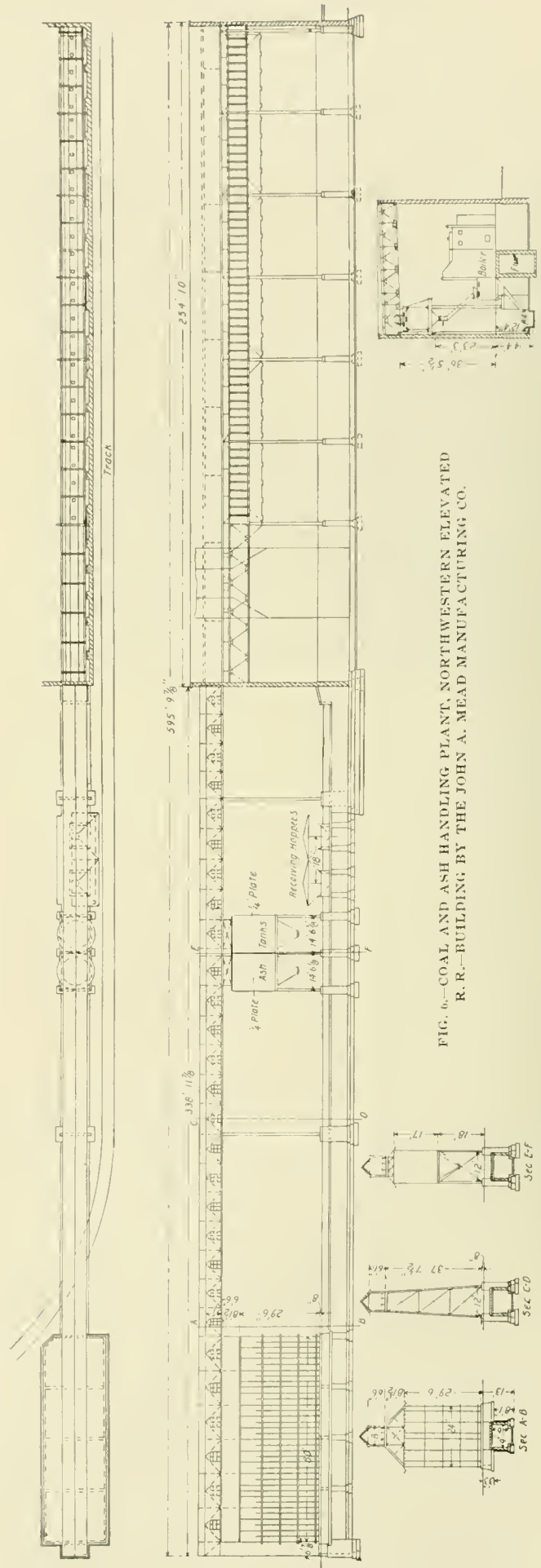


FIG. 6.—COAL AND ASH HANDLING PLANT, NORTHWESTERN ELEVATED R. R.—BUILDING BY THE JOHN A. MEAD MANUFACTURING CO.

At 35 feet above the ground the external outline of the stack becomes octagonal. The thickness of the walls is gradually reduced from 41 inches at the base to 13 inches at the top. The top has a cast iron hood; the internal diameter at the top is 16 feet and the short diameter of the external octagon 21 feet 3 inches. The total height of the stack above the street level is 203 feet and from the

forated plate which prevents the current of steam from coming in direct contact with the water accumulated in the separator. This horizontal plate is of $\frac{1}{4}$ inch steel in three pieces, and perforated with 120 holes $\frac{1}{8}$ inch in diameter; it is 16 inches from the bottom of the separator. The exit to the engine is a 10 inch pipe located with its center 19 inches from the top of the separator.

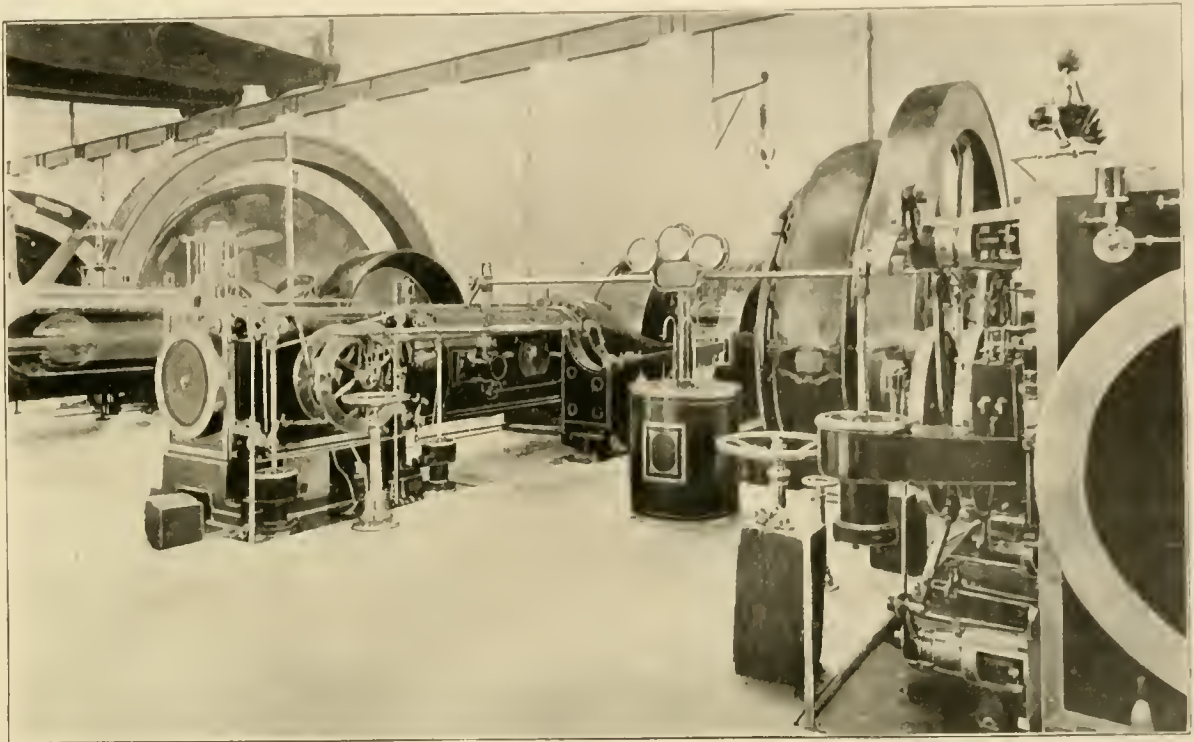


FIG. 7.—ALLIS-CORLISS ENGINE WITH 1,500-KW. SIEMENS-HALSKE GENERATOR.

bottom of the smoke flue is 217 feet 6 inches. For the first 110 feet there is an inner shaft of fire brick, 16 feet internal diameter, and decreasing in thickness from 17 inches at the base to 9 inches near the top. A curved partition wall divides the stack for the first 20 feet; the flue inlet is 16 feet high by 4 feet wide.

The building as it now is contains room for five units, one of 750 kw. and four of 1,500 kw. capacity. Only three of the large units are now installed. The engines were all built by the E. P. Allis Co., of Milwaukee, and are of the cross compound condensing corliss type direct connected to Siemens & Halske generators. The engine room is 57 feet 7 inches wide by 250 feet long.

The large engines have cylinders 30 and 60 inches by 60-inch stroke, and are designed to run at 75 r. p. m. The center lines of the high and low pressure engines are 24 feet 8 inches apart; the fly-wheel is 25 feet in diameter. Each engine has two governors; one regulates the working cut-off in both cylinders and the other trips a safety cut-off valve when a safe speed is exceeded.

The smaller engine has cylinders 23 and 46-inches by 48-inch stroke and runs at 80 r. p. m. The fly-wheel for this engine is 20 feet in diameter.

The shafts for these engines were made by the Bethlehem Steel Co. and are of fluid compressed open-hearth steel hollow-forged over a mandrel. For the large engines the shafts are 28 inches in diameter at the fly-wheel and 22 inches at the bearings; the axial hole is 8 inches in diameter.

In Fig. 4 are shown two vertical sections of the separator for one of the large engines. The shell is of $\frac{1}{2}$ -inch steel, 42 inches inside diameter, and the heads are of 5-8-inch flange steel bent to a spherical surface of 42-inch radius. The length of the separator over the head is 9 feet 4 $\frac{1}{2}$ inches; it is supported on a castiron base, which brings the top 9 feet 11 inches above the floor. The longitudinal seam of the shell is a double strap, double-riveted butt joint with $\frac{7}{8}$ -inch rivets 4 inches on centers; the transverse joints are single riveted. All rivet holes are drilled. The steam enters the separator at one side at a point 53 $\frac{1}{4}$ inches below the center and impinges on a shield in front of which are battle plates arranged as shown in the drawing. The pocket at the lower part of the shield is provided with a pipe to carry the intercepted water below the per-

The receiver and separator for each unit are located in the basement between the foundations of the high and the low pressure engines, and this permits all of the piping, both steam and exhaust to be placed under the engine room floor and arranged compactly. Fig. 4 shows the piping for engine No. 2. It will be noted that the supply pipe, 12 inches in diameter, as brought from the boiler room

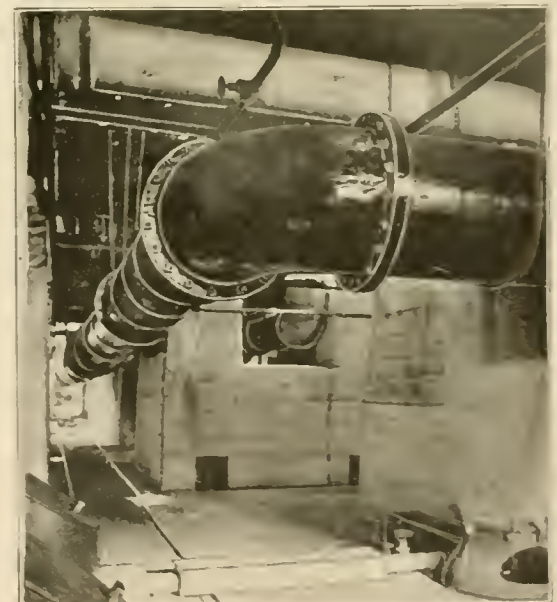


FIG. 8.—BASEMENT OF ENGINE ROOM.

is about 5 feet above the inlet to the separator, and in the vertical section is a safety stop valve; this valve is of the sector type, similar to the corliss engine valve, and is normally open with the operating lever weighted. It is held in this position by a pawl con-

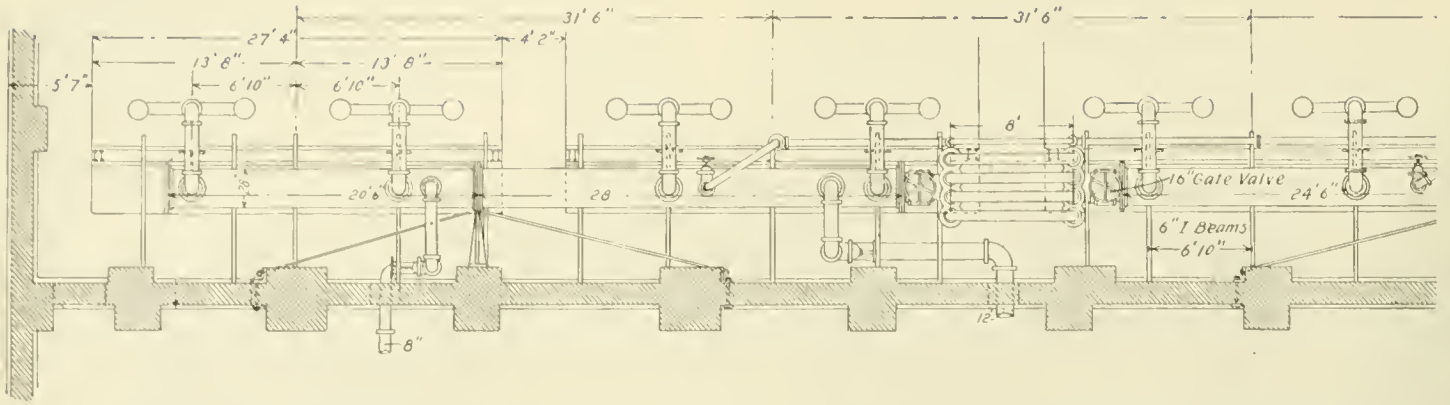


FIG. 9. PLAN OF STEAM HEADER

nected to a slow-running governor on the engine; when the engine speed rises above the maximum limit as set, the pawl releases and the suspended weight closes the valve by gravity.

The receiver is 61 inches in diameter and 10 feet 6 inches high. The 14-inch exhaust from the high pressure cylinder and the 20-inch supply to the low pressure cylinder open into the receiver 2 feet 6 inches from the top. The exhaust pipe from the low pressure cylinder is 22 inches until it is clear of the engine foundation and a 22-inch Wainwright joint 2 feet 6 inches long; thence it is 28 inches in diameter to the exhaust main. The live steam lines are all extra heavy lap-welded wrought iron pipe and the exhaust piping of cast iron. The live steam valves are extra heavy-ribbed, bronze-seated gate valves of the Chapman make. The working pressure is 100 pounds.

the Southwark Foundry & Machine Co. and is large enough to take care of the ultimate capacity of the plant, 14,000 h. p. It is very interesting to know that the installation of this central condenser instead of the independent condenser first contemplated made a saving of over \$10,000 in the cost of the piping and enabled the building to be made about 30 feet shorter.

The auxiliary machinery at present installed is for 7,000 h. p. of engines only. It consists of a steam engine driving the air pump tandem and belted to the circulating pump, the latter being in the basement. The air pump is an air compressor of improved type, with a Weiss positive slide valve, and works free from water, the intake of the pump being from the top of the condenser. The circulating pump is of the Bibus rotary type and handles only the cold injection water.

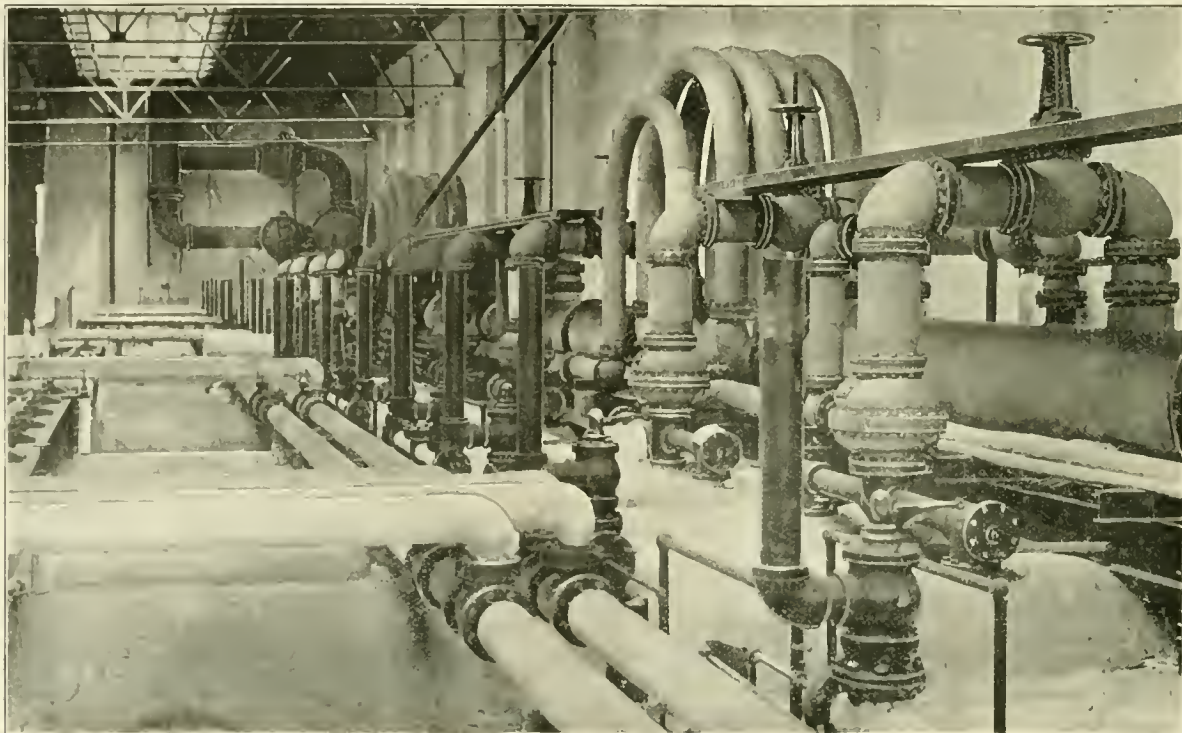
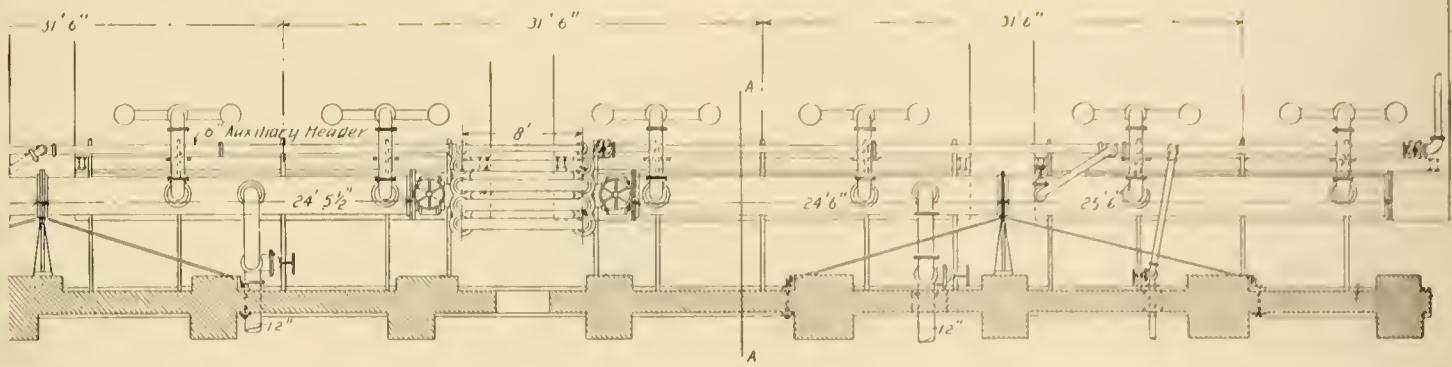


FIG. 11. STEAM HEADERS AND FEED PIPING.

The city of Chicago has a 12-foot brick tunnel in Fullerton Ave., through which water is drawn from the lake to flush the north branch of the Chicago River, and the company has arranged to take its supply of condensing water from this tunnel. The intake is a 30-inch pipe, which is carried along the east wall of the building, just below the level of the basement floor; the return to the tunnel is a 36-inch pipe along the longitudinal partition wall of the building, also below the basement floor. The original design of this station contemplated the use of a separate condenser for each engine, but this was changed and a central condenser of the Weiss counter-current type was installed. This condenser was built by

Fig. 5 shows the Weiss condenser in elevation. The exhaust main, which is in the basement of the engine room between the engine foundations and the dividing wall, increases in size from 22 inches for the small engine to 55 inches after passing the fourth one, and joins an immense elbow in which the openings are 65 inches in diameter. The vertical 65-inch pipe is carried up and opens into the enlarged head of the condenser 10 feet in diameter; from this head a pipe extends down to near the bottom of the hot well, and constitutes a water leg or barometric tube. The condensing water is handled by the Bibus pump and delivered to the condenser through a 22-inch pipe at a point about 6 feet above the steam inlet.



NORTHWESTERN ELEVATED STATION.

From the top of the condenser a pipe is taken and carried down to the bottom of a smaller well, where it opens under water, forming a second barometric tube. Near the top of this smaller barometric tube is placed a separator, from which a 9-inch suction pipe leads to the air pump.

A small pipe connecting the main condenser vessel with the small barometric tube insures, at all times, a sufficient quantity of water in the small auxiliary hot well to seal the tube. The water from

tenant adjusts the quantity of injection to meet the increased demands, and all without a total loss of vacuum.

Two 28-inch pipes, with a Blake back-pressure valve in each, connect the 65-inch exhaust riser to a 40-inch free exhaust pipe opening above the roof. The boiler feed is drawn from the condenser hot-well at practically the same temperature as the exhaust steam entering the condenser

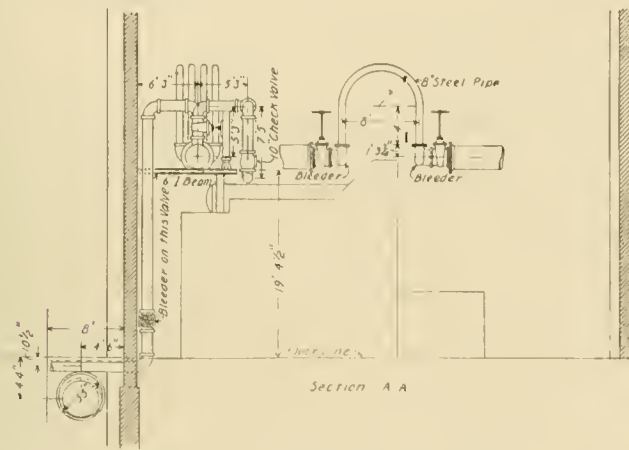


FIG. 10.—SECTION OF STEAM HEADER.

the auxiliary hot well flows over a weir into a bucket (marked B in the drawing), the latter having a hole in the bottom which allows the normal flow to escape. But in the event of a sudden and heavy overload, when the supply of water has been adjusted for a light load, causing the temperature of the discharge to reach the boiling point, an abnormal quantity flows over and down the small barometric tube filling the bucket, thus by the increased weight opening a free air valve into the condenser. This reduces the vacuum to just below the boiling point, and maintains it there until the at-

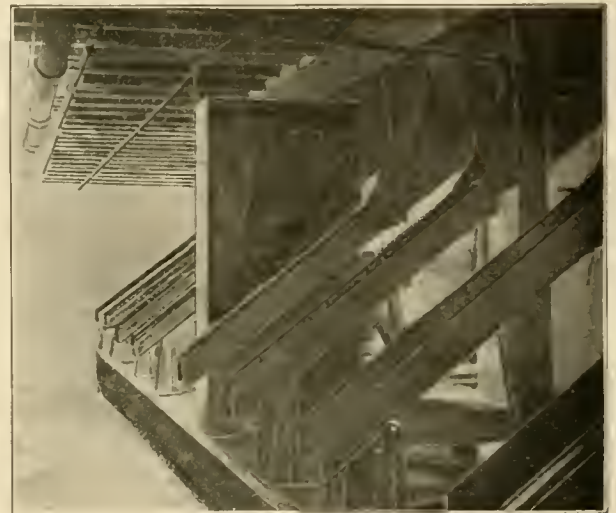


FIG. 12.—BASEMENT OF BOILER ROOM.

The advantages claimed for the Weiss central condenser, aside from the simplification in the piping and economy of room already mentioned, are the less power required to drive the machinery, the less amount of cooling water (one-half to two-thirds) required as compared with the ordinary jet condenser, the lesser head on the circulating pump, and the higher temperature of the hot-well.

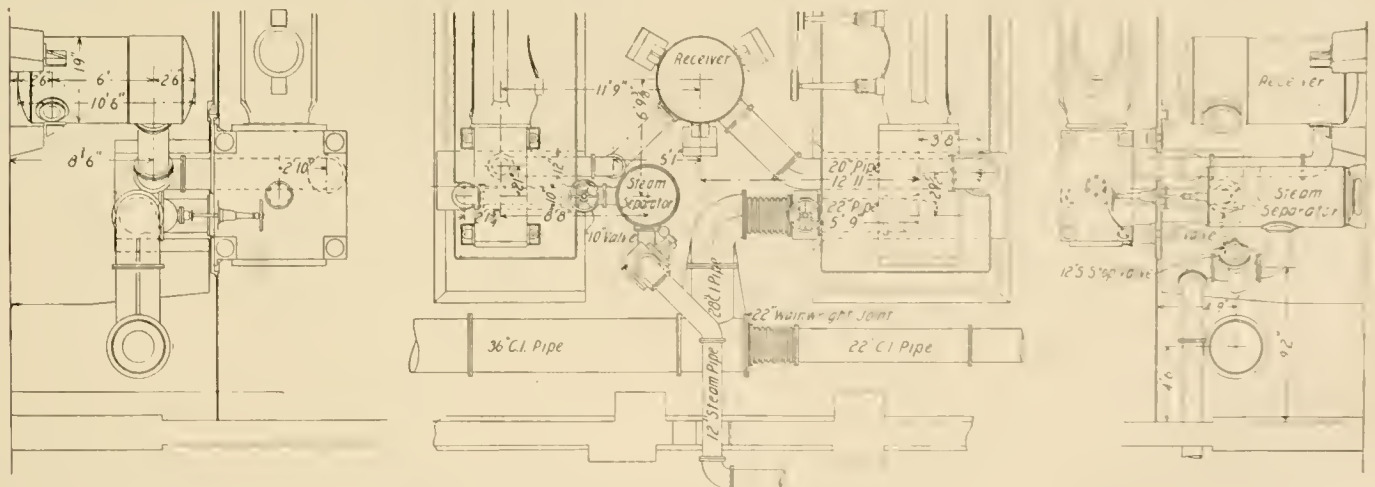


FIG. 13.—PLAN AND ELEVATIONS OF ENGINE PIPING.

Since the supply of injection water is constant and independent of the vacuum, a sudden increase of load or a leak does not act to reduce the vacuum when it is most needed, and hence the condenser is very reliable in its action.

The station has been in partial operation since June 1st and the

opposite the stack. It is built in two decks, the station panels being placed below and the feeder panels above. The construction of the switchboard is apparent from Fig. 14, and Fig. 15 shows the arrangement of the panels, and Fig. 16 the details of a feeder panel.

As arranged at present, current from three of the generators

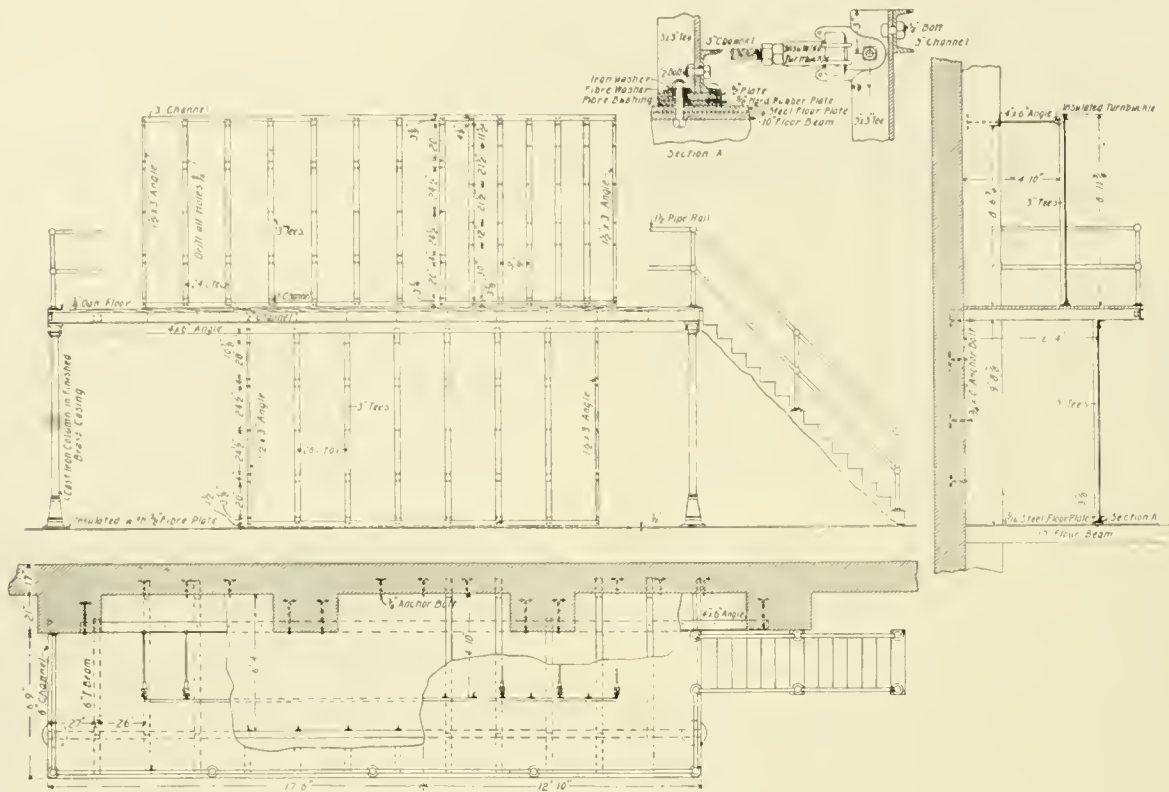


FIG. 14.—SWITCHBOARD.

performance of the condenser has been all that could be desired; the temperature of the exhaust has been between 115 and 118 degrees F.

In addition to the live steam and exhaust piping and the engine separators and receivers, the engine room basement also contains the electric cables to and from the switchboard. These are placed overhead along the east wall of the building. Turner oil filters and pumps for forcing the oil to the engines are also in the engine room basement. For feeding cylinder oil an oil pump, made by

passes through the upper of the two Thomson wattmeters and that from the fourth unit through the lower one. On the feeder board an extra or emergency panel has been provided; it is the one immediately over the wattmeter panel of the lower board. An auxiliary bus bar (the upper one in Fig. 15) connects all the feeder panels, including the emergency one; the regular feeder panels have two single throw switches, one for connecting to the station bus and one for connecting to the auxiliary bus, and the emergency panel but one switch. In event of an accident to the circuit breaker or

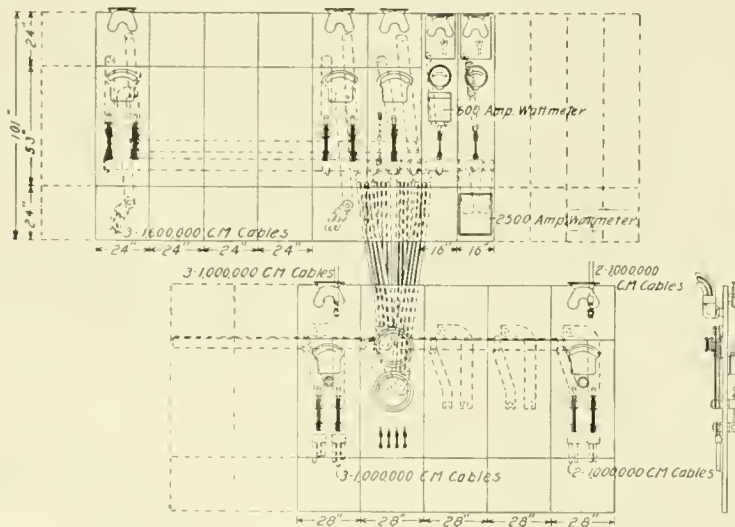


FIG. 15.—ELEVATION OF SWITCHBOARD.

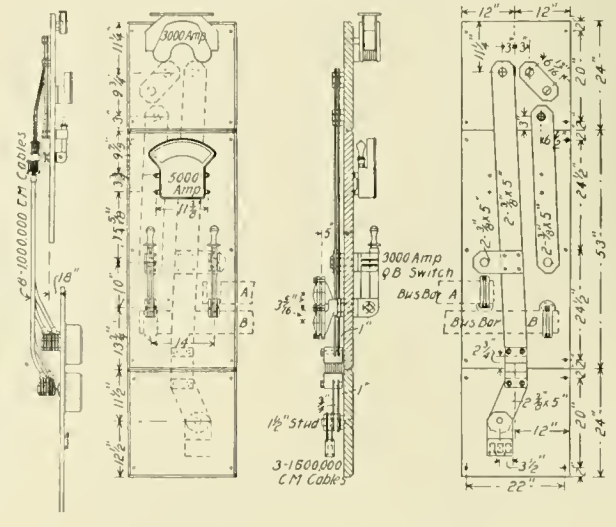


FIG. 16.—DETAILS OF SPARE FEEDER PANEL.

the Phoenix Metallic Packing Co., is attached to each of the low pressure engine cylinders and is driven from the reciprocating parts of the engine; sight feed lubricators of the usual type are used on the high pressure engines.

The switchboard is located along the east wall of the engine room

other apparatus the panel affected is disconnected from the main bus, connected to the auxiliary, and the switch on the emergency panel thrown in. General Electric circuit breakers, Thomson wattmeters, and Weston ammeters and voltmeters are used.

The company has contracted with the John A. Mead Manufactur-

ing Co., of New York, for the construction of a complete coal and ash conveying plant, which will not be completed for some months yet. Temporarily the coal is wheeled into the building on a wooden platform built in front of the furnace and level with the tops of the hoppers.

The lot owned by the company is 595 feet 10 inches long, and the present building 254 feet 10 inches. The coal-storage building is 24x80 feet, 29 feet 6 inches high at the eaves and 46 feet 7½ inches at the ridge, and is at the extreme north edge of the lot. This storage building is to be connected with the boiler room by an overhead passage way for the conveyors and by a tunnel. The overhead way is 38 feet 3½ inches above the ground, and its internal dimensions are 6 feet 6 inches by 8 feet; the tunnel is 6x9 feet inside and the foundations are 14 feet 6 inches below grade.

About 50 feet north of the power station are located the receiving hoppers into which the coal is unloaded directly from the freight cars. Just north of these are two ash tanks which can be discharged into cars or wagons. The coal crushing machinery is at the hoppers and from here conveyors take the coal to the elevator at the north end of the storage building, and thence to storage hoppers, or to the bunkers in the boiler room. Ashes are taken by a conveyor from the basement of the boiler room up and around and finally dumped in the steel ash tanks.

The capacity of the conveying system is 50 tons per hour. The coal storage building holds 1,500 tons and the bunkers in the boiler room hold 300 tons.

The chief engineer of the station is Mr. John Wright.

THE ST. LOUIS STRIKE.

After fifty-six days of lawlessness and riot the St. Louis street railway strike, in many respects one of the greatest clashes that has ever occurred between capital and labor, was formally declared off on July 2nd, when representatives of the company and the executive committee of the employes union signed the following agreement:

1. The provisions of the agreement of March 10, 1900, as to rates of pay and hours of service will be continued in force by the company.

2. Every employe of the company to be free to join or not to join any organization, and no discrimination to be made for or against him because of the manner in which he exercises his freedom.

3. Any attempt on the part of any employe to induce another employe by intimidation or threats to join or not to join any union shall be cause for the immediate discharge of the person guilty of such attempt.

4. Any attempt to influence any employe by an official of the company to join or not to join any union shall be cause for the discharge of such official.

5. The company will meet any employe or committee of employes, whether representing themselves, other employes or an association of employes, regarding any matter of mutual interest.

6. For the purpose of filling vacancies which may now exist or hereafter arise, the committee of former employes, of which T. B. Edwards is chairman, shall prepare a list of the men who were in the company's service, May 7 last, and as the company now or hereafter needs additional men it will select them exclusively from this list until it is exhausted, not interfering, however, with men now in the service. No person shall be eligible to this list who has been guilty of any acts of lawlessness or violence.

In the two preceding issues of the Review will be found an account of the causes of the strike and the principal events occurring in connection with it up to June 13th. For the purpose of making the record complete we give herewith a summary of events after that date.

June 14. There were no disturbances of any kind during the day or night. All divisions in the city were operated on regular schedules and save for the presence of members of the sheriff's posse comitatus at the car barns and power stations there was very little outward evidence that a strike was in progress. A coroner's jury brought a verdict of homicide against a member of the posse who had shot and killed a rioter on June 10th. The deputy sheriff was not arrested, however.

June 15. No rioting took place. The strikers submitted a new agreement to the company as a basis of settlement of the controversy. The sheriff continued to add new members to his posse.

June 16. President Whitaker, replying to the proposition submitted by the strikers on the 15th, stated he could not accept the suggestion to arbitrate the matter of the reinstatement of former employes as the company intended to keep faith with its new men and retain them in the places assigned them. There were no serious disturbances during the day.

June 17. A car on Euclid Ave. was slightly damaged by an explosion of dynamite and a woman was roughly handled by a mob of shop girls for riding on a car.

June 18. General Manager Baumhoff stated that many applications for reinstatement had been received from strikers, and he was taking the old men back at the rate of fifteen or twenty a day. Both day and night cars were running on former schedules without police protection. A few slight outbreaks occurred in various parts of the city, but none of them were serious. Judge Spencer rendered an important opinion, holding that all persons convicted of placing obstructions on the street railway tracks during the present strike came under the provisions of the state law making the penalty for obstructing the operation of a "railroad," imprisonment in the penitentiary for a term not exceeding twenty years.

June 19. The situation remained practically unchanged; Governor Stephens in an interview stated that the backbone of the strike had been broken.

June 20. The day passed without event worthy of record, all cars running as usual, although not carrying as many passengers as they had before the strike.

June 21. The situation continued as on previous days. The sheriff granted furloughs of two days to several of the companies in his posse, which at this time numbered about 1,500 citizens.

June 22. The board of police commissioners decided that the posse comitatus should be reduced to 500 men, but special provision was made for recalling 1,000 of the deputy sheriffs for special duty on July 4th, if necessary, as it was feared the general discharge of firearms and fireworks on that day might occasion acts of violence.

June 25. A temporary injunction was issued against the strike leaders restraining them from interfering with the operation of United States mail cars on any of the lines of the St. Louis Transit Co.

From this time on until the end of the strike there was very little of importance to record. Small outbreaks occurred more or less frequently, but were quickly quelled by the police or special deputies. Occasionally a wire was cut or a torpedo exploded under a car, but the men evidently had begun to realize the hopelessness of forcing the Transit company into granting their unjust demands, and were only waiting an opportunity to obtain their old jobs on the best terms they could make. An attempt was made to institute a general boycott against the company, but this was practically a failure from the start.

July 9th the strike and boycott were renewed, it being alleged that the company had taken on new men in violation of section 6 of the agreement. The company replied that all the new men complained of had been contracted for prior to July 2d and were virtually employes at that time; it was offered to leave this question to the attorney for the men.

Reports indicate that neither the strike nor the boycott will prove successful. On July 12th officials of the company stated that so far as it was concerned there was no strike, and traffic on the cars was increasing daily.

A new electric railway between Quebec, Can., and La Bonne Ste. Anne was opened June 27th.

A new and extensive system of transfers has been put into effect by the United Railways & Electric Co., of Baltimore, in order to comply with a recent act of the General Assembly requiring the company to carry a passenger from any point on its system to any other point within the city limits for a 5-cent fare.

The inventor of a new car fender offered to prove to the officials of the Camden (N. J.) & Suburban Railway Co., the value of his device by standing in front of a car fitted with it, and letting it pick him up while the car was going at high speed. The officials succeeded in persuading him to try it on a dummy instead and at the first test the dummy was ground to pieces under the wheels of the car.

The English Tramway Exhibit.

AS SEEN BY A MEMBER OF THE "REVIEW" STAFF.

First Exhibit of its Kind Abroad—A Splendid Success—Fine Displays Well Arranged—Large Attendance of Tramway Officials—American Exhibitors Praised for Enterprise.

The International Tramways & Light Railways Exhibition, the first ever held in Europe, was formally opened at the Royal Agricultural Hall, London, June 22nd, and will close July 4th. It was the first occasion on which municipal and private tramway interests have cordially co-operated toward a mutually desirable object, and it is expected that the informal meetings of leading officials of municipal tramway committees and companies, which have taken place during this exhibition, will do something to smooth the path of tramway progress in Britain.

England is on the verge of a complete tramway conversion. London to-day is the most backward in its tramway system—the omnibus and little "bob" horse car being the typical Londoners' ideal mode of travel—but scarcely will the doors of this exhibition

way men, who have not "missed a meeting in the past ten years," agree that this London exhibition of tramway equipment is the largest and most complete ever held.

The exhibition was open for private view June 22d, when it was declared formally opened by W. H. Dickinson, Esq., chairman of the London County Council, in the presence of 300 guests of the management, the patrons of the enterprise and many members of various city corporations; a very dainty luncheon was served and much speechmaking indulged in. One hundred and eighty-five guests sat down to the beautifully decorated tables. Among the American visitors present were: Harold P. Brown, New York, of the Edison-Brown Plastic Rail Bond Co.; W. J. Clark and Mr. Rice, New York, General Electric Co.; D. C. Warren, Chicago,



INTERNATIONAL TRAMWAYS AND LIGHT RAILWAYS EXHIBITION, LONDON.

have closed before the new installation of the London United Tramways Co., of which Mr. J. Clifton Robinson is managing director, will be put in operation on the West London lines.

In reviewing the different exhibits that were displayed the visitor, if he were acquainted with the origin of various tramway materials, would certainly be impressed by the predominance of the American product and ideas. Many American manufacturers have come forward with large and creditable displays, indicating that they are well aware of the immense future business to be obtained in this market.

The Tramway Exhibition was conceived, promoted, and managed by the owners of the Tramway and Railway World, of London, to whom great credit should be given. Many old street rail-

"Street Railway Review;" W. A. Parker, Milwaukee, Christensen Engineering Co.; Geo. A. Harwood, Mansfield, Ohio, Ohio Brass Co.; F. C. Green, Albany, N. Y., Consolidated Car Heating Co.; E. P. Thomas, Lorain (O.) Steel Co.; G. W. Wallaston, Jersey City, N. J., Dixon Crucible Co., and J. G. White, New York.

Mayors and other officials of large English cities and representatives of the army and navy were present in large numbers.

As the list of exhibitors and description of the hall were published in the "Review" for April, they will not be repeated here; suffice to say the display was extremely gratifying to all concerned, and will doubtless become an annual feature in English traction events. There were 91 exhibits, some of which were even larger than any seen at the conventions of the American Street Railway

Association. One company is credited with having spent \$30,000 on its exhibit. The illustrations tell how complete and attractive many of the displays are.

Agricultural Hall was ample for all requirements, and allowed a liberal space for each company's display. The British Westinghouse Co. has the largest exhibit, followed closely by Dick, Kerr & Co., the British Thomson-Houston Co., R. W. Blackwell & Co., the J. G. Brill Co., the Ohio Brass Co., and others. All of the exhibits were well arranged to show their respective merits, and many neat advertising souvenirs were to be had for the asking.

I have been much impressed with the fact that while American ideas largely predominate, at the same time it is very evident that there is a strong disposition on the part of tramway companies to give the preference to home manufacturers or to American companies manufacturing here. Next in order come American goods sold by English agents. Strong competition has developed between these various interests and there is great activity on the part of all the sellers to capture the big orders in prospect, one of the largest of which is the London County Council's contract. Railway material and equipment here are sold largely upon the recommendation of the various city councils or corporations, and it is a sure thing that they will award their contracts to English concerns if the matters stand anywhere near equal.

Without attempting to describe in detail each exhibit, I will briefly mention our American displays and a few of the more notable English concerns.

SOME EXHIBITS.

British Westinghouse Electric & Manufacturing Co., London.—This exhibit extends over the entire length of the Agricultural Hall, and is an actual electric tramway in practical operation, complete in all details from the power house to the moving car. The line on which the car runs is 310 feet long. The current is obtained from a Westinghouse underground conduit, built on this company's sectional system. Each end of the exhibit is paved so that the conduit and rails present the appearance that they would have in a street. The intervening portions are open so that they can be readily inspected. The power station, which is at the main entrance of the hall under the east gallery, is equipped with a gas engine, electric generator and switchboard, all of Westinghouse make. Motors of the same build are shown mounted on trucks and dismounted for inspection. A handsome double-decked tram car, specially designed for this exhibit and fitted with every modern improvement, including electric signal bells at each seat outside and inside the car in order that passengers may easily signal the motorman to stop, runs on the line, carrying passengers. A conspicuous feature of the exhibit is the Westinghouse electro-magnetic brake (Newell patents), which is operated electrically by the motors that drive the car. Another important feature is the Westinghouse electro-pneumatic control system whereby all the railway and other motors on a train, can be simultaneously operated from one point. This exhibit may be said to represent an outlay of about £6,000, and is of British construction entirely.

The British Insulated Wire Co., Ltd., of Prescott, shows a full line of cables, section pillars, tee and disconnecting joint boxes. Mr. G. H. Nesbitt is in charge.

Miller & Co., Edinburgh, are well represented with one of their directorate, Mr. W. Gordon, in charge. Their exhibit consists of chilled car wheels, wheel presses and switch points.

The Ohio Brass Co., Mansfield, O., shows a large variety of articles in a very attractive manner. The exhibit is in the charge of Mr. Geo. A. Harwood, the company's general foreign agent, assisted by Mr. L. K. Cameron, of the Toronto (Can.) office; it consists of head lights, gongs, flexible pole brackets, railbond material, track brushes and cleaners, and overhead material in great variety.

The Christensen Engineering Co., Milwaukee, has one of the large exhibits, showing in operation several of its air-brake equipments. Mr. W. A. Parker, European manager of the Christensen company, is in charge.

The Consolidated Car Heating Co., Albany, N. Y., displays a large line of electric heating apparatus under the supervision of Mr. Francis C. Green, general superintendent.



OPENING THE EXHIBITION.

The gentleman facing the steps with his hat in his hand is W. H. Dickinson, Esq., Chairman of the London County Council.

Chas. Churchill & Co., Ltd., London, have a large line of American planers, shapers, lathes and general machine tools, the Q & C Co.'s pneumatic hammers and riveters, track drills, jacks, rail saws, fenders, etc.; also the Stanwood car step.

The Lorain Steel Co., Lorain, O., has a large display of rail joints, electric welded joints, portable crossovers and Dupont car trucks, and an exhibit of special track construction, similar to that used in several cities in Northern England which have recently adopted electric traction. The special feature to be noted is the solid piece construction, and the extreme length of the points, one open point and one crossing. The points are 12 feet and the crossing 9 feet 6 inches. Messrs. E. P. Thomas and Carroll Burton in charge.

Electric Tramway & Equipment Co., Birmingham, shows a full line of overhead material. This company makes this line to sell



OHIO BRASS CO. EXHIBIT.

direct to the supply trade, as it does no contract work itself. It is also agent for Nuttal's (Pittsburg) gears and pinions.

Dick, Kerr & Co., Ltd., London, the Electric Manufacturing Co., Ltd., and the Electric Railway & Tramway Carriage Works, Ltd., combined their exhibit, which comprises a complete line of tramway appliances from the rails and overhead materials to the

rolling stock. The special features of their exhibit are several new types of cars—first, the bogie vestibuled top seat car for heavy city service, with Bellamy reversed stairway; second, a bogie cross-bench car for high speed, summer suburban service; third, a wheel single deck car, seating capacity 20 persons, equipped with air brake, with axle driving compressors. Mr. W. Rutherford and Mr. C. Armstrong are in charge.

J. G. Brill Co., Philadelphia, has a Brill convertible car made for the Leeds (Eng.) Corporation and several types of car trucks. This display attracted a great deal of attention and much favorable comment. The Brill cars and trucks are almost as well known here as at home and are much liked.

Brush Electrical Engineering Co., Ltd., London.—This exhibit is in charge of Mr. King and is large and of a very attractive nature. The Brush company is very particular to state that it is the actual manufacturer of the entire line of railway equipment. The exhibit shows a bogie vestibuled car, such as constructed for the Swansea Tramway Co. This motor car is arranged to seat 44 persons and has two compartments, which can be used for separate classes or for smoking. The car runs on bogie maximum traction trucks and is consequently able to go round very sharp curves. In the exhibit are also tramway motors and controllers, electrical service brakes, and many other articles of the well-known Brush make. The

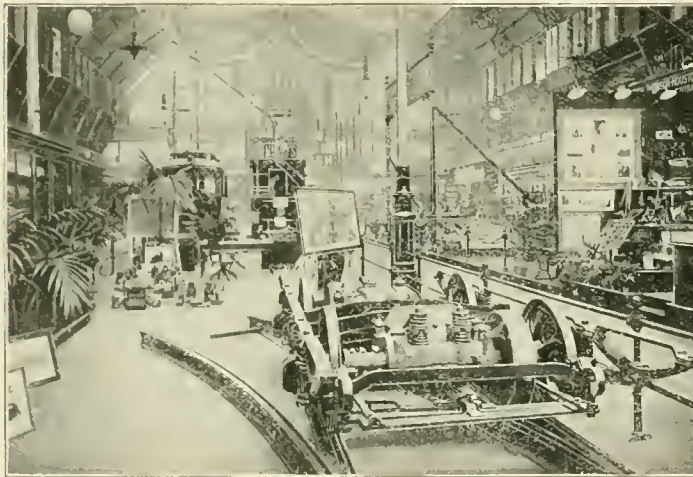
The British Thomson-Houston Co., Ltd., London.—This exhibit consists of cars and motor equipment. Among the cars shown is a full equipped car built by Messrs. Hurst-Nelson, and mounted on Brill trucks, also a car similar to what the British Thomson-Houston Co. is supplying to the London United Tramways, mounted on Peckham trucks and equipped with B. L. motor brake equipment.

The Pearson Huggins Co., Ltd., Bristol, is the maker of uniforms, and has a very attractive display in exhibit No. 47. Mr. Arthur House is in charge.

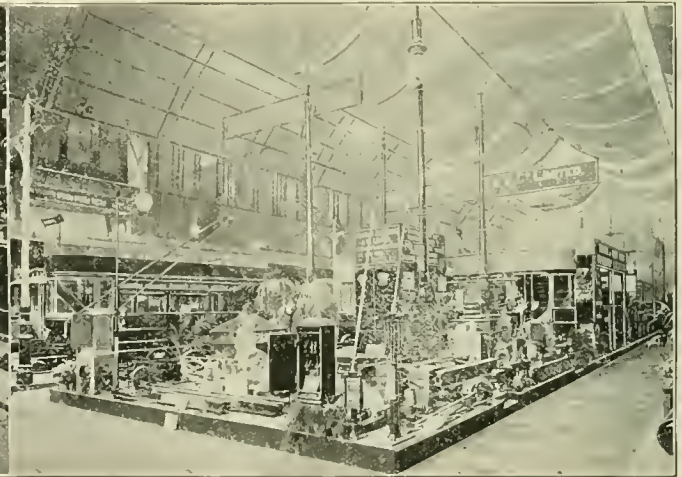
The Weston Electrical Instrument Co., of Newark, N. J., is represented by Ellicott Bros., its London agent, who showed a full line of Weston apparatus.

The British Griffin Chilled Iron & Steel Co., Ltd., London.—This company has a very complete exhibit of wheels, electric motor wheels, and axles shown in various stages of use, and some that have been put under a test to show the durability and tensile strength of the metal.

Bergtheil & Young, London.—This firm is European agent for the H. W. Johns Manufacturing Co., of New York, and the Johns-Pratt Co., of Hartford. They show a full line of electric car heat-



DICK, KERR & CO.—ENGLISH ELECTRIC MFG. CO.
ELECTRIC RAILWAY & TRAMWAY CO.



ROBT. W. BLACKWELL & CO.

Brush company is to be congratulated on its exhibit, which compares favorably with any American or Continental competitors.

Robert W. Blackwell & Co., Ltd., London.—The Blackwell exhibit ranks with the very best shown in the hall, and the variety of traction materials exhibited is probably the greatest. The exhibit is under the direct charge of Mr. J. Pringle, and associated with Mr. Pringle are many gentlemen connected with the various firms of which the Blackwell company is European agent. Mr. Long, the vice-president of the Peckham company; Mr. Scott, of the Cutter company, Philadelphia, and Mr. Harold P. Brown, of the Edison-Brown Rail Bond Co., of New York, are among the Americans in attendance at the Blackwell stand. The Blackwell company shows a large variety of American made goods, prominent among which are the Crane Co.'s steam specialties, the Griffing Co.'s Bundy separators, the Peckham Co.'s various types of tramway trucks, McGowan pumps, etc. The exhibit of Harold P. Brown, No. 120 Liberty St., New York, deserves special mention. Mr. Brown has fitted up a booth adjoining the Blackwell stand, in which he practically demonstrates his system of bonding rails. His tests are very interesting and comprehensive and the means he has taken of demonstrating his article cannot fail to produce good results.

Smith, of New York.—This exhibit is in the charge of Mr. Edwin Lansing, the European manager of this house, and Mr. Lansing is able to tell all that is worth hearing about headlights, signal lamps and torches.

ers and the well-known Johns asbestos coverings. The gentlemen in charge are Mr. Pell, Mr. A. H. Berry, manager of the electrical works of the H. W. Johns Co., of New York, and Mr. H. H. Luskomb, secretary of the Johns-Pratt Co.

Joseph Dixon Crucible Co., London and Jersey City.—This exhibit is in charge of Mr. G. W. Wollaston, manager of the European branches of the Dixon company, with a full line of Dixon graphite paint, dynamo brushes and resistance rods.

The Babcock & Wilcox Co., Ltd., London, exhibits a model of its water tube boiler.

The Worthington Pumping Engine Co., London, has a very prominent stand in the main entrance, composed of pumps, heaters and condensers.

The Hale & Kilburn Manufacturing Co., of Philadelphia, shows a line of car seats and seat materials. Mr. S. A. Walker, of Philadelphia, is in charge.

NOTES OF THE EXHIBITION.

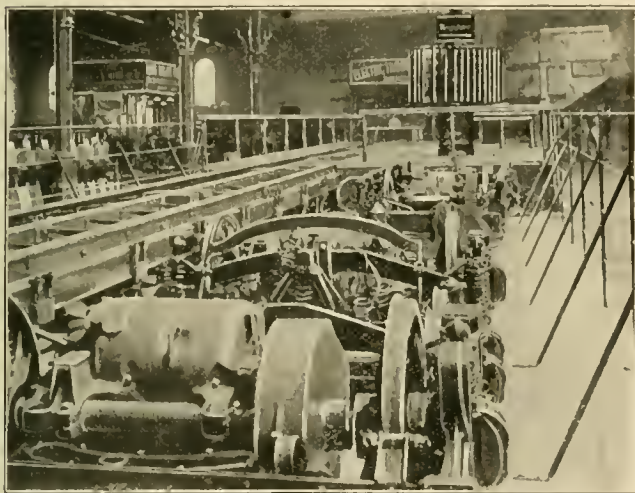
The catalog of the Tramways Exhibition is a book of 180 pages and most admirably arranged. Sufficient space is devoted to each exhibitor to allow him to state the exact nature of his product, his cable address and any other information that would be useful to the visitor. A plan of the exhibition is also arranged so that each

booth can be located easily. The catalog is bound in cardboard, with a very tastefully designed cover.

As fast as the deputations of the various city councils and corporations arrive in the hall a typewritten announcement of the fact is made, stating who they are, and from which city they may have come, and these announcements are distributed at the various booths, so that the exhibitor is kept posted at all times as to the responsible tramway men that may be in the hall.

In glancing through the exhibition hall one would be much impressed by the great predominance of American goods. A great many of such goods while shown under the name of an English or Scotch firm, and to all appearances made in Great Britain, still they have the stamp of an American origin plainly on them. There is no need of concealing the fact that the English municipal corporations are loyal to their own manufacturers, and if circumstances are anywhere near equal they will award their contracts to their home concerns. This does not to any very great extent prohibit the American manufacturer from this market, as the American-made goods as yet, have many points of advantage over those of home construction.

Mr. Francis C. Green, superintendent of the Consolidated Car Heating Co., of Albany, N. Y., is attending the exhibition, and in



WESTINGHOUSE EXHIBIT.

charge of that company's exhibit. He states that the company has already equipped about 250 cars in England and on the Continent, with its electric heaters.

Mr. G. A. Harwood, general foreign agent of the Ohio Brass Co., is making an extended trip throughout the world, which will be of about two years' duration. Mr. Harwood expects to keep continually among the European agents of the company.

Mr. W. Gordon, director of Miller & Co., Ltd., Edinburgh, is in charge of that company's exhibit. Mr. Gordon took quite an extended tour in the United States about a year ago, and is a warm admirer of American business methods in general. Miller & Co. are the oldest makers of chilled wheels in Great Britain, and have until the last few years supplied the greater part of the demand for such articles.

The promoters of the Tramways & Light Railways Exhibition offered at the suggestion of several tramway managers a prize of £25 for the best invention for securing a dry seat on the tops of tramcars and omnibuses, in all conditions of weather, and a second prize of £25 for the most practical and efficient life-saving guard or fender for tramcars. There were about fifty competitors for the dry-seat prize and five or six tried for the fender award. The judges awarded the seat prize to Peter Burns, of Birmingham, who showed a seat which automatically reversed itself when not in use, allowing the underneath seat to be used for posters or advertisements. The competition for the fender award was very

keen, and several very efficient devices were shown. The judges gave the award to Wilson & Bennett, of No. 123 Market Street, Hyde, who showed an automatic life guard that was placed far under the car.

The Westinghouse Electric & Manufacturing Co., Ltd., of London, is erecting a large plant at Manchester, England, capable of employing 5,000 British workmen.

Mr. Lawrence Fulton Braine, general manager of the Continuous Rail Joint Co., of Newark, N. J., was in attendance at the exhibition.

London, July 1, 1900

D. C. W.

CHICAGO UNION TRACTION EARNINGS.

The statement of gross earnings of the first fiscal year that the Chicago Union Traction Co. has operated the lines of the old North and West Side companies shows a gain for the year of 5.2 per cent. The month of June was the only one that did not show an increase for the combined system; in this month the West Side gained \$8,000 and the North Side lost \$32,000. Of this about \$21,000 is believed to be due to opening the Northwestern Elevated and the balance to cool weather and the labor troubles.

The comparative figures are as follows:

	1899-1900.	1898-1899.	Increase
July	\$ 653,811.60	\$ 612,320.19	\$ 41,482.41
August	672,049.55	612,764.02	59,285.52
September	633,253.80	605,000.28	27,353.52
October	679,039.80	623,194.15	55,845.65
November	608,836.45	563,710.43	45,126.02
December	621,614.99	587,070.11	33,935.79
January	587,020.70	531,657.21	65,362.99
February	520,593.70	483,896.20	36,696.99
March	580,420.90	575,041.20	5,379.70
April	600,952.40	586,088.35	14,864.05
May	647,347.20	621,882.11	25,465.09
June	614,952.65	639,166.10	* 24,213.54
Total	\$7,412,770.00	\$7,043,608.00	\$369,162.00

* Decrease.

TEN-CENT FARES SAID TO BE ILLEGAL.

For several years it has been the practice for the Brooklyn Rapid Transit Co. to increase the fare on one of its Coney Island lines to 10 cents during the summer season. The object of this was to provide one route on which the cars would not be so crowded and thus better accommodate those patrons to whom the higher fare was no hardship.

This year the usual increase of fare on one line was followed by an application for an injunction by one Peter H. McNulty. The Supreme Court, Justice W. D. Diekey, on June 10th refused the injunction restraining the collection of a 10-cent fare, but stated that an action through the attorney-general to forfeit the charter of the company would lie.

SYRACUSE, N. Y., BENEFIT ASSOCIATION.

In our March issue, page 141, we gave some particulars concerning the Employes' Mutual Benefit Association of the Syracuse (N. Y.) Rapid Transit Co., and among other things stated that the membership was at that time 148. Since Mr. E. G. Connette has been general manager of the company he has taken considerable interest in this association and persuaded the trustees that it would be advantageous to remit the initiation fee of \$1 to applicants for a short period. The result of this action and of the active work of the trustees has been to increase the membership to 250. The total number of employes of the company is about 350, but many of those who have not joined the association are ineligible because of age.

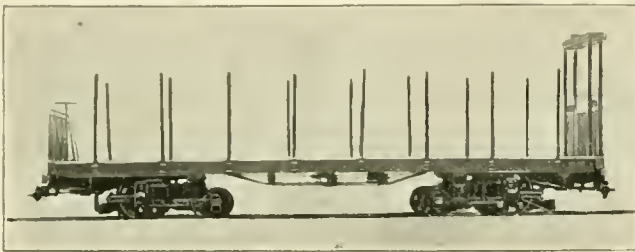
The United Traction Co., of Albany, N. Y., has filed a protest with the State Board of Tax Commissioners against the valuations placed upon its property which were increased from \$225,671 in 1899 to \$864,500 in 1900.

ATTRACTIVE FOLDER FROM TOLEDO.

The Toledo (O.) Traction Co. has issued a 16-page folder, 30 $\frac{1}{4}$ x 8 $\frac{1}{4}$ in., on one side of which appears a colored lithographed map showing the location of all the traction company's lines. Two of the pages on the reverse side are devoted to the latest time-tables of the company, and in the remaining space is given a description of the growth and commercial prosperity of Toledo, a history of the Toledo Traction Co., a description of Lake Erie Park and Casino, and the plans for the Ohio Centennial and Northwest Territory Exposition to be held at Toledo from May 1 to Oct. 30, 1902, and for which nearly \$3,000,000 has been practically pledged from various sources.

FREIGHT CAR ON MAXIMUM TRACTION TRUCKS.

The Winston Salem Railway & Electric Co., of Winston, N. C., has recently had the J. C. Brill Co. build for it a car which is well worthy of the attention of street railway men, especially those connected with roads where there is much transportation of heavy freight. It is a 30-ft. flat car mounted on Brill maximum traction



ELECTRIC FREIGHT CAR.

trucks. The framing of the car is of the usual freight car type with truss rods and needle beams. Both ends are fitted with dashers and brake wheels, and stake pockets are placed along the sides. The body is 7 ft. 6 in. wide at the sills. The trolley stand is supported on four posts at one end of the car. The trucks have a wheel base of 4 ft., the driving wheels are 33 in. in diameter, 3-in. tread and $\frac{3}{8}$ -in. flange. Each truck has one G. E. 58 motor. There are two Brill sand boxes and two pedal gongs.

CHEAP FARES FOR WORKINGMEN IN ENGLAND.

At a conference last month between the chairmen of committees in the House of Lords and the House of Commons, and representatives of the British Board of Trade, it was decided to adopt a model clause to be inserted in all tramway bills providing for cheap fares and special cars for working people. The provision is as follows:

"The company, at all times after the opening of the tramways for public traffic, shall, and it is hereby required to, run a proper and sufficient service of carriages for artisans, mechanics, and daily laborers each way every morning and every evening (Sundays, Christmas Day, and Good Friday always excepted), at such hours, not being later than 8 in the morning or earlier than 5 in the evening respectively, as may be most convenient for such workmen going to and returning from their work, at fares not exceeding one halfpenny for every mile or fraction of that distance. On Saturdays the company, in lieu of running such carriages after 5 o'clock in the evening, shall run the same at such hours between noon and 2 o'clock in the afternoon as may be most convenient for the said purposes. If complaint is made to the Board of Trade that such proper and sufficient service is not provided, the Board, after considering the circumstances of the locality, may by order direct the company to provide such service as may appear to the Board to be reasonable. The company shall be liable to a penalty not exceeding £5 for every day during which it fails to comply with any order under this section."

The endless chain scheme for selling street car tickets has reached Cincinnati.

DRAINAGE CANAL TRIP.

The members of the Chicago Trade Press Association, on June 25th, made an inspection trip down the drainage canal and visited the controlling works at Lockport. The party consisted of about 60 gentlemen and ladies and was escorted by President William Boldenweck, of the Sanitary District Trustees.

While appreciating what has already been done, the members present were unanimous in the hope that the District would be successful in its efforts to have the Chicago River deepened and widened, allowing vessels of greater beam and draft to pass through the river and into the canal. This work is absolutely necessary if the commercial supremacy of Chicago is to be retained.

SALE OF THE STEPHENSON CAR WORKS.

On June 12th, the John Stephenson Car Works at Elizabeth, N. J., were sold at public auction to J. C. Willetts and Adolph Wumpfheimer, of New York, representing a creditors' committee. The plant, which comprises seven buildings and 80 acres of land, brought \$177,000, and material on hand sold for \$49,283. The original cost of the works was \$400,000; of the material, \$143,960.

It is said the new owners will re-open the plant at once and will build high-grade street cars for all conditions, as formerly.

TRACKS PAVED WITH GOLD.

It has been discovered that large quantities of stone which the Denver City Tramway Co. has been using for paving between its tracks, contain gold ore in paying amounts, some of the specimens assaying at \$5 and \$7 to the ton. The stone was taken from quarries in Boulder County, and it is said thousands of tons have been used in Denver's streets.

The discovery was made by an expert miner, who recognized traces of the precious metal in a small piece of the paving stone picked up in the street.

LABORATORY TRAINING.

In discussing operating work as a feature of electrical laboratory training at the meeting of the Society for the Promotion of Engineering Education, Prof. W. S. Aldrich, of the University of Illinois, lays down these principles:

"Training in handling electrical machinery is quite as essential as training in electrical measurements. The one should be done and the other not left undone. If with all of his familiarity with galvanometer work the young electrical engineer is left to the mercy of the wireman or the operating engineer his laboratory training has been incomplete. A knowledge of the behavior of electrical machinery and confidence in handling electric circuits is becoming more necessary with each widening use of electricity. The utilization of alternating currents and the operation of alternating current machinery constitute today a most interesting and important field, one with which the electrical student cannot become too familiar. It is the result of experience that students who have been given a course of electrical laboratory training involving study, inspection, illustration and operation, have a better understanding of testing work than if they had been put at once into the latter without attention to the former."

IMPROVEMENTS ON ST. LOUIS & SUBURBAN.

It is announced that the St. Louis & Suburban Railroad Co. has in contemplation improvements and betterments to its system that will cost over \$500,000 and possibly \$1,000,000. The roadbed will be thoroughly overhauled, new switches and curves put in, and it may be decided to cast weld joints on all divisions. New rolling stock will also be purchased and the overhead work improved and strengthened.

But the principal changes will be made at the DelHodiamont power house. This station has become inadequate to handle the rapidly increasing traffic of the road, and it will be necessary to add new machinery or else build an entire new station. Which course will be followed has not yet been decided.

THE STREET RAILWAY AT DERBY, CONN.

The pioneer electric road of New England is that owned and operated by the Derby Street Railway Co., of Derby, Conn. The charter was granted in 1887, and on the night of Apr. 30, 1888, the first car was run over the four miles of track. Electric roads at that time were hardly more than a theory, and in consequence the Derby line has passed through all the vicissitudes attendant upon the development of a new idea. Looking over the 13 years of the company's existence an excellent conception of the development of electric railroading may be had.

The first power house was built at the Derby Docks and was equipped with one 175-h. p. boiler, one 100-h. p. engine and one 75-h. p. Van Depoele generator, with the necessary "exciter," and one throw-over switch. Originally the road was intended for freight but upon the completion of the plant, the freight motor had not been received and the passenger cars, equipped with the Van Depoele 15-h. p. motors, were put into service. These motors were set up in a cab in the front of the cars and were geared to the axle by sprocket chains.

These crude motors were used until the fall of 1889, when the passenger service, having grown beyond all expectations, the General Electric F-20 under-running motors were given a trial and, proving very satisfactory, all cars were finally equipped with them; they were used until 1894, when the G. E. 800 under-running motors were put in and are being used today.

The Van Depoele generator was used until 1892, when it was replaced with an Edison bi-polar 150-kw. machine. This proved satisfactory until 1894, when a new station was built on Main St. in Derby. The general dimensions of the present power house, which is of brick and stone, are 60 x 55 ft. The boiler room is 28 x 55 ft. and 30 ft. high, and is equipped with three 600-h. p. Bigelow & Co. boilers, National feed water heaters, Chapman & Kennedy valves, Davidson condensers and pumps, and Sellers injectors. The steam pressure carried on the boilers is 100 lb.

The engine room is 30 x 55 ft. and 20 ft. high, and is equipped with two 600-h. p. Allis-Corliss engines and two direct-connected General Electric generators of 400 kw. capacity. The switchboard has six panels, with a Thomson recording wattmeter, two Weston voltmeters and two Weston ammeters. The current is generated at 525 volts.

The completion of this power house marked a point in the development of the road for which the company had scarcely dared to hope. At the beginning the almost superstitious opposition of the people to an electric road and the fight of a bob-tail horse car company to secure travel, raised obstacles hard to overcome. With-

are the McGuire "Columbian" and the motors are the G. E. 800 and G. E. 1200. The car equipment includes steel gears and pinions made by the United States Projectile Co., 2¼-lb. trolley wheels made by the H. A. Osborne Manufacturing Co., New Haven fare registers, Consolidated electric car heaters, "Standard" air brakes, Corning brake shoes, 33-in. 300-lb. car wheels made by the Boston Car Wheel Co. The bearings are all babbitted.

Nine regular and 10 extra conductors and the same number of



FIG. 1 BOILER IN FIRST POWER HOUSE.

motormen are employed; 11 hours constitute a day's work, the average wages paid being \$55 per month.

The overhead construction consists of No. 0 trolley wire and three No. 0000 feeders five miles long, made by J. A. Roebling's Sons. The overhead fittings were made by the General Electric Co. and the Ohio Brass Co. The poles are of wood. The overhead construction is maintained by the repair shop employes, six men being employed, who work 10 hours a day and are paid \$50 a month. The repair shop is located on Main St., Derby, and is 125 x 25 ft.

The company has two car houses, one on Main St. and the



FIG. 2—ENGINE IN FIRST POWER HOUSE.



FIG. 3—VAN DEPOELE GENERATOR.

in a short time the electric road became the popular one, however, and eventually absorbed the horse car line, equipping that with electricity and making a belt line between Ansonia and Derby.

From three cars the rolling stock of the company has grown to 12 open and 12 closed motor cars, and 5 open and 2 closed trailers. The cars were made by Brill and Jackson & Sharp; the closed cars are 18 ft. long and the open cars are 10-bench. The trucks

other at Lake Housatonic Park. The former is 35 x 125 ft., built of brick and will shelter 14 cars. The latter is 65 x 130 ft., built of iron, and will shelter 16 cars. Hydrants with hose attached are conveniently located in the buildings for use in event of fire; one watchman and one inspector are employed.

The company operates about 10 miles of single track, an extension of about two miles, having been opened on Sunday, May 27th.

The heaviest grade on the road is $7\frac{1}{2}$ per cent and 400 ft. long. The track is laid with 90-lb. girders and 60-lb. T-rails, made by the Lorain Steel Co., the Johnson Co. and Wm. Wharton, jr. & Co. The ties are of chestnut 6 x 7 in. x 6 ft. spaced 2 ft. between centers. The joints of the 9-in. rails are made with 8-hole fish plates and the 6-in. with 6-hole fish plates. "Crown" bonds are used. The streets are for the most part paved with macadam, but there are $1\frac{1}{2}$ miles of Belgian block.

In the operation of the road four tons of George's Creek, pea



FIG. 4—ERECTING BOILERS AND STACK OF NEW PLANT.

and dust coal are burned daily, the cost per ton running from \$1.50 to \$3. The average car-mileage per day is 625.

The cost of power per kilowatt-hour is 1.56 cents, distributed as follows: Fuel, .8654; labor, .5717; supplies, oil, waste, etc., .0450; water, .07892.

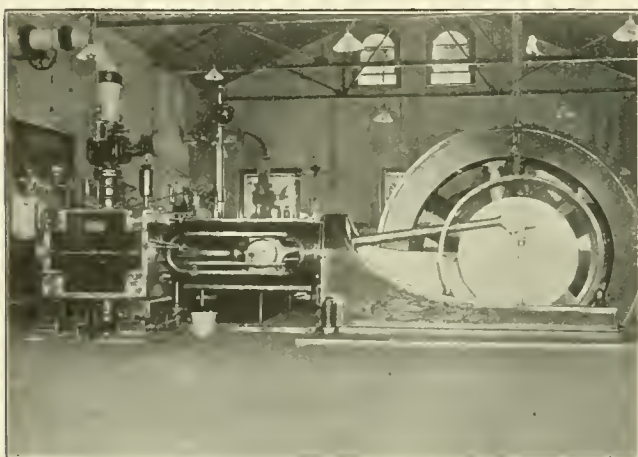


FIG. 5—600-H. P. ALLIS ENGINES IN NEW PLANT.

The operating expenses in cents per car-mile are as follows:

General expense	1.576
Transportation	5.962
Maintenance of overhead construction, way and buildings....	.604
Maintenance of equipment.....	1.835
Power station	2.368
Losses by damage .....	.459
Total	12.804

The maximum speed of the cars is nine miles an hour, the schedule speed being 7.25.

The officers and operating staff were: President, H. Holton Wood, Boston; vice-president and treasurer, Charles E. Clark, Derby; secretary, F. W. Wallace, Ansonia; general manager, B. W. Porter; superintendent, George N. Kennedy; chief engineer, H. Schmitz; attorneys, Wooster, Williams & Gager, Derby. The authorized capital stock is \$250,000, of which \$150,000 has been issued, and the authorized funded debt is \$250,000, of which \$150,000 has been issued. Early in June of this year the Derby Street Ry. was acquired by the Connecticut Lighting & Power Co., of New York, otherwise known as the Young syndicate, which has recently secured control of a large number of other street railways in Massachusetts and Connecticut. The consideration is stated to have been \$350,000.

A few years ago the company purchased a tract of land a short distance north of Derby on Lake Housatonic, and opened a pleasure resort. Pavilions and baseball grounds were provided and



FIG. 6—CURVE AT NAUGATUCK BRIDGE.

launches put on the lake. This park proved a delightful place for the people of this section to spend the warm summer days and evenings, and has been a profitable investment.

There is one point in track building, overlooked in the first construction, in 1887, which experience disclosed was a very important one—a good joint. The hasty and imperfect work at the joints caused endless trouble. The joints were soon improved, however, and the resultant change brought the road into the popular favor it has since enjoyed.

Figs. 1, 2 and 3 of the illustrations show the boiler and engine rooms of the original power plant, and when these views are compared with Fig. 5 which shows the direct-connected unit now used, the progress made in building machinery for railway power plants is very evident. Fig. 4 is a view of the stack of the new station when in course of erection and Fig. 6 shows the big curve at the Naugatuck River bridge.

PETITION AGAINST CHEAP FARES.

Residents of Evanston, a northern suburb of Chicago, have presented to Mayor Harrison one of the few petitions ever drawn protesting against a reduction in car fares. It now costs 10 cents to go from Chicago to Evanston by street car, but it has been proposed to connect the Chicago, Milwaukee & St. Paul Ry. with the newly opened Northwestern Elevated and run express trains into the city, charging a 5-cent fare. The delegation that called on the mayor urged him to disapprove of the plan as it is feared the reduced rate would bring to Evanston an undesirable class of residents and turn the suburb into a popular excursion resort.

The Ohio Board of Public Works has granted permission to T. N. Fordyce of Detroit, Mich., to build and operate an electric tow line along the Miami & Erie canal for the purpose of drawing canal boats.

Electrical Measuring Instruments.

BY J. FRANKLIN STEVENS.

Mr. Stevens is president of the Keystone Electrical Instrument Co., of Philadelphia, and this paper was read at a stated meeting of the Franklin Institute.

PART I.—The author touches briefly on the history of the subject and the success with which instrument makers have met the demands for new types of instruments. Next the instruments needed in making ordinary electrical measurements are enumerated, and the requirements of a practical and satisfactory instrument for measuring voltage, current or power defined. The different types of instruments in common use are then classified and their respective advantages, disadvantages and limitations for various classes of work discussed. The six types of instruments considered are: Hot-wire, Electro-static, Tangent galvanometer, Dynamometer, D'Arsonval galvanometer, Electro-magnetic.

PART II.—After completing the discussion of the characteristics and limitations of the different types, the questions of specifications and installation are taken up. The importance of selecting a manufacturer who has learned the "trick" of making an instrument properly, is dwelt upon and suggestions are made as to the way of avoiding the troubles that arise between the maker and the purchaser and his engineer because the instruments are carelessly or ignorantly handled by the switchboard contractor. The permissible errors in instruments, the definitions of the ohm, ampere and volt, and remarks on testing and calibrating follow next, and the conclusion deals with special forms of indicating instruments.

Since we have available a very extensive literature bearing on the subject of laboratory testing instruments, in which can be found descriptions of the instruments employed, their construction, application and approximate laws, I shall pass over that portion of the subject and confine myself to commercial direct reading indicating instruments, such as are to be found in every-day use.

The history of the art embodied in the commercial manufacture of indicating instruments is extremely interesting, but shows many analogies to the development of other branches of electrical engineering, with the single exception that practical data in published form are extremely scarce. Every one entering this field is compelled to master some of the most intricate problems known to the profession, and must learn for himself how best to apply theoretical deductions to practical mechanical devices. Until very recent years, our sole guide has been the study of early and primitive types which in their time were useful and valuable, but which today fail to reach the high standard we have learned to demand of an instrument whose function is to indicate the input or output of our many and varied electrical devices. Every new device put before the public has meant a new condition to be met by the instrument manufacturer, requiring of him a new design or modification of an existing design. Two rather recent examples of this occur to me: one, the increasing tendency to employ high voltages in commercial work, reaching frequently 12,000 volts in the case of series constant-current arc light systems and 33,000 volts in long-distance power transmissions; the other, the rapid development of the electric automobile, which requires a volt-ammeter of as high a degree of accuracy as the portable laboratory instrument, yet able to withstand the roughest usage ever accorded an instrument of precision, coupled with restrictive specifications as to size and weight. In every instance instrument manufacturers have met the demands made upon them better, I think, than many of our fellow-workers have in some other lines. Much yet remains to be done, and much, I am confident, will be done in the matter of perfecting existing instruments in the near future. Gradually inefficient or unreliable types are being relegated to oblivion and the remaining ones brought closer and closer to standard uniform construction.

The great majority of measurements required today can be made with a voltmeter, ammeter and wattmeter, and, while it might be thought that the wattmeter is merely a combination of the voltmeter and ammeter mounted in one case, this is not true in all classes of measurement. While it is true that the reading of the wattmeter represents the product of the readings of the voltmeter into the ammeter in the case of direct current measurements, it is not true in the case of alternating current measurements, save in the very exceptional case of a circuit possessing neither capacity nor inductance or a balance of the two. When either inductance or capacity exist there is a consequent lag or lead of the current wave relative to the pressure wave, and, since the instantaneous readings of the volts and amperes represent the mean effective or virtual values, that is, the square root of the mean square, their product differs from the reading of the wattmeter, which indicates the integrated values of two curves, the maximum and minimum values of which occur at different times. To obtain an agreement between the values obtained by volt-ampere readings and watt readings, it is necessary to multiply the volt-ampere readings into the cosine of the angle of lag or lead, so that the ratio of the watt readings, as given by a properly constructed wattmeter, to the volt-ampere readings gives us the power factor of the circuit, and from the two sets of readings we can readily determine the angle of lag or lead and the so-called wattless current. Probably this is well known to all of

you, yet scarcely a week passes but I have to explain the matter to one or more customers who cannot reconcile the difference in the two sets of readings and are inclined to believe that some, if not all, of their instruments are indicating erroneously.

Before touching on the different types of indicating instruments which are most commonly found in commercial use, let us consider for a moment the essential requirements of a practical and satisfactory instrument for measuring voltage, current or power. To start with, the instrument must be direct reading. We have no time today to convert angular deflections into true values by means of tables of constants, but insist that the pointer shall indicate directly in definite units the value of the passing load or the impressed electro-motive force. We must next be assured of the accuracy of the calibration, and for that depend principally upon the reputation of the maker or check the indications by comparison with a secondary standard. Beyond this we must know that the accuracy of the indications is not affected by the influence of ordinary external fields or by normal variations of temperature, due either to heating within the instrument, by means of the passage of the current to be measured, or to variations in the temperature of the room in which they are installed. All instruments should be mounted in dust-proof cases, and the systems carried in jewelled bearings; the movement of the pointer should be aperiodic or dead-beat, and, so far as possible, the system should contain nothing subject to change or deterioration, and should be constructed so that it will withstand successfully the ordinary rough usage liable to be accorded it in practice. The question of gradual change of accuracy, due to the change in some constituent part of the system, has led me to strongly advocate the use of electro-magnetic instruments with gravity control for switchboard use whenever the conditions render them applicable, and I fully expect to see this type of instrument become more popular as its advantages become more widely appreciated. Such a system is not applicable for portable instruments, save the dynamometer system for alternating currents, and even then a spring control must be used; nor is the series electro-magnetic ammeter practical above about 1,500 amperes, due to the structural difficulties involved in carrying the bus bars directly to the instrument terminals. The one objection most commonly urged against the electro-magnetic instrument for direct current switchboard use is the unequally divided scale, for, as a rule, the scale only covers a range starting at 10 per cent of the total up to maximum. In most cases, however, this objection is purely captious, for a switchboard voltmeter is seldom used to indicate more than 10 per cent above or below the normal voltage; and the ammeter indications are of principal importance in the higher ranges to prevent a possible overload of the circuit or generator. In alternating current circuits an equally divided scale is an impossibility, so why should we sacrifice constancy in direct current measurements for the sake of an equally divided scale when the lower registers are so seldom used? In portable direct current instruments the proposition is somewhat different, as we desire to cover the maximum limits of possible measurement on a single scale instrument; therefore, an equally divided scale is desirable and practically necessary.

Taking up now the different types of instruments which are in most common use, we find they may be roughly divided into six classes, depending on the principle by means of which measurements of voltage, current or power are made: (1) the hot-wire; (2) the tangent galvanometer; (3) the electro-static; (4) the dynamometer; (5) the D'Arsonval galvanometer and (6) the electro-magnetic.

The hot-wire instrument is designed to operate by the expansion

of a fine wire or strip of conducting material due to the heating produced by the passage of the current to be measured, and, therefore, the indications are proportionate to the square of the current. This type of instrument possesses the advantage of indicating with equal accuracy the current flow on either direct or alternating current circuits and is independent of the frequency of the circuit or of the shape of the current wave; it is, further, unaffected by the presence of external fields. These advantages, however, are all that can be claimed for this system, and to offset them are many serious disadvantages. Since the instrument operates by virtue of temperature differences, it is extremely susceptible to variations of external temperature, and such variations must be compensated either by mechanical means, which provide for bringing the pointer to zero by increasing or decreasing the tension on the working wire, or by providing auxiliary heating strips which are supposed to automatically adjust the tension of the working wire on the general principles of a thermostat. This may seem a small matter to most observers, but to me it signifies an error in principle, and reminds me of one of our early types of arc dynamos which, by reason of incorrect construction, we found to spark badly; so, in place of correcting the design, an air blast was provided to blow out the spark. Another point of objection is the constant change of zero, due to the fact that until the wire has been stretched to its elastic limit it will fail to return to the same point after having been stretched by the heat applied and will always show a slight residual strain. To attempt to correct this prior to installation in the instrument means, judging by my own experience, that at least 90 per cent of the wires will break during the preliminary stretching process, and the remaining 10 per cent will stand but a very slight overload in service. As overloads are quite common, this would constitute a serious objection, for it means the return of the instrument to the manufacturer for the insertion of a new wire and recalibration. Another very serious objection is the amount of current required to operate the instrument. The average resistance of a modern hot-wire voltmeter is 4 ohms per volt, which means a current flow of .25 ampere. This low resistance effectually bars this type of instrument for accurate testing, since the amount of power abstracted from the circuit to be tested vitiates the accuracy of the results obtained and introduces serious errors, which must be allowed for in all calculations. Recently an attempt has been made to introduce the hot-wire instrument as a shunt ammeter, particularly for alternating current measurements. As a shunt ammeter, the hot-wire instrument is a distinct failure, for, while the manufacturers claim it can be operated on a drop of .3 volt for full scale, my personal experience has shown a drop of 6 volts to be necessary. On the makers' figures, 300 watts would be required to operate a 1,000 ampere ammeter, nearly .4 horse-power per instrument, while on the sample I have tested 6,000 watts, or 8 horse-power, would be required. Again, it has been shown that these ammeters when calibrated on direct current are not accurate within 10 per cent when used on alternating currents, unless the reactance in the shunt is exactly equal to the reactance in the instrument, a condition almost impossible to obtain, even with the most careful design.

A modification of the hot-wire system has been proposed, consisting of an enclosed chamber containing a fixed resistance wire, one end of the chamber, which is made air-tight, consisting of a flexible diaphragm operating the pointer through a system of levers. In this case, the heat supplied to the wire by the passing current causes the air in the enclosed cylinder to expand and, consequently, puts the diaphragm under tension, very much on the principle employed in the aneroid barometer. I find by actual experiment that such a system could be applied to voltmeters, and could be so made that it would be accurate in its indications and would possess a reasonably high resistance. The feature, however, which renders this system impracticable is the slowness with which the readings can be taken. The pointer will not come to rest until after the heat supplied the air enclosed within the chamber is equal to the heat radiated by the walls of the enclosing chamber, and from one and a half to two minutes are required before the pointer will come finally to rest at the part of the scale marked to indicate the impressed e. m. f. This is true no matter how small the air chamber is made; and while it is possible to shorten this time by carefully covering the sides and one end of the cylinder by a heat insulating jacket, still it cannot be constructed so as to give an in-

stantaneous reading, and every attempt to shorten the time by covering the walls of the chamber results in a corresponding increase of the time required for the pointer to come back to zero after current has been shut off. In other words, the instrument is similar in its action to an ordinary thermometer, which, as you know, cannot be made to respond instantly to changes of temperature.

Electro-static instruments, which depend for their action on the mutual attraction of two plates connected to the opposite sides of the line, are still used, but not extensively, for high tension measurements. They will indicate correctly on either direct or alternating current circuits, but are limited to measurement of voltage. It is impossible with this type of instrument to obtain a low reading, as the attraction of the plates toward one another varies approximately with the square of the potential difference between them. I say "varies approximately" advisedly, as the capacity of two plates varies directly with the square of the voltage only when the distance between the plates is maintained constant, which in this case is an obvious impossibility. As a rule, these instruments cannot be made dead-beat without introducing elements liable to seriously interfere with their accuracy; and, while there are no errors due to temperature changes, and while they are also extremely efficient, requiring no current flow at all, they are affected very considerably by external influences, particularly by static charges, which are almost invariably present in power stations or dynamo rooms, and, as you probably know, it is practically impossible to provide a shield for static effects.

Instruments employing the principle of the tangent galvanometer are still employed, and for certain classes of measurements are extremely useful. They can be particularly recommended for use as ground detectors or differential voltmeters, where the actual value of the indicators is of small moment, the particular object being to show a balance of two opposing voltages or the presence of a ground by deflection. In this system the magnetized needle is suspended vertically, and is acted upon by two equally and oppositely wound solenoids; that is, the solenoids are wound with two wires in multiple and then cross-connected, so that we have two circuits equal in effect but opposite in action. I might say in passing, that if the proper proportions of solenoids to magnetized needle are employed, and the length of the magnetized needle properly proportioned to its area, the tangent galvanometer instrument may be made extremely accurate and also quite permanent. Care must be taken, however, that under no conditions can the direction of the lines generated by the solenoids oppose the lines existing in the magnetized needle, otherwise the value of the calibration is almost instantly destroyed.

For measurements of alternating current voltage, and also for the measurement of the watt output of any alternating current source of energy, the dynamometer system, in one of its many modifications, is unquestionably the best type of instrument that can be used. This instrument indicates directly the mean effective voltage of the line to which it is connected, and is equally accurate for direct current measurements, provided readings are taken with the direct current flowing through the instrument in one direction, then the direction of the current flow reversed and a second reading taken, the mean of the two readings being the correct value of the impressed electro-motive force. This for the reason that the instrument is extremely susceptible to the influence of external fields. Further, the dynamometer type of instrument is only properly adapted for use in portable instruments. The fact that two readings are necessary on direct current prohibits its use as a switchboard instrument on direct current circuits, and its delicacy, coupled with its field of low intensity and its susceptibility to error, due to the presence of iron in its immediate neighborhood, whether used on direct or alternating current circuits, renders it impracticable as a switchboard instrument for alternating current circuits. As an ammeter, it cannot be successfully employed for measurements above .5 ampere, due to the difficulty of providing perfectly flexible contacts capable of carrying large currents. When you attempt to convey a current into a moving coil beyond the carrying capacity of a flexible conducting spring, recourse must be had to mercury contacts, and a mercury contact should never be employed in a portable or enclosed type instrument. In the dynamometer instrument great care must be taken to have the moving coil as light as possible; and to render the instrument aperiodic, or dead-beat, an aluminum air vane, moving in a partially enclosed chamber, must be employed. Manu-

ally operated brakes acting on the delicate moving system should be avoided, as their continued use results in a serious derangement of the moving parts.

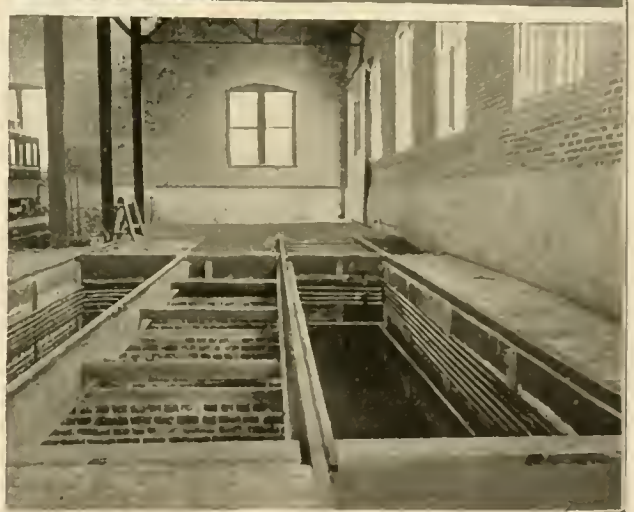
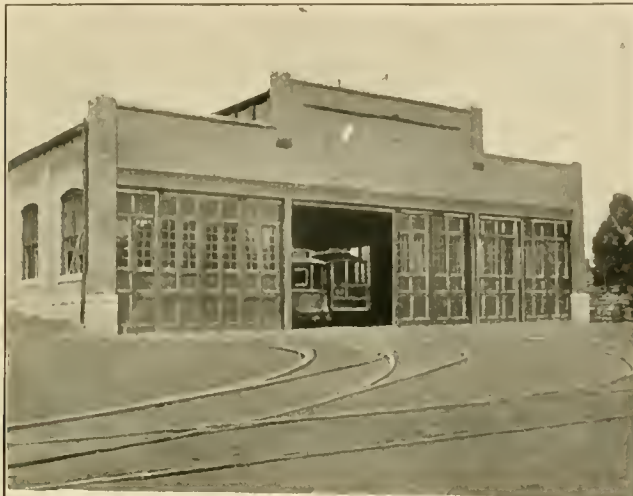
Instruments based on the principle of the D'Arsonval galvanometer are very extensively used today for both switchboard and portable instruments on direct current circuits; they can be calibrated so as to show an equally divided scale, and, if properly constructed, are an extremely efficient instrument. Further, they are very well adapted to the measurement of resistances and grounds. In the construction of this type of instrument the important factor is the permanency of the permanent magnet fields employed. It is essential, in the first place, that the proper grade and quality of steel shall be employed, which means a steel possessing high permeability and a high degree of retentivity; then this steel must be carefully worked within definite limiting temperatures and must be treated

CAR BARN AT QUINCY, ILL.

Through the courtesy of the Quincy Horse Railway & Carrying Co. we are able to reproduce herewith plan and elevation drawings and a group of photographs of a well-designed and substantially built car barn that has recently been completed by this company at a cost of \$11,000.

The building which will be used mainly for storage purposes is 130 ft. long by 80 ft. wide at the ground, with side walls of hard machine bricks laid in brown mortar, and footings of concrete. Measuring over the foundations which are of rubble range work the dimensions are 130 ft. 4 in. by 80 ft. 4 in.

Two rows of steel columns resting on concrete foundations spaced 16 ft. c. to c. and 24 ft. from the side walls, extend the length of the building and support the steel roof trusses shown on the rear eleva-



EXTERIOR OF CAR BARN.
INTERIOR OF BARN.

EXTERIOR OF HEATING PLANT.
REPAIR PITS.

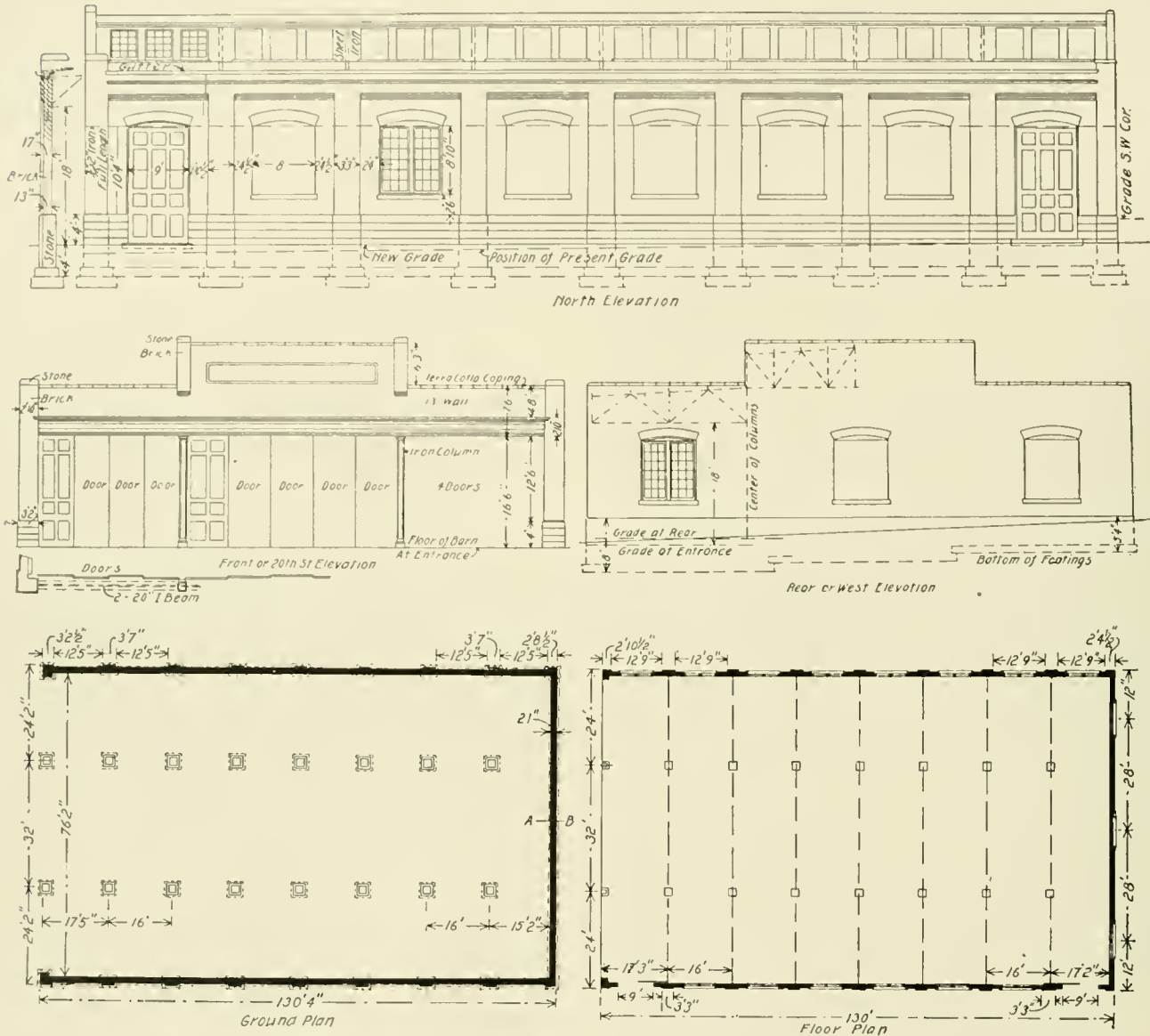
with great care and skill in the processes of magnetizing and ageing. Further than this, the moving coil should be extremely light and the whole system carefully shielded from the influence of external fields, and yet so shielded that the moving coil will not be robbed of an appreciable number of lines of force, due to the presence of the shielding iron. The greatest field for this type of instrument is in the measurement of heavy currents; that is, for currents of 1,000 amperes and upwards, due to the fact that it can be operated as a shunt instrument, requiring an extremely small drop of potential, full scale being obtained with a drop of from .03 to .05 volt. This means a relatively high efficiency, and, while the instrument does not possess all of the advantages of a series ammeter, yet it is far easier to install, and, where a high degree of accuracy in current indications is not demanded, will be found very satisfactory in practice.

(To be continued.)

tion and in the interior view. The construction of the column foundations is also shown in one of the drawings. The roof is 18 ft. from the ground at the sides and is formed of 1½-in. iron sheeting, on which are placed four coatings of tar and gravel. An ornamental terra cotta coping extends along the edge of the roof at the front and back of the structure.

The front wall for the entire width of the building is fitted with sliding doors on upper hangers so that at least one-half of the entrance may be thrown open at one time, this feature greatly facilitating the ingress and egress of cars. The front wall above the doorways is supported on two 20-in. I-beams. Seven tracks extend the full length of the interior.

In designing the barn special care was taken to secure good ventilation, lighting and heating. Twenty-four small ventilators along each side of the raised portion of the roof and numerous windows and doors in the sides and ends of the building as shown in the ele-



ELEVATIONS AND PLANS OF CAR BARN, QUINCY, ILL.

vations insure plenty of fresh air and light, and a steam heating system keeps the repair pits and the interior of the barn at a nearly constant temperature in winter regardless of the outside temperature. A low pressure steam heating system is used and the generating plant, consisting of an Haxton boiler, is housed in a separate

HINTS ON SEEKING FOREIGN BUSINESS.

An expert salesman writing in the Engineering Magazine for June gives some excellent advice to American manufacturers on what to do and particularly what not to do if they are seeking foreign markets for their goods. A brief summary is as follows:

Write to customers in their own language; in default of this write to the Frenchman, Belgian, Italian, Russian and Scandinavian in French and to the German, Austrian and Dutch in German.

Do not mimeograph letters.

Give full and concise answers to letters asking questions.

Pay an agency similar to the Bradstreet or Dun companies to advise you as to the standing of would-be customers; do not expect the American consul to do this work.

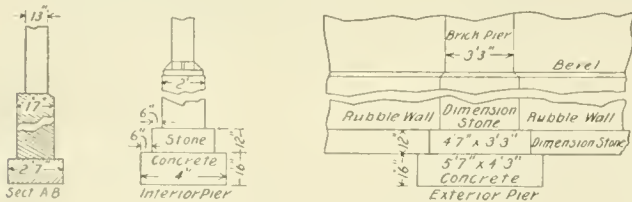
Solicit foreign business just as you would the home business by employing competent salesmen.

Do not think that foreigners are dishonest or unwilling to pay for goods ordered.

Do not neglect the export trade because the domestic business is good.

The Pueblo Electric Street Ry. has been reorganized, the new name being the Pueblo Traction & Electric Co.

A conductor in the employ of the Buffalo, Kenmore & Tonawanda Electric Railway Co. caused the arrest of a noted criminal recently. He saw the man drive past his car in a carriage in the direction of the depot, and immediately telephoned the police.



PIER FOUNDATIONS.

building 150 ft. from the barn. The installation is of sufficient capacity to heat not only the car house but also a work shop that the company intends to erect shortly. The figure, \$11,000, given as the cost of the building does not include the expense of putting in the heating system.

The cable conduit and tracks on Grand avenue, Kansas City, Mo., have been moved bodily to one side of the street to make room for new tracks. Greased skates running on rails were inserted beneath the yokes and the conduit forced over by jacks.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

MUST LOOK OUT FOR CARS HIDDEN BY TREES.

Kelley v. Wakefield & Stoncham Street Railway Co. (Mass.), 56 N. E. Rep. 285. Mar. 1, 1900.

There is, the supreme judicial court of Massachusetts says, no absolute rule of law requiring a traveler to look and listen before crossing the tracks of an electric railway in a public highway. It also says that his conduct is not to be judged of in the light of what has happened, but in the light of the circumstances as they at the time presented themselves to him, and he cannot fairly be charged with the result of arithmetical calculations after the event, by persons not confronted with the necessity of action. Yet, notwithstanding this, it holds guilty of contributory negligence a driver of a grocer's wagon who looked for a car only once, and that when he had reached, on a cross street, a point about 80 feet from the track which he was approaching, and neither looked nor listened at all at any time for any car that might when he did his looking be temporarily hidden behind an impenetrable row of pine trees so placed that he could see beyond its further end, but coming from behind which such car would reach the crossing just about the time he did.

OPERATING CAR IN UNUSUAL MANNER AND INJURING PASSENGER ON RUNNING BOARD.

Citizens' Street Railroad Co. v. Hoffbauer (Ind.), 56 N. E. Rep. 54. Jan. 9, 1900.

It is a well-settled rule, says the appellate court of Indiana, that a carrier of passengers is held to the highest degree of care and diligence for the safety of passengers consistent with the mode of conveyance employed. But the duties imposed by the law upon those who operate steam railways are not the same as those imposed upon those who operate street railways. And the principles of law which govern these two systems of transportation are not altogether the same, although many general rules are applicable to both.

A street railway engaged in the carriage of passengers, the court goes on to state, is not an insurer. But it must use every reasonable precaution in the management and operation of its cars. And its duties in this regard are not the same when it is operating its cars in the usual manner as when in an unusual manner. If the car is run in an unusual manner, and a danger arises therefrom which does not ordinarily exist, it is the company's duty to warn passengers of such danger. A passenger has the right to presume, in the absence of knowledge or warning to the contrary, that all necessary precautions have been and will be taken for his safe transportation. The care and vigilance required in operating an open car may be greater than that required in operating a closed car. If a danger approaches of which the passengers are ignorant, they should be notified, so they may take steps to avoid it.

Take this case. A man, anxious to get to the city to keep an appointment, boarded, as it was growing dark, an open car running, where there was but a single track, towards the center of the city. But the car was at the time going backwards. Soon the man found that the car was carrying him away from his destination, and was running head end first, as cars usually run. The conductor was at the rear end of the car. He had paid his fare to the city, and wanted a transfer. Having had no warning of danger, he left his seat and stepped upon the running board to go to the conductor to get the transfer. Unfortunately, however, the car was not then running upon the track which he supposed, but upon a track which brought the side of the car he was on near the poles along the track, which was here double, and he was struck by one of the poles.

Now the court says that it is evident that a passenger might leave his seat in the car, and go upon the running board, under circumstances which would require a court to say, as matter of law, that he was guilty of negligence, and assumed the risk of contact with things outside the car. But under such conditions and circumstances as here stated it declares that it cannot say, as matter of law, that the passenger's own negligence contributed to his injury. It was a question for the jury, which, in this case, not only answered it in his favor in the general verdict, but, in answer to an interroga-

tory, said that, under all the circumstances, the passenger, at the time of the injury, exercised such care as would be exercised by an ordinarily prudent person under like circumstances.

Furthermore, the court holds that there was no error in permitting witnesses to testify that the usual and ordinary use of the running board was for passengers to go from one part of the car to another, and that passengers used the running board for that purpose. The company could not daily permit a certain part of its car to be used for certain purposes by passengers, and then be heard to say it was not liable for an injury to a passenger so using the car because that particular part was constructed for another purpose.

When this passenger went upon the foot board, the court holds, he took upon himself the duty of looking out for himself against the usual and obvious peril of the place, as long as the car was operated and managed in the usual manner. But the danger of being hit by a trolley pole while on the foot board was not such a danger as he was bound to anticipate when the car was running in the unusual manner of having the foot board next to the trolley poles, and he had no knowledge that it was so running. In the absence of knowledge, he had the right to assume that the car was properly managed, and was running with the foot board away from the poles, and that there was no danger from trolley poles while on the foot board. His failure to look ahead was not necessarily negligence, unless he had reason to anticipate danger. He had the right to assume that the company was running the car in the usual manner, and that it would perform its duty in guarding the safety of its passengers.

However, the court reverses a judgment which the passenger obtained because of what it considers the too great breadth of an instruction which told the jury that if it found the two facts, namely, that the car was on the wrong track, with the running board next to the poles, and that the passengers were not warned, negligence was shown, which, it holds, was taking from the jury the question which the latter should have decided from all the facts and circumstances existing at the time.

LIABILITY WHERE PASSENGER IS THROWN THROUGH WINDOW WHEN WHEEL BREAKS AND OTHER PASSENGERS TESTIFY TO EXCESSIVE SPEED.

Johnsen v. Oakland, San Leandro & Haywards Electric Railway Co., Consolidated (Cal.), 60 Pac. Rep. 170. Feb. 21, 1900.

Where a passenger upon an electric street car was thrown across the car, against and through the window on the opposite side of the car from where he was sitting, the supreme court of California holds that the jury may well have said from the evidence that this would not have happened if the car had been traveling at a proper and lawful rate of speed, and holds that it was justified in finding that the proximate cause of injury was the excessive rate of speed, notwithstanding the flange of one of the wheels of the car may have broken, while it was upon a curve, and the car left the track. In other words, the court holds that it cannot be said, as matter of law, where such an accident happened, that, if the speed of the car had been but eight miles per hour, the passenger would still have been precipitated through the window of the car, and have received the injuries suffered.

Moreover, having thus settled that the defective wheel was not necessarily the sole cause, or to any degree the direct and proximate cause of the injury, the court holds that, even conceding a latent defect in the wheel, and the exercise of the proper amount of care in selecting and using the wheel by the defendant company, still, the passenger's cause of action might be full of merit, and presented a proper case to go to the jury upon the question as to the proximate cause of the injury.

Then it was argued that the various other passengers who were riding on the car at the time the accident occurred, who were introduced as witnesses by the plaintiff to show the rate of speed the car was traveling, were not competent to give an opinion upon that question. But, in view of the fact that they were regular travelers upon this line of cars, and that the schedule and statutory time was eight miles per hour, the court holds that there could be no question

but that the testimony given by them to the effect that the car was going very fast, and at an unusual rate of speed, was proper evidence to go to the jury. And, indeed, the court says, the law recognizes a very broad and liberal rule in the reception of opinion evidence of nonexperts as to the rate of speed cars may be traveling. To this it adds that the fact that these witnesses were passengers upon the car, rather than bystanders, did not bar them from testifying in this respect, they having only given an approximate opinion as to the rate of speed the car was going at the time, while they were fairly intelligent, and had at least made casual observation as to the speed of the cars at other times.

EXTREME CARE MUST BE EXERCISED TO PROTECT WORKMEN ON TRACK.

Bengivenga v. Brooklyn Heights Railroad Co. (N. Y.), 62 N. Y. Supp. 912. Mar. 6, 1900.

An employe of an asphalt company, who was carrying a shovelful of hot asphalt ready for deposit between the rails of the track of the railroad company, waited for a car to pass, which came along just in time to prevent its deposit, and then stepped between the tracks to deposit the asphalt, when he was struck by a freight car, which followed the passenger car. The evidence also tended to establish that the car which struck the man gave no signal of its approach. He got judgment for damages, against the railroad company, which the appellate division, second department, of the supreme court of New York affirms.

Under ordinary circumstances, the court says, it is quite probable that upon the evidence the man would have been held to be guilty of contributory negligence, as matter of law, had he been a traveler upon the highway. But the court does not think such result should follow under the peculiar circumstances of the case. It holds that the railroad company was chargeable with notice of the fact, both by its contract to repair the street and its actual condition, it being torn up, that workmen were upon the track at this point, and were required to be, in order that the work might proceed.

It is evident, the court goes on to say, that the operation of the cars created a condition in which this man and those engaged upon the improvement were required to work in the intervals between the moving cars upon the track, and, under such circumstances, would remain thereon many times until the car came very close upon them. The condition was one where the person operating the car was required to exercise extreme care for the protection of the workmen, and it is evident that abundance of warning was required. The car was also required to be under such control as that it could be stopped practically upon the instant. A finding being authorized that no warning of any description was given of the approach of this car, the railroad company's negligence was established.

Whether the man should have observed the car, or not, became a question of fact for the jury. Yet, as the condition was one where he had the right to assume that warning would be given, and as the prosecution of the work required that the asphalt should be deposited while hot, the court says that it is quite evident that the operation of the car was to be had with regard to the man's being between the rails of the track; and it thinks that he might rely upon the fact that the operator of the car would stop the same when it reached the point where he was upon the track. But whether, under such circumstances, he ought to have immediately looked, after the passage of the first car, or whether he was justified in relying upon the assumption that the railroad company would discharge its duty to give warning of the approach of the car, and stop the same before working an injury, was, the court holds, a question of fact for the jury. The returning of a verdict in his favor, shows the latter's view of it.

CASE MADE WHERE PARTY DRIVES INTO UNNOTICED SAGGING WIRE ON STREET.

Lloyd v. City & Suburban Railway Co. (Ga.), 35 S. E. Rep. 170. Mar. 2, 1900.

As a physician and his servant were going along in a vehicle drawn by two horses at an ordinary gait,—a slow trot,—the servant driving, they encountered, at a cross street, a wire, belonging to the street railway company, which had sagged from the poles and was swinging at about the height of the horses' necks from the ground.

The wire touched the horses' necks as they were driven under it, and caused them to jump, and to move forward more rapidly. Then, passing over the horses, it struck and caught the doctor and the driver, and injured them, as well as cut off the top of the vehicle.

Both of the men testified that they did not see the wire until it had struck the necks of the horses. The driver testified that he was looking straight forward along the street, as it was his duty to do, but did not see the wire until the doctor made an exclamation and threw up his hands, the wire then being within twelve inches of his face, yet that he could have seen it 100 yards, if his attention had been directed to it. The doctor, according to the evidence, was not looking ahead, but, as was his custom, relied upon his driver to look out for obstructions, etc., on the road or street. There was no evidence as to the length of time the wire had been allowed to remain swinging across the street. Nor was there any evidence as to what caused it to sag from the poles. Moreover, the evidence disclosed that, from the time the wire was seen by the doctor until the time it inflicted the injuries, the occupants of the vehicle could not stop the horses or avoid running against the wire.

Under this state of facts, the supreme court of Georgia holds, it was error to grant a nonsuit in the actions brought by the doctor and his servant, respectively, to recover damages.

It is a general rule, the court says, that, when a person sees that he is in danger in consequence of the negligence of another, he is bound to avoid that danger, if he can do so by the exercise of ordinary care; or, if he has reason to apprehend danger occasioned by another's negligence, he must exercise ordinary care to avoid it. But whether a person who is in the habit of traveling the streets of a city day after day, and these streets are clear of obstructions, ought to see a wire the size of the little finger, when he is looking straight ahead in the direction of the wire, and, could have seen it a much greater distance, if his attention had been called to it, is, the court thinks, a question for the jury, and not for the court. And, assuming that the jury would find that the plaintiffs in these cases ought, by the exercise of ordinary care, to have seen the wire, this, the court holds, would be conclusive that there was negligence on their part; but still, if the defendant was also negligent, and the plaintiffs' negligence was less than that of the defendant, they could recover damages, if, after seeing or having reason to apprehend the danger, they could not then have avoided it by the exercise of ordinary care.

MAY EXPECT ONE WILL CEASE TURNING TOWARDS TRACK WHEN GONG IS SOUNDED.

Cawley v. La Crosse City Railway Co. (Wis.), 82 N. W. Rep. 197. Feb. 27, 1900.

A motorman has a right to expect, the supreme court of Wisconsin holds, that a person in a buggy turning towards the track in front of his car will respond to the gong and cease such movement, and is bound, as an ordinarily careful man, to exert efforts to stop his car only after the contrary becomes apparent.

FRANCHISES ARE NOT LIKE PROPERTY HELD IN TRUST.

State v. Superior Court (Wis.), 81 N. W. Rep. 1046. Feb. 27, 1900.

In holding that a court of equity has no jurisdiction to restrain a city council from exercising a discretionary legislative power vested in it to grant corporate rights and franchises, the supreme court of Wisconsin makes the point that such corporate rights and franchises are not like a fund or property held in trust for the citizens and taxpayers of the city.

FAILURE TO GIVE TIMELY SIGNALS EVIDENCE OF NEGLIGENCE.

Dennis v. North Jersey Street Railway Co. (N. J.), 45 Atl. Rep. 807. Feb. 26, 1900.

It is not error in a trial judge, the supreme court of New Jersey holds, to charge the jury that, if the motorman operating on the public streets an electric street railway car, on which a bell or gong is maintained to be rung or sounded as a signal of danger, fails to give timely signals of danger in approaching a street crossing which he intends to cross, such failure is evidence of negligence on the part of the motorman.

CONTRIBUTORY NEGLIGENCE OF PASSENGER INJURED ON RUN BOARD BY OUTSIDE OBJECT.

Flynn v. Consolidated Traction Co. (N. J.), 45 Atl. Rep. 790. Feb. 26, 1900.

There was evidence in this case from which the jury might infer that the plaintiff, a passenger on a trolley car, had notified the conductor of his desire to alight; that the car had slowed down; that the passenger had got upon the run board, in preparation to alight; that the car then increased its speed, and that the passenger, in endeavoring to again signal the conductor, leaned over so far that his head was brought into contact with the handle of the door of a milk wagon proceeding in the same direction with the car; and that he thus received the injuries for which he brought suit.

In making absolute a rule to show cause why a new trial should not be granted, after verdict for the plaintiff, the supreme court of New Jersey holds that on taking such a position the passenger was under a duty to use his powers of observation, and observe and avoid dangers ab extra, as it calls them, or from without, and that the evidence that he leaned over so far as to be carried against a passing vehicle, which he did not observe, and which, if he had used observation, he could have observed and avoided, established his negligence contributing to his injury.

It does not decide, but propounds as a query, whether, in respect to dangers ab extra, or from without, not created by the carrier, nor the result of the construction or operation of its road, it is negligence per se, or in and of itself, in the passenger to take a position on the run board of a car. And yet it does intimate that the true rule might be that a passenger who is invited to take passage in a street car so full of passengers that he is obliged to stand on a run board, is not to be considered as negligent with respect to dangers arising from the construction of the car, or its operation by the carrier and its servants, but that the passenger may be considered negligent with respect to dangers which may be said to arise ab extra.

APPERTAINING TO FORECLOSURE OF TRUST DEED AFTER A DEFAULT.

Rumsey v. People's Railway Co. (Mo.), 55 S. W. Rep. 615. Dec. 19, 1899.

In a suit to foreclose a trust deed on the property of a street railway company, the supreme court of Missouri holds that where there is no pretense that bondholders not made parties have any interest in the bonds which the trustee named in the deed does not represent, or that he is not acting in good faith, whatever forecloses the trustee, in the absence of fraud or bad faith, forecloses them, without their being made actual parties. But where the petition to foreclose is in behalf of all the bondholders who may desire to become parties to the suit, it holds that it is their right and within the province of the court to permit them to intervene.

It also holds that a clause in such a trust deed declaring the bonds due on default of payment of one coupon for 30 days is self-executing, as it is termed, valid, and will justify a decree for the full amount of the bonds.

Nor does the court consider that a decree of sale under foreclosure proceedings is vitiated because, while it provides that the property be sold to the highest and best bidder for cash, it also provides that the bonds and coupons secured by the mortgage deed of trust may be put up, to amount which they may be proportionately entitled to, in payment by the purchaser or purchasers. It maintains that if the purchaser has the requisite bonds, in payment of which the proceeds arising from the sale of the property are to be applied that there is no reason to go through the useless ceremony of paying cash on the bid, and then taking up the bonds with the same cash.

Neither does the court think that such decree can be said to be erroneous in ordering the sale of the property by a special commissioner, the statute not prohibiting it and it not being an unusual way for the conducting of such sales when made under decrees of courts of chancery.

An appointment of a receiver having been acquiesced in by all the parties to a suit for more than a year after it was made, the court holds that they must be held to have waived any irregularity if any there was in the appointment. One reason given for

this is that an application for the vacation of an order appointing a receiver must be made in a reasonable length of time.

Evidence touching the relations of the president with, and influence over the board of directors of the street railway company, the court pronounces mere matter of opinion, and not admissible for any purpose.

CONSTRUCTION OF INHIBITION AGAINST CONSOLIDATIONS INJURIOUS TO COMPETITION.

Trust Co. of Georgia v. State (Ga.), 35 S. E. Rep. 323. Feb. 27, 1900.

That portion of paragraph 4, section 2, article 4, of the constitution of the state of Georgia which denies to the general assembly "power to authorize any corporation to buy shares or stock in any other corporation," the supreme court of Georgia holds is not absolute in its terms, but was designed only to prevent the general assembly from authorizing one corporation to purchase shares of stock in another when doing so "may have the effect, or be intended to have the effect, to defeat or lessen competition in their respective businesses, or to encourage monopoly."

This clause of the constitution, the court goes on to say, applies to and includes all corporations, and consequently is applicable to street railway companies, and enforceable as to them whenever they directly or indirectly violate its provisions.

However, in interpreting what is meant by "competition" in this connection, the court suggests that it is well enough to bear in mind that there is a vast difference between the business of street railway companies, constructed generally simply for the purpose of passenger travel from one portion of a city to another, and steam railroad companies, whose business is the transportation of freight and passengers for long distances, and involving business in extensive territory. And it does not consider it violative of the constitutional provisions for a consolidation of street railway lines to be effected where it will probably lead to granting the public generally along their routes greater and less expensive facilities and conveniences of transportation. Such a case it maintains was one where, with the disconnected lines, a passenger, by paying the usual fare of five cents, could go only in one direction, and only to a point on the line which he first took; but, with the separate lines connected, one could start upon any line of the system, and for the same fare, by procuring a transfer to any other line in the system, he could reach at the same expense any point upon any of the lines that were controlled by the entire system.

LIABILITY FOR INJURY TO EMPLOYEE FROM DEFECTIVE CAR.

Murdock v. Oakland, San Leandro & Haywards Electric Railway Co. (Cal.), 60 Pac. Rep. 469. Mar. 6, 1900.

To furnish a car for the use of the public, or even for the use of the motorman and conductor, which is in such defective condition that it starts with a jump or jerk, or will make sudden lunges, so that if started before passengers are seated they must be steadied by the conductor, and the employes must brace themselves to escape injury, the supreme court of California holds, is clearly negligence. Indeed, in one part of its opinion it says that it was gross negligence to send out such a car for the patronage of the public.

Nor does the court consider that a nonsuit was justified where a conductor went to work upon such a defective car, not knowing at the time it was defective, but soon after discovered the defect, and that the use of the car was surrounded with some danger, and thereupon continued work for the period of an hour or more until he was injured. It says that if the employe, upon the discovery of the defect, had at once made complaint to the company, and had been promised that it should be remedied, clearly he would have been justified in continuing work for a reasonable time in expectation that the promise would be kept; and what would be a reasonable time is a question of fact for the jury. Again, the employe clearly had a reasonable time in which to make complaint to the company of the defect, and that, too, would be a question of fact for the jury. So the court holds that whether the conductor had been guilty of that which would defeat his recovery in this case was a question of fact, and not of law.

The employe, the court goes on to say, certainly was not bound to stop and leave the car at the moment he discovered the defect, regardless of the number of passengers, and regardless of the lo-

cation of the car upon the track as to its distance from the power house or other cars. The dangers surrounding its further use by the employe should be great in order to justify such a course of action. There was no such great danger here. These being the principles of law bearing upon a state of facts like those in this case, the court holds that it was a question of fact for the jury to say whether the conductor should have made complaint at once, or, as a reasonably prudent man, might have waited until noon to make complaint, or delayed until night, or still have delayed an additional length of time.

It will thus be seen, adds the court, that an employe is not barred from recovering damages in every case, as matter of law, when he knows a defect exists in the appliance, and that there is a certain amount of danger surrounding its use. He is not bound, as matter of law, to stop work instantly in all such cases. If the exercise of ordinary prudence demands that he stop work at once, he must stop, but, if otherwise, he should make complaint to the employer of the defect, and for a reasonable time thereafter cannot be held as matter of law to have assumed the risk.

Judgment for defendant, upon motion for nonsuit, reversed.

LIABILITY WHERE ATTORNEYS' FEES ARE ASSUMED ON COMPROMISE.

Pilkington v. Brooklyn Heights Railroad Co. (N. Y.), 63 N. Y. Supp. 211. Mar. 13, 1900.

A party who claimed to have a cause of action against a street railroad company made a written contract with his attorneys, by which he agreed that they should receive for their services one-third of any sum for which the case might be adjusted, and that neither party should settle the case without the consent of the other. Accompanying the summons and complaint was a notice to the company, signed by the attorneys, that they claimed a lien in accordance with this agreement. The company effected a settlement with the party for \$2,600 and agreed with him, in writing, "to adjust any claim for costs or for any lien upon the cause of action which the said attorneys may be able lawfully to establish."

In this latter feature, particularly, the case seems to be different from most, or all, of the cases in the books. In deciding it, the appellate division, second department, of the supreme court of New York holds that the attorneys were entitled to one-third of \$2,600; that their client was still under a valid obligation to pay them that sum, and that what the company contracted to do was to assume his liability, and so assume it as to finally release and discharge him, and that it could not be assumed that the company intended only to agree to pay or adjust such lien as the attorneys should be able to establish against it by a continuance of the litigation or otherwise.

But this being settled, the court does not consider that the performance of the agreement could be enforced by a summary order, disobedience of which could be punished as for a contempt. Nor does it think that this was made otherwise by the amendment to section 66 of the code of civil procedure to the effect that "the court upon petition of the client or attorney may determine and enforce the lien." That, it holds, does not confer power to determine and enforce a stipulation in the action not between attorney and client, although relating to the former's lien.

To sum up, the court says that the attorneys have their claim against their client, who has a fund of \$2,600 on which they have a lien for their compensation; and in addition they have the company's written agreement, made for a valuable consideration, binding it to pay and discharge this claim and lien, and which is enforceable by action. Or they have the undoubted right, supported by numerous and uniform decisions, to proceed to judgment in this action for the protection and enforcement of their liens, either by default in case no answer has been served, or in the usual way if the action is at issue.

REQUIRED SALE OF TICKETS OUTSIDE OF CORPORATE LIMITS AND USING COUPON TICKETS.

Rice v. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 81 N. W. Rep. 927. Feb. 20, 1900.

By the terms of a village franchise the duty was imposed to sell five tickets for 50 cents, good between a certain point outside of said village and any point in the village. The franchise further provided, "All such tickets shall be kept for sale upon each and

every car operated by it." The company contended that the franchise was in force only within the territorial limits of the township, and did not cover territory in other townships. But the supreme court of Michigan does not think that this contention can be sustained.

The court holds that the franchise was in the nature of a contract, and imposed obligations upon the company which those having the right to ride between the points mentioned in it had a right to enforce. It says that the company saw fit to contract with the village for a rate outside the limits of the village, and to agree that tickets should be sold on its cars, and that this contract it could not repudiate. The tickets must be kept for sale on the cars at any point on the line, intermediate as well as terminal.

To illustrate, the tickets which the company was accustomed to sell consisted of two parts, applying to and from a point in a township intermediate between the two terminal points stated. A passenger asked to buy a strip of the five tickets at this intermediate point, having ridden on a part of ticket that he had up to such point, and the court holds that his right under the village franchise in question was not different than it would have been had the franchise of the intermediate township been silent on the subject of fares, and that he was entitled to buy the tickets at such point.

But it was urged that no damage was shown, for the reason that the tickets which the company was accustomed to sell, consisting, as they did, of two parts, were not the kind of tickets required by the franchise, and that the company was not required to accept the strip or coupon from the intermediate point to the village, but was only required to furnish a through ticket. The court replies that it might be a sufficient answer to say that a failure to sell the tickets to the passenger when demanded entitled him to nominal damages, at least, and that no more than nominal damages were awarded in this case; but, it goes to state, a further answer was that the company had placed its own construction on the requirements, and had provided tickets to suit itself. The passenger was entitled, by means of such tickets, to a ride between the two terminal points for 10 cents. He sought to obtain it by means of the only tickets kept by the company for sale. One part of such a ticket had been given up, and, if he had been able to obtain the tickets requested, the remaining portion could have been paid for with the other coupon. Hence, the judgment given for 5 cents, the amount sued for, and costs, was affirmed.

PHYSICAL EXAMINATION OF PLAINTIFF IN CASE IN UNITED STATES COURT.

Camden & Suburban Railway Co. v. Stetson (U. S.), 20 S. C. Rep. 617. Apr. 9, 1900.

It is settled in the supreme court of the United States that no power to make an order for the surgical examination of the plaintiff in an action to recover damages for injury to the person exists at common law; in other words, that the court has no inherent power to make it. But the supreme court now holds that where the state in which the United States court trying such a cause sits has a law which provides for the making of an order for the examination of the person of the plaintiff in a case of that character, the law of the United States (section 721 of the Revised Statutes) applies that law to that case; in fact, to all cases of such a nature on trial in Federal courts sitting in that state. Moreover, such a statute as the New Jersey act of May 12, 1896, on the subject, it does not think violates the federal constitution. Nor does it consider that the citizenship of the plaintiff at the time of the injury is material, so long as the United States court that tries the case has jurisdiction thereof and the parties at the time of the commencement of the action.

THE COLOR LINE IN NEW ORLEANS.

The railroad committee of the Louisiana Legislature has reported favorably a bill compelling all street railway companies in New Orleans to provide separate cars for whites and blacks. It is said the companies will offer no opposition and the bill is expected to pass both houses.

An ordinance has passed the Kansas City Board of Aldermen requiring all street railway companies operating in the city to sprinkle between their tracks.

The Functions of Modern Tramways and What Glasgow is Doing Towards Their Fulfillment.

BY JOHN YOUNG.

This paper was read at the meeting of the Tramway and Light Railway Association at the International Tramway and Light Railway Exhibition, June 27, 1900. Mr. Young is general manager of the Glasgow Corporation Tramways, and is largely responsible for their satisfactory development and operation. In his introduction the author touches upon the backwardness of the rulers and proprietors of the British Isles in road building, and reviews the development of road transportation up to the time of the modern tramway, which means an electric tramway. The most perplexing question for municipalities and boards of health, is the housing problem, and for this the electric tramway offers a ready solution. Electric tramways are safe and comfortable means of transport, but to fulfill their functions properly the unjust speed restrictions should be removed. One of their greatest benefits is that they economize the streets as the author illustrates by the experience of New York. The paper concludes with a brief resume of the history of Glasgow tramway lines and the results obtained from their operation.

Tramways are practically the latest development of road-making. It took the inhabitants, or perhaps I should say the rulers and proprietors, of these islands long centuries to realize the enormous importance of roads for the development of the country. Their backwardness in this regard seems the more inexcusable when we consider the object lesson given by the Romans during their occupation. At any rate, the fact remains that it was only about the middle of last century that the construction of roads for carriage traffic was really undertaken. I believe the first carriages or coaches seen in this country appeared in the latter half of the 16th century. The pack horse, however, continued as general goods carrier until a couple of centuries later, and it was only in our own grandfather's time that the horse track was being developed into a road for carts and wagons, and the beast of burden into a draught horse.

I presume the metropolis would, in the earlier times, have the best roads in this country. This makes it all the more difficult to realize the recorded fact that "so late as 1736, the roads in the neighborhood of London were so bad that in wet weather a carriage could not be driven from Kensington to St. James's Palace in less than two hours, and sometimes stuck in the mud altogether."

I need not follow closely the process of road-making. Now in our county and suburban districts we have the improved roads of Telford and macadam, perfected by the steam roller; and for our city streets, the cobble stones have been superseded by square dressed sets, wooden blocks and asphalt. In order to get the fullest use of the streets, however, something more has been found necessary than simply to improve their surface. In this age of unprecedented progress, people had become impatient of the old means of locomotion. They had become so accustomed to fast, comfortable, and even luxurious railway traveling that something on rails, smoother, as well as faster, than coaches and buses, was demanded. Hence the introduction of tramways, or street railways as they are more appropriately called in America.

Although to this country belongs, I believe, the credit of the first tramways, their adoption and rapid development in America have given our enterprising cousins the right to claim that their country is the real home of tramways. I do not wish in any way to detract from their rightful claim, but there is one simple reason why tramways "caught on" so rapidly in America. It is in the fact that, the country being comparatively new, the paving of the streets was in most cases so primitive and rough that, once our friends got the idea of the "street railway," it became evident that to lay rails on wooden sleepers was the readiest way for them to arrive at smooth riding on their streets, and they did not hesitate.

But it is of modern tramways that I have more particularly to speak. In the ordinary acceptance of the word "modern" it is the opposite of ancient. In this country we are apt to think of anything ancient as belonging to the dark ages. When we speak of Ancient Britain we mean Britain about the beginning of the Christian Era. This comes of our living in a country with a history. It is rather different in the new countries where so many of the brightest and best of the sons of these isles have made their homes. There you hear men talking in fatherly tones of the "old days" when referring to matters which occurred half a dozen years ago. It is when the visitor, whose hair may happen to be turning gray, looks at the speaker and finds him to appearance not far gone in the twenties, that he realizes that he is from home. When tramways or street railways are spoken of anywhere, what happened six or eight years ago is ancient history. That being so, the term "Modern Tramways" must be taken to mean tramways that are quite up-to-date.

It is only now that the people of this country are awakening to

the important part which modern tramways are calculated to play in catering for the wants and requirements of communities. The object lessons on electric traction, which have recently been given in a good many of our cities and towns have worked wonders. The men who took part in the pioneer reporting and working in favor of it had to exercise both persistence and patience, but what they foresaw has now come with a vengeance.

Even with horse traction the usefulness of tramways on the public streets and highways for carrying the people from point to point was fully demonstrated, especially in a few of the larger cities. The limits of such a system were, however, very apparent. The cost of a horse tramway service and its speed necessarily limit it to districts closely populated. It can scarcely be said that steam cars or oil motor cars have been more successful or more popular than horse cars. Some eight or ten years ago the cable system was strongly advocated in this country, but even then electric traction had taken such a strong hold in America that the revolution in street railways and street railway interests had already begun, just as it has here now. From that time cable cars have been gradually disappearing in favor of the bright, flexible, and universally popular electric cars. We may, therefore, take it that when we speak of modern tramways we practically mean electric tramways.

What is it that we expect modern tramways to do for us? Obviously their great function is to provide the best and cheapest possible facilities for conveying the inhabitants of populous places from one point to another on the public streets or highways. Tramway traffic is necessarily local, and for comparatively short distances. You have only to give the facilities, however, and the whole population seem eager to take advantage of them, some for business, some for pleasure, and many for both. Modern tramways are, perhaps, the most democratic of all modes of transportation. They are practically brought within the reach of and are used by the whole community without distinction, just as the public streets are.

During my time no question has been more perplexing to large corporations and boards of health than the housing problem. I look upon electric tramways as a godsend to them. No other agency has come to their hand which can be made so powerful and effective for spreading population and lessening that congestion which had wrought so many evils in our cities. Surely it is a great boon if we can, upon any or all of the leading thoroughfares, convey the workers in our cities comfortably, expeditiously, and at a merely nominal fare for any distance up to say five or six miles, and so give them and their children a chance of living in homes where they can have fresh air and healthy surroundings.

Railway companies—all credit to them—have done much in the direction indicated, and there is still room for them to do more. Railway passengers, however, are chiefly those who travel some considerable distance, and tramways act both directly and indirectly as feeders to railways. We undoubtedly must look to electric tramways as the chief means of handling the great local highway traffic of a city population.

The prizes offered by the promoters of the present exhibition point to two of the requirements of a tramway service. A "fender" suggests safety, and a "dry seat" comfort.

Electric cars may be generally considered quite as safe as horse cars. When any mistake or accident takes place, however, there is greater chance of the consequences being serious. We certainly want the best fender we can find, and all the car equipments must be day by day maintained in perfect order, but for safety we must rely very much upon the competence, the sustained alertness, and the good judgment of the drivers.

With regard to comfort, I think our electric cars, running on

well-constructed permanent way with well-jointed 60-foot rails, do not leave much to be desired. On the question of seats, I do not approve of upholstery. A well-formed inside seat is quite comfortable for a short distance without a cushion, and is much better from a sanitary point of view. Top-seated cars may now be looked upon as standard in this country, and I hope the competition at the present exhibition will hasten the adoption of a top seat which is otherwise satisfactory and always dry.

It is, of course, essential that tramway fares should be as low as the operators can reasonably afford. I shall have occasion to refer to this point further on, when speaking of what Glasgow is doing.

City people nowadays look upon it as a calamity if they have to wait more than a couple of minutes for a car. The service must, therefore, be as close as the traffic will justify, and at regular intervals. Of course, the other requirements of an expeditious service are that there should be the least possible delay in stopping and starting, and the cars should run as fast as well-regulated street traffic will safely permit. The modern electric car in the hands of a trained motorman, is a perfect marvel in its flexibility and elasticity of movement.

The speed at which a tramway car should be permitted to run should depend upon the power you have of controlling and stopping it, and also upon the nature and amount of the other traffic on the street. On this point I would, with all due respect, make a remark on the restrictions placed upon the operating of tramways in this country by the Board of Trade. In my opinion they are unnecessarily stringent in the matter of speed. The maximum speed allowed—eight miles an hour—is all right in the busy central parts of a city, but with a clear headway on a good street or suburban road, such a restriction for an electric car, which is so completely under control, is quite unnecessary to secure safety. Surely a car on grooved rails should be allowed to run faster than a vehicle which, having no such guide, can go meandering all over the street to the danger of the lieges. But it is not so. The speed of a butcher's cart seems only to be restricted by the possible pace of the horse, or at best by what a policeman may consider reckless driving. A gentleman may drive at the rate of twelve miles an hour in his dogcart; a motor car may go whirring along at 14 or 16 miles an hour, or a bicyclist as fast as he likes; but an electric car—the safest and best carriage for the general public ever invented—must not go faster than eight miles an hour. Under the present regulations, electric tramways cannot, in my opinion, confer upon the people the fullest benefits of which they are safely capable.

One great benefit of modern tramways is that they economize space upon the streets. This is not so fully realized as it should be. Some people still seem to retain the idea that the opposite is the case. It is quite clear, however, that even horse cars economize space as compared with the buses and cabs necessary for the same traffic. Very much more is this the case with electric cars, which make better time and save the whole space occupied by the horses.

Perhaps the best proof of this is to be found in Broadway, New York, which is a very busy, though not a very wide thoroughfare. It so happened that my first visit to New York was in 1885. In the beginning of May of that year I had the privilege of traveling upon the rather primitive omnibuses which almost literally covered Broadway at that time. They were single deckers, as the cars are now. There was no conductor. The passengers simply dropped their "nickel" fares into a box upon the upper end of the bus, or passed them up for the nearest passenger to put them in. A small window admitted of the driver seeing into the bus when he chose to turn around, and there was a hole through which he could pass change to anyone who asked for it. The driver's duties were rather complicated, but he got along somehow. Although at the time I speak of there was no outward appearance of any change being contemplated, I found on my return from the Pacific Coast six or seven weeks later that the buses had entirely disappeared from Broadway. A double line of tramways had been laid during the interval, and horse cars had superseded the omnibuses. It was smart work. It must be remembered, however, that the practice in America is simply to close the street against all traffic for the time being when the lines are to be constructed or altered. In this way the whole street can be attacked at once with as many men as can find room to work. In this instance the change seemed very gratifying. Instead of buses spread all over, there was in both directions the regular and systematic line of car traffic, and it was

quite noticeable that the general traffic of the street was being conducted with greater regularity and much less appearance of crowding than before.

When I next saw Broadway, in 1896, the car traffic had greatly increased, and was being operated by the cable system, which had been installed at very great cost. Now, however, the fourth stage has been reached, and the cable is giving place to electric traction. The traffic is now enormous, but I have never seen Broadway look so crowded as it did fifteen years ago when the omnibuses had possession. And what applies to Broadway would equally apply to a similar street in any other city.

I shall now state, shortly, what Glasgow Corporation has been and is doing towards fulfilling the functions of modern tramways.

The Glasgow Corporation tramways system dates from 1871. The corporation originally constructed, and have always owned, the tramways. They have also, under the Glasgow Act of 1870, possessed powers to operate them. In the first instance, however, they leased them for twenty-three years, from 1871 to 1894. Since July 1, 1894, they have operated them as a municipal department. Twenty-two per cent of the original corporation tramways lay outside the then city boundary, traversing half a dozen suburban burghs and districts. The majority of these places were annexed to the city in 1891. Govan is the only adjoining burgh which owns tramways. This burgh owns four miles of double track, which, by an amicable arrangement, is leased and operated as a part of the Glasgow Corporation system. When the extensions sanctioned by the Glasgow Act of 1890 have been completed, the system will extend to 121 miles, calculated by single track. The lines are practically all double. Of the total of 121 miles, 34 miles or 28 per cent are outside the city boundary. In every case, the outside extensions have been undertaken by the Glasgow Corporation, with the concurrence of the respective burgh and county authorities, and at the call of the inhabitants. The authorized system now extends to Paisley on the southwest, a distance of about six miles from the center of the city, and to Barachnie on the northeast, almost a like distance. Under an arrangement with the county councils, and at the request of the inhabitants, the corporation has undertaken to ask powers next session for other extensions within the same radius. All the tramways constructed by the corporation beyond the city boundary are their property, to be maintained by them in perpetuity. The obvious policy of the corporation is to ensure facilities, such as they alone can give, for the transit of the overflow population of the rapidly growing city, and for a community which is really one, notwithstanding certain arbitrary lines of demarcation, which, sooner or later, are sure to disappear. The population served by the corporation tramways may be put down at about 850,000.

Glasgow Corporation started the municipal working of the tramways on July 1, 1894, by horse traction. They had practically no option. Electric traction was certainly in their minds, and in 1892-93 offers were taken to convert and equip some eight miles of double track for the overhead system. But the corporation had no effective powers to alter or interfere with the track before the expiry of the lease. Besides, other complications and uncertainties were so great, and the time for preparation so short, that it was only with horse traction that the corporation could be in a position to give a full service of new cars on the morning after the lessees had withdrawn their cars.

The new municipal service of horse cars proved so very popular and successful in every way that the corporation could afford to wait further developments of electric and other forms of mechanical traction. In 1896, however, representatives were sent to the most important cities in Europe and America to inspect and report on the subject. The result was that by the autumn of 1898, by way of demonstration of the overhead electric system, a small temporary power station for about fifty cars had been erected, and the Springburn section had been equipped. It was opened for traffic on October 13th of that year. So quickly was its success established that two months later (on December 28th) the corporation decided to adopt overhead electric traction for the entire system. Mr. H. F. Parshall, who was some time after called in to report, considered all the circumstances, and recommended that the tramways department should have for its own purposes one central high generating station and five substations. His scheme, which he is now retained to carry out, was based upon starting with 600 cars, but provision is made for working 1,000 cars later on. The site secured for the generating station is in many respects an ideal one. It has a long

frontage to the canal, which will be used for condensing purposes. The two leading railways, which command the coal supplies, have each a branch entering the station, and the coal receiving and handling arrangements will be very complete and economical in working. There will be four 4,000 horsepower engines and generators, with room for two more within the building, and all the necessary auxiliary and subsidiary plant and accessories.

Five of the existing district depots are suitably situated and are being adapted for the substations. The laying of ducts and the renewal and conversion of the track is already well advanced. The first of the large engines is expected to be running early next year, and we anticipate that the bulk of the system will be operated electrically when our forthcoming Glasgow International Exhibition is opened in May next. Of course, we expect everybody to be in Glasgow at that time. As regards tramway men, we are glad to see them at any time.

At present, in operating the five miles of double track from our present temporary power station, I think we are fairly fulfilling the functions of modern tramways.

So far as we have gone we have had no more serious accidents than with the horse cars. I am sure the dense crowds through which our cars operated while our novel illuminated car was being displayed over the route on two successive nights after Pretoria was occupied by our troops, will bear witness to the ease and safety with which the electric cars can be handled.

The comfort of our standard double-decked electric cars seems to meet every reasonable want. We are now turning out from three to four, and will soon be increasing the number to five of these new cars per week from our own car works, besides doing all our own repairs. Next spring we hope to convert and equip over 100 of our horse cars for electric traction.

As regards expedition, we are doing our best under the restrictions already referred to. We only stop the cars when required at fixed stopping places, which are indicated by a plate on the side pole. These are on an average about 200 yards apart. This plan is safer as well as more expeditious than stopping anywhere, and passengers now take quite kindly to it.

The greatest attraction of our tramway system is its cheapness. We started in 1894 with halfpenny fares on every route in the city, and thus developed an entirely new short-distance traffic. In this way the greatest good of the greatest number seems to be effected. Practically all our cars run through the central district of the city from one extreme to another. In that central area there is necessarily a very close service on all the routes. At some points three cars pass each way every minute. With such opportunities given them, people naturally step on and take their halfpenny worth to save them walking even a very short distance. The halfpenny fare has also developed a large meal-hour traffic. Thousands now go home for meals who formerly did not. The present average halfpenny stage is rather over half a mile (.58), and any three consecutive halfpenny stages, or about 1¾ miles, can be traveled for 1d. We can well afford this, even with horse traction. In point of fact, the lowering of fares seems to have increased our net revenue. The average fare taken per passenger is ¾d. Every third passenger (30.3 per cent) pays only ½d., and there are 23 who pay 1d. for every one who pays over 1½d. The passengers carried and traffic receipts during the six years (the first being only eleven months) have been as follows:

	Passengers.	Receipts.
1894-1895	57,104,647	£222,121
1895-1896	86,462,594	328,827
1896-1897	98,966,658	365,761
1897-1898	106,344,437	389,216
1898-1899	118,775,668	433,128
1899-1900	127,628,484	464,786

During these six years of municipal working we have accumulated a reserve fund amounting to £169,733 after paying all working expenses, interest, statutory sinking fund, common good payment in lieu of wayleave, etc., maintenance and depreciation. (The interest and sinking fund amount to over 5 per cent on the capital we have employed in the undertaking.) This reserve will be used for the purpose of meeting expenditure in any loss on the renewing of the track, and horse line equipments caused by the change of traction. In addition to this reserve fund we have accumulated a permanent way renewal fund now amounting to £69,600.

Our experience with the small installation is that the total working expenses (including maintenance and renewals) with electric

traction is 6¼d. per car mile—it will be under 6d. with our large installation—as compared with 9d. with horse traction. There is, of course, interest on the greatly increased capital to provide for. But the anticipated saving in expenditure of 2d. per car mile is assured, and there is also a substantial gain in additional receipts. In point of fact, after deducting working expenses from gross receipts, our net revenue for the year ended May 31 last has been 2.63d. per car mile with horse traction, and 7.63d. with electric traction—a difference of 5d. per car mile in favor of electric traction; but I consider the electric routes rather more remunerative in any case than the average of the horse routes.

Electric tramways are therefore practicable where horse tramways would be commercially impossible. I have no doubt next year with the adoption of electric traction generally, our fares will be further reduced. In point of fact, my committee have had before them for some time a proposal for next year to extend the ½d. stage, which is our unit, to three-quarters of a mile. Three of these stages, with a central area which it is proposed to throw in, would make the penny stage about three miles.

The policy and object of the Glasgow Corporation is to carry the people at as low fares as possible, always keeping a safe margin for a reserve. They cannot fall back on the ratepayers for any deficit. On the other hand, there is no attempt at relieving ordinary city rates with tramway profits. The rates are imposed to pay for necessary work of various specific kinds performed for the community, and the work of each department is accounted for separately. Glasgow Corporation makes its own gas. It does not, however, ask the consumers of gas to pay more than the cost of its production, in order to lessen the police, or sanitary, or any other rates. The same with the tramways. The benefits go to the users in cheaper fares, and a better service.

INTERESTING OVERHEAD WORK.

The accompanying illustration shows an interesting piece of overhead work at one of the car houses of the Cleveland Electric Railway Co. Ten tracks are provided, and it will be noted that after passing the switch shown in the foreground only one additional switch must be thrown to reach any desired berth in the barn. The



OVERHEAD WORK. CLEVELAND ELECTRIC RAILWAY.

storage tracks branch from a main track, the switches being normally open, instead of being reached by the continued branching of Y's, which arrangement necessitates the throwing of a greater number of switches, one at every junction.

EMPLOYEES' ROOMS AT CAMDEN, N. J.

On the evening of June 11th the management of the Camden & Suburban Railway Co., of Camden, N. J., opened a club room for its employes, Mr. Walter E. Harrington, general manager of the company, making the presentation speech. The room was accepted

~TRANSITION NO. 1~

ARC	R	A	S	X	Y	R'	a	b
1	933.752	0°36'49"	0°36'49"	0.054	9.999	150.00	1.078	26.224
2	466.883	1°13'38"	1°50'27"	0.268	19.997	195.00	1.204	27.339
3	311.263	1°50'27"	3°40'54"	0.750	29.986	140.00	1.330	28.454
4	233.455	2°27'16"	6°08'10"	1.605	39.949	135.00	1.456	29.569
5	186.772	3°04'05"	9°12'15"	2.940	49.860	130.00	1.582	30.684
6	155.651	3°40'54"	12°53'09"	4.856	59.675	125.00	1.708	31.799

DATA FOR 3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.263	19.676	19.678	0°46'00"	0.273	20.318	20.320	0°46'10"
4	1.548	38.884	38.915	2°16'50"	1.662	41.014	41.046	2°19'10"
6	4.605	57.454	57.639	4°35'00"	5.107	61.896	62.106	4°43'00"

~TRANSITION NO. 5~

ARC	R	A	S	X	Y	R'	a	b
1	2431.12	0°13'48"	0°13'48"	0.020	10.000	400.00	0.406	26.274
2	1245.56	0°27'36"	0°41'24"	0.100	20.000	380.00	0.477	27.558
3	830.38	0°41'24"	1°22'48"	0.261	29.999	360.00	0.548	28.842
4	622.79	0°55'12"	2°18'00"	0.602	39.993	340.00	0.619	30.126
5	498.23	1°09'00"	3°27'00"	1.104	49.980			
6	415.20	1°22'48"	4°49'48"	1.825	59.954			

3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.100	19.880	19.881	0°17'10"	0.100	20.120	20.121	0°17'10"
4	0.594	39.594	39.599	0°51'30"	0.610	40.392	40.398	0°51'50"
6	1.791	59.115	59.142	1°44'10"	1.861	60.793	60.821	1°45'10"

~TRANSITION NO. 2~

ARC	R	A	S	X	Y	R'	a	b
1	899.94	0°19'06"	0°19'06"	0.014	5.000			7 CHORDS
2	449.97	0°38'12"	0°57'18"	0.069	10.000	120.00	0.431	16.317
3	299.98	0°57'18"	1°54'36"	0.154	14.998	115.00	0.551	17.092
4	224.99	1°16'24"	3°11'00"	0.417	19.993			8 CHORDS
5	179.99	1°35'30"	4°46'30"	0.764	24.981	110.00	0.633	17.976
6	149.99	1°54'36"	6°41'06"	1.263	29.956	105.00	0.732	18.970
7	128.57	2°13'42"	8°54'48"	1.941	34.910	100.00	0.832	19.963
8	112.50	2°32'48"	11°27'36"	2.826	39.831			

~TRANSITION NO. 6~

ARC	R	A	S	X	Y	R'	a	b
1	3437.75	0°10'00"	0°10'00"	0.014	10.000	550.00	0.295	26.398
2	1718.88	0°20'00"	0°30'00"	0.073	20.000	525.00	0.341	27.924
3	1145.92	0°30'00"	1°0'00"	0.204	29.999	500.00	0.388	29.450
4	859.44	0°40'00"	1°40'00"	0.436	39.996	475.00	0.435	30.976
5	687.55	0°50'00"	2°30'00"	0.800	49.990	450.00	0.482	32.502
6	572.96	1°0'00"	3°30'00"	1.323	59.976	425.00	0.528	34.028

DATA FOR 3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.073	19.913	19.913	0°12'30"	0.073	20.087	20.087	0°12'30"
4	0.432	39.706	39.710	0°37'20"	0.440	40.286	40.290	0°37'30"
6	1.304	59.367	59.381	1°15'30"	1.342	60.585	60.600	1°16'10"

TRANSITION NO. 2 - DATA FOR 3 FT OFFSET LINES -

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
3	0.191	14.820	14.822	0°44'10"	0.197	15.176	15.178	0°44'40"
4	0.409	19.656	19.701	1°11'20"	0.425	20.290	20.295	1°12'00"
5	0.745	24.536	24.547	1°44'20"	0.783	25.426	25.438	1°45'50"
6	1.227	29.333	29.359	2°23'40"	1.299	30.579	30.607	2°26'00"
7	1.876	34.081	34.133	3°09'00"	2.006	35.739	35.795	3°13'00"
8	2.720	38.768	38.863	4°00'50"	2.932	40.894	40.999	4°06'00"

TRANSITION NO. 7

ARC	R	A	S	X	Y	R'	a	b
1	5018.43	0°06'52"	0°06'52"	0.010	10.024			4 CHORDS
2	2515.22	0°13'44"	0°20'36"	0.050	20.072			5 CHORDS
3	1680.81	0°20'36"	0°41'12"	0.141	30.143			6 CHORDS
4	1263.61	0°27'28"	1°08'40"	0.302	40.238			7 CHORDS
5	1013.29	0°34'20"	1°43'00"	0.555	50.355			8 CHORDS
6	846.41	0°41'12"	2°24'12"	0.919	60.492			9 CHORDS

3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.050	20.012	20.012	0°08'30"	0.050	20.132	20.132	0°08'30"
4	0.300	40.039	40.041	0°25'40"	0.304	40.437	40.439	0°25'50"
5	0.550	50.055	50.058	0°37'50"	0.559	50.654	50.657	0°38'00"
6	0.910	60.075	60.083	0°52'00"	0.928	60.309	60.317	0°52'20"

~TRANSITION NO. 3~

ARC	R	A	S	X	Y	R'	a	b
1	1250.49	0°27'36"	0°27'30"	0.040	10.000	200.00	0.817	26.378
2	625.05	0°55'00"	1°22'30"	0.200	19.995	190.00	0.958	28.050
3	416.71	1°22'30"	2°45'00"	0.560	29.992	180.00	1.099	29.722
4	312.54	1°50'00"	4°35'00"	1.199	39.972	170.00	1.240	31.394
5	250.04	2°17'30"	6°52'30"	2.198	49.922	160.00	1.381	33.066
6	208.37	2°45'00"	9°37'30"	3.633	59.818			

3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.197	19.760	19.761	0°34'20"	0.203	20.238	20.239	0°34'30"
4	1.167	39.176	39.193	1°42'20"	1.231	40.768	40.786	1°43'50"
6	3.492	58.153	58.258	3°26'10"	3.774	61.483	61.599	3°30'50"

~TRANSITION NO. 8~

ARC	R	A	S	X	Y	R'	a	b
1	933.75	0°22'00"	0°22'00"	0.019	9.9756	150.00	.3853	15.6861
2	466.88	0°44'00"	1°06'00"	0.096	19.9507	145.00	.4304	16.3568
3	311.26	1°06'00"	2°12'00"	0.267	19.9238	140.00	.4755	17.0260
4	233.44	1°28'00"	3°40'00"	0.573	23.8916	135.00	.5206	17.6959
5	186.76	1°50'00"	5°30'00"	1.0510	29.8481	130.00	.5657	18.3658
6	155.63	2°12'00"	7°42'00"	1.7378	35.7841	125.00	.6108	19.0358

3 FT. OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	.094	11.760	11.760	0°27'20"	.097	12.142	12.142	0°27'30"
4	.553	23.255	23.262	1°21'50"	.594	24.529	24.536	1°23'10"
6	1.648	34.500	34.489	2°44'20"	1.828	37.119	37.164	2°49'40"

~TRANSITION NO. 4~

ARC	R	A	S	X	Y	R'	a	b
1	1999.855	0°17'11.4"	0°17'11.4"	0.025	10.000	320.00	0.510	26.387
2	999.931	0°34'22.8"	0°51'34.2"	0.125	19.999	300.00	0.620	28.483
3	666.624	0°51'34.2"	1°43'08.4"	0.350	29.997	280.00	0.730	30.580
4	499.972	1°08'45.6"	2°51'54"	0.750	39.989	260.00	0.840	32.676
5	399.981	1°25'57"	4°17'51"	1.375	49.969	240.00	0.950	34.773
6	333.321	1°43'08.4"	6°00'59.4"	2.273	59.929	220.00	1.061	36.869

DATA FOR 3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	0.124	19.850	19.851	0°21'30"	0.126	20.148	20.149	0°21'30"
4	0.738	39.493	39.500	1°04'10"	0.762	40.485	40.491	1°04'40"
6	2.218	58.885	58.927	2°09'30"	2.328	60.973	61.017	2°11'10"

~TRANSITION NO. 9~

ARC	R	A	S	X	Y	R'	a	b
1	1250.09	0°19'15"	0°19'15"	0.0196	7.0000	200.00	4.007	18.4737
2	625.05	0°38'30"	0°57'45"	0.0980	13.9995	190.00	4.698	19.6469
3	416.70	0°57'45"	1°55'30"	0.2744	20.9974	180.00	5.388	20.8201
4	312.53	1°17'00"	3°12'30"	0.5879	27.99904	170.00	6.078	21.9933
5	250.03	1°36'15"	4°48'45"	1.0775	34.9732	160.00	6.769	23.1665
6	208.36	1°55'30"	6°44'15"	1.7819	41.9377	150.00	7.459	24.3397

3 FT OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG	X	Y	D	ANG
2	.097	13.832	13.833	0°24'00"	.099	14.167	14.167	0°24'10"
4	.572	27.433	27.439	1°11'40"	.603	28.548	28.554	1°12'40"
6	1.713	40.769	40.805	2°24'20"	1.851	43.105	43.146	2°27'30"

- TRANSITION NO. 10 -

ARC	R.	A	S	X	Y	R'	a	b
1	1611.44	0°16'00"	0°16'00"	.0175	7.5000	250.00	34.64	19.5822
2	805.72	0°32'00"	0°32'00"	.0350	14.9997	250.00	39.41	20.5580
3	537.15	0°48'00"	0°48'00"	.0525	22.4990	240.00	44.18	21.5338
4	402.87	1°04'00"	1°04'00"	.0700	29.9928	230.00	48.95	22.5096
5	322.30	1°20'00"	1°20'00"	.0875	37.4801	220.00	53.72	23.4855
6	268.58	1°36'00"	1°36'00"	.1050	44.9537	210.00	58.50	24.4613

3 FT. OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG.	X	Y	D	ANG.
2	0.863	14.8606	14.8609	0°20'00"	0.883	15.1388	15.1391	0°20'00"
4	5.128	29.5294	29.5339	0°59'40"	5.344	30.4562	30.4609	1°00'20"
6	15.398	43.9818	44.0089	2°00'20"	16.348	45.9256	45.9548	2°02'20"

- TRANSITION NO. 14 - DATA FOR 3' OFFSET LINES -

SHORT SIDE				LONG SIDE				
R.	X	Y	D	ANG.	X	Y	D	ANG.
100.00	0.705	11.534	11.556	3°30'00"	0.785	12.840	12.864	3°29'50"
866.7	1.096	14.321	14.363	4°22'40"	1.228	15.994	16.041	4°23'30"
758.3	1.586	17.067	17.140	5°18'40"	1.792	19.155	19.239	5°20'40"
674.1	2.185	19.762	19.882	6°18'30"	2.495	22.318	22.457	6°22'40"
606.7	2.901	22.401	22.590	7°22'40"	3.352	25.468	25.688	7°29'50"
55.5	3.749	24.975	25.255	8°32'10"	4.377	28.595	28.928	8°42'10"
50.56	4.723	27.472	27.876	9°46'00"	5.592	31.682	32.172	10°00'40"
46.67	5.851	29.879	30.446	11°04'50"	7.005	34.713	35.413	11°24'30"
43.33	7.115	32.183	32.961	12°28'20"	8.629	37.667	38.643	12°54'10"
40.44	8.534	34.367	35.411	13°56'40"	10.476	40.519	41.852	14°29'50"
37.92	10.096	36.416	37.790	15°29'40"	12.552	43.242	45.027	16°11'10"

- TRANSITION NO. 11 -

ARC	R.	A	S	X	Y	R'	a	b
1	1999.85	0°14'00"	0°14'00"	.0166	8.1443	320.00	33.08	21.4940
2	999.93	0°28'00"	0°28'00"	.0332	16.2883	300.00	41.19	23.2022
3	666.62	0°42'00"	0°42'00"	.0497	24.4312	280.00	48.60	24.9108
4	499.97	0°56'00"	0°56'00"	.0662	32.5712	260.00	55.81	26.6190
5	399.98	1°10'00"	1°10'00"	.0827	40.7050			
6	333.32	1°24'00"	1°24'00"	.1000	48.8274			

3 FT. OFFSET LINES

SHORT SIDE				LONG SIDE				
ARC	X	Y	D	ANG.	X	Y	D	ANG.
2	0.82	16.167	16.167	0°17'30"	0.84	16.410	16.410	0°17'30"
4	4.89	32.166	32.169	0°52'20"	5.06	32.977	32.981	0°52'40"
6	14.72	47.977	47.999	1°45'20"	15.45	49.678	49.702	1°46'50"

- TRANSITION NO. 13 - CORRECTIONS FOR R'

R.	a	b	46.67	43.33	40.44	37.92				
35	2.201	22.280	2.505	22.966	2.774	23.415	2.987	24.812	3.125	24.005
36	2.127	21.904	2.405	22.531	2.642	22.975	2.816	23.260	2.907	23.382
37	2.054	21.528	2.306	22.096	2.510	22.482	2.645	22.700	2.689	22.759
38	1.980	21.152	2.206	21.661	2.379	21.986	2.475	22.141	2.511	22.111
39	1.907	20.775	2.107	21.226	2.247	21.490	2.304	21.582	2.383	21.582
40	1.833	20.399	2.007	20.791	2.115	20.994	2.133	21.023	2.130	21.023
41	1.760	20.023	1.907	20.356	1.983	20.497	1.983	20.497	1.983	20.497
42	1.686	19.647	1.808	19.921	1.851	20.001	1.851	20.001	1.851	20.001
43	1.613	19.271	1.708	19.486	1.720	19.505	1.720	19.505	1.720	19.505
44	1.539	18.894	1.609	19.051	1.583	19.051	1.583	19.051	1.583	19.051
45	1.466	18.518	1.509	18.616	1.437	18.616	1.437	18.616	1.437	18.616
46	1.392	18.142	1.410	18.181	1.306	18.181	1.306	18.181	1.306	18.181
47	1.319	17.766	1.306	17.744	1.175	17.744	1.175	17.744	1.175	17.744
48	1.245	17.389	1.245	17.389	1.044	17.389	1.044	17.389	1.044	17.389
49	1.172	17.013	1.172	17.013	0.913	17.013	0.913	17.013	0.913	17.013

- TRANSITION NO. 13 -

ARC	R	A	S	COORD. 1ST RAIL		COORD. 2ND RAIL		CHORDS	
				X	Y	X	Y	1ST RAIL	2ND RAIL
1	686.67	0°17'00"	0°17'00"	0.007	2.988	0.007	3.012	2.918	3.012
2	303.33	0°34'00"	0°34'00"	0.037	5.966	0.037	6.034	2.917	3.023
3	202.22	0°51'00"	0°51'00"	0.103	8.929	0.103	9.069	2.965	3.035
4	151.67	1°08'00"	1°08'00"	0.218	11.880	0.218	12.114	2.953	3.047
5	121.33	1°25'00"	1°25'00"	0.400	14.817	0.416	15.165	2.942	3.058
6	101.11	1°42'00"	1°42'00"	0.662	17.735	0.688	18.223	2.930	3.070
7	86.67	1°59'00"	1°59'00"	1.014	20.632	1.062	21.282	2.918	3.082
8	75.83	2°16'00"	2°16'00"	1.472	23.503	1.550	24.337	2.906	3.094
9	67.41	2°33'00"	2°33'00"	2.048	26.341	2.168	27.379	2.895	3.105
10	60.67	2°50'00"	2°50'00"	2.753	29.134	2.931	30.404	2.883	3.117
11	55.15	3°07'00"	3°07'00"	3.600	31.881	3.852	33.391	2.872	3.128
12	50.56	3°24'00"	3°24'00"	4.597	34.563	4.947	36.333	2.860	3.140
13	46.67	3°41'00"	3°41'00"	5.752	37.165	6.226	39.215	2.849	3.151
14	43.33	3°58'00"	3°58'00"	7.077	39.675	7.697	42.010	2.837	3.163
15	40.44	4°15'00"	4°15'00"	8.568	42.075	9.374	44.706	2.824	3.176
16	37.92	4°32'00"	4°32'00"	10.234	44.343	11.258	47.275	2.814	3.186

- TRANSITION NO. 13 - CORRECTIONS FOR R'

R'	a	b	60.67	55.15		
35	1.244	13.136	1.555	20.367	1.878	21.415
36	1.220	12.815	1.519	20.098	1.826	21.094
37	1.195	12.494	1.482	19.829	1.773	20.773
38	1.170	12.174	1.445	19.561	1.720	20.453
39	1.146	11.853	1.408	19.292	1.667	20.132
40	1.121	11.532	1.372	19.023	1.614	19.812
41	1.097	11.212	1.335	18.755	1.562	19.491
42	1.072	10.891	1.298	18.486	1.509	19.170
43	1.047	10.570	1.261	18.217	1.456	18.850
44	1.023	10.249	1.225	17.949	1.403	18.529
45	0.998	9.928	1.189	17.680	1.350	18.209
46	0.973	9.607	1.153	17.412	1.297	17.888
47	0.949	9.286	1.118	17.143	1.245	17.567
48	0.924	8.965	1.083	16.874	1.192	17.247
49	0.899	8.644	1.048	16.605	1.139	16.926
50	0.875	8.323	1.014	16.337	1.087	16.606
51	0.850	8.002	0.979	16.068	1.034	16.285
52	0.825	7.681	0.945	15.800	0.981	15.964
53	0.801	7.360	0.911	15.531	0.928	15.644
54	0.776	7.039	0.877	15.262	0.875	15.323
55	0.751	6.718	0.843	15.000	0.822	15.000
56	0.726	6.397	0.809	14.738	0.769	14.678
57	0.701	6.076	0.775	14.476	0.716	14.357
58	0.676	5.755	0.741	14.214	0.663	14.036
59	0.651	5.434	0.707	13.952	0.610	13.715
60	0.626	5.113	0.673	13.690	0.557	13.394
61	0.601	4.792	0.639	13.428	0.504	13.073
62	0.576	4.471	0.605	13.166	0.451	12.752
63	0.551	4.150	0.571	12.904	0.398	12.431
64	0.526	3.829	0.537	12.642	0.345	12.110
65	0.501	3.508	0.503	12.380	0.292	11.789
66	0.476	3.187	0.469	12.118	0.239	11.468

- TRANSITION NO. 14 - CORRECTIONS FOR R'

R'	a	b	67.41	60.67	55.15	
35	1.830	12.631	1.662	13.916	2.004	14.958
36	1.801	12.452	1.620	13.630	1.945	14.620
37	1.772	12.274	1.578	13.344	1.886	14.282
38	1.743	12.095	1.537	13.057	1.827	13.944
39	1.714	11.917	1.495	12.771	1.769	13.606
40	1.685	11.738	1.453	12.485	1.710	13.268
41	1.656	11.560	1.412	12.199	1.651	12.930
42	1.627	11.381	1.370	11.912	1.592	12.592
43	1.598	11.202	1.328	11.626	1.534	12.254
44	1.569	11.023	1.286	11.340	1.475	11.916
45	1.540	10.844	1.244	11.054	1.416	11.578
46	1.511	10.665	1.202	10.767	1.357	11.240
47	1.482	10.486	1.160	10.481	1.298	10.902
48	1.453	10.307	1.118	10.195	1.240	10.564
49	1.424	10.128	1.076	9.909	1.181	10.226
50	1.395	9.949	1.034	9.623	1.122	9.888
51	1.366	9.770	0.993	9.336	1.063	9.550
52	1.337	9.591	0.951	9.049	1.004	9.212
53	1.308	9.412	0.909	8.763	0.945	8.874
54	1.279	9.233	0.867	8.477	0.887	8.536
55	1.250	9.054	0.825	8.191		
56	1.221	8.875	0.783	7.905		
57	1.192	8.696	0.741	7.619		
58	1.163	8.517	0.700	7.332		
59	1.134	8.338	0.659	7.046		
60	1.105	8.159	0.617	6.760		
61	1.076	7.980	0.575	6.474		
62	1.047	7.801	0.533	6.188		
63	1.018	7.622	0.491	5.902		
64	0.989	7.443	0.449	5.616		
65	0.960	7.264	0.407	5.330		
66	0.931	7.085	0.3			

ment is 36 min. 49 sec., the succeeding chords of 10 ft. subtending angles of 2, 3, 4, 5, and 6 times that amplitude.

The values of x and y are found by taking the chord into the sine and cosine respectively of the angle it makes with the tangent, and adding the respective products to the sums of the preceding x's and y's, thus:

$$\begin{aligned}
 x_1 &= \text{chord} \times \sin \frac{1}{2} \Delta_1, \\
 y_1 &= \text{chord} \times \cos \frac{1}{2} \Delta_1, \\
 x_2 &= \text{chord} \times \sin (\Delta_1 + \frac{1}{2} \Delta_2) + x_1, \\
 y_2 &= \text{chord} \times \cos (\Delta_1 + \frac{1}{2} \Delta_2) + y_1, \text{ etc.}
 \end{aligned}$$

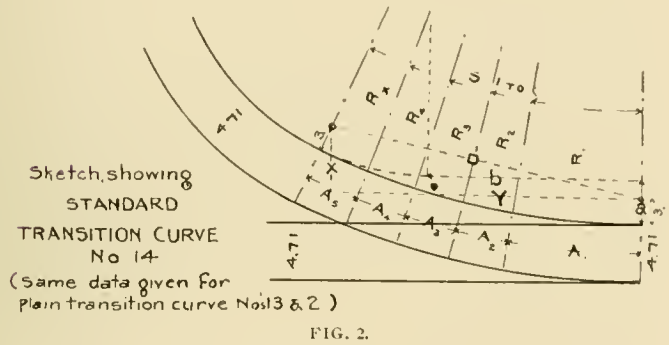
The equations for finding a and b are readily apparent from inspection:

$$a = x - R(1 - \cos S); \quad b = y - R \sin S.$$

Where the same transition is used on both ends of the curve the tangent is equal to $(R^2+a) \tan \frac{1}{2} I + b$, I being the intersection angle between the tangents.

For convenience in putting in points in the field, values of x, y, D, and the angle marked "Ang." in the diagrams and tables are calculated for points 3 ft. from the gage line of the rail, and tabulated under the head of "Data for 3 ft. offset lines."

Table No. 2 is for curves of from 100 to 120 ft. radius; the value of Rx for the 8th arc being less than 115 ft., only 7 chords of the compound curve are used with that radius. No. 3 is for curves of from 160 to 200 ft.; No. 4 for 220 to 320 ft.; No. 5 for 340 to 400 ft.; No. 6 for 425 to 550 ft.; No. 7 for 650 to 1,200 ft.



Of course other central radii can be used when found necessary, but the ones given are used for convenience when practicable.

Transition curves Nos. 8, 9, 10 and 11 have recently been tabulated and are used instead of Nos. 1, 3 and 4 in streets where the change of direction is slight. Nos. 8 to 11 occupy less of the intersection angle than do the transitions Nos. 1, 3 and 4.

Tables Nos. 13 and 14 are for approaches to curves of less than 100 ft. radius and therefore it is necessary to locate points less than 10 ft. apart. In these tables the co-ordinates for the rails, and the chords are given for each arc of the transition curve. The values of a and b for the several values of R' and Rx are given in the additional tables.

TRAMWAY AT TERNI, ITALY.

The Societa per le Tramvie Elettriche di Terni advises us that it is now building an electric railway from Terni, Italy, to the water falls of the River Nera, a distance of about 5 miles, which will be in operation before the end of the year. The overhead trolley system will be used. The company will have lines in Terni, a town of about 20,000 inhabitants, but the principal object is to connect the town with the various manufacturing establishments in the valley of the Nera. The available power at the main falls is estimated at 90,000 h. p. of which only about one-half is at present utilized. Lower down the river are lesser falls with 40,000 h. p. available, and the company expects to develop the electrical power industry in this vicinity. The company's main office is at Rome, No. 148 Via del Pozzetto.

The street railway companies of Cleveland and the city officials have reached an agreement whereby the question of the city's right to reduce fares will be taken into the Supreme Court and a decision secured with the least possible delay.

STATISTICS RELATING TO POWER PRODUCTION.

Mr. Philip Dawson has recently contributed to Engineering, of London, a series of articles giving interesting statistics relating to electric power production, from which the accompanying tables are reproduced.

TABLE I.—DATA OF SOME KEYED ELECTRICAL POWER TRANSMISSIONS

NAME OF TRANSMISSION	DISTANCE IN Miles	Voltage in Kilovolts	Power in Kilowatts		System of Transmission	Type of Line	NAME OF MARKER
			Transmitted	On Line			
Layton, Franklin (Germany)	196	300	370	30,000	3 phase	55	A. G. Erdmann Electric Works, Frankfurt
Hollands, Sacramento, Cal.	84	1,100	750	20,000	2 phase	50	General Electric Co., Sacramento
Telluride, Utah	86	1,100	900	40,000	2 phase	60	Idaho Electric Co.
Ogden Salt Lake City, Utah	60	1,100	2,000	1,000	2 phase	60	Idaho Electric Co.
Yrebo, Cal.	35	1,100	1,000	11,000	2 phase	60	Idaho Electric Co.
West Kootenay, B. C.	30	2,200	1,000	10,000	2 phase	60	Idaho Electric Co.
Newcastle, Sacramento, Cal.	28	1,100	500	10,000	2 and 3 phase	60	Westinghouse
Ripon, Sacramento, Cal.	28	5,000	4,000	10,000	3 phase	60	Brown and Boveri
San Antonio, San Bernardino, Cal.	28	100	1,100	10,000	Single phase	60	Westinghouse
Folsom, Sacramento	28	4,500	800	11,000	3 phase	60	General Electric Co., Sacramento
Hollands, Cal.	21	1,100	2,000	1,000	2 phase	60	Idaho Electric Co.
Poleys, Idaho	21	1,100	12,000	1,000	2 phase	60	Brown and Boveri
Niagara Falls, Buffalo	11	1,100	500	10,000	3 phase	55	General Electric Co., Schenectady
Butte City, Montana	71	4,000	800	15,000	3 phase	60	General Electric Co., Schenectady
Blue Lake, Cal.	21	1,100	1,000	10,000	2 and 3 phase	60	General Electric Co., Schenectady
Geneva, Switzerland	20	1,100	300	12,000	2 phase	60	Idaho Electric Co., Schenectady
Pachoa, Mexico	19	1,100	700	10,000	3 phase	60	General Electric Co., Schenectady
Milan, Italy	12	1,100	350	10,000	2 phase	60	Brown and Boveri
Teluride	12	1,100	500	11,000	2 and 3 phase	60	Westinghouse Company
Santa Cruz, Cal.	12	600	1,200	11,000	2 phase	60	Idaho Electric Co.
Tivoli, Rome, Italy	12	2,000	300	3,500	Single phase	60	General Electric Co., Schenectady
Lowell, Michigan	12	300	1,000	1,000	2 phase	60	Idaho Electric Co.
Three Rivers, Canada	7	300	2,000	1,000	2 phase	60	Idaho Electric Co.
Waterbury, Conn.	10	1,100	1,000	1,000	3 phase	60	General Electric Co., Schenectady
Concha, Argentine Republic	11	1,100	500	1,000	2 phase	60	Idaho Electric Co.
Manchester, N. J.	16	1,100	1,000	10,000	2 phase	60	Idaho Electric Co.
Bogota, Colombia Republic	11	1,100	500	6,700	2 phase	60	Westinghouse
Hochelagen, Ontario	11	500	500	13,000	2 phase	60	Brown and Boveri
Lowell, Alaska, N. H.	10	500	250	5,000	2 phase	60	General Electric Co., Schenectady
Salem, N. C.	11	1,100	1,000	10,000	2 phase	60	Idaho Electric Co.
Montreal, Canada	15	20,000	12,000	12,000	2 phase	60	Idaho Electric Co.
Kulack, Oregon	14	400	400	13,000	2 phase	60	Idaho Electric Co.
Portland, Ore.	14	2,500	6,000	6,000	2 phase	60	Idaho Electric Co., Schenectady
Little Cotton Wood—Salt Lake City, Utah	14	3,000	500	15,000	2 and 3 phase	60	Westinghouse
Big Cotton Wood—Salt Lake City, Utah	14	675	325	5,000	3 phase	60	General Electric Co., Schenectady
Larcos, Italy	14	1,000	3,000	5,000	2 phase	60	Idaho Electric Co.
Bodie, Cal.	13	100	3,500	3,500	Single phase	60	Idaho Electric Co.
Zurich, Switzerland	12	1,200	5,000	5,000	3 phase	50	Westinghouse
La Goulette, France	10	2,000	3,000	3,000	2 and 3 phase	50	Idaho Electric Co.
Les Trois-Yvettes, Switzerland	10	1,000	5,000	5,000	2 phase	60	Idaho Electric Co.
Suhl, Zurich	12	2,000	5,000	5,000	2 phase	60	Brown and Boveri
Montpelier, Vt.	12	400	2,500	10,000	2 phase	60	Westinghouse
Cumberland Mills, Me.	12	0	1,000	8,000	2 and 3 phase	60	Idaho Electric Co.
Kilville, Canada	12	375	2,300	11,000	3 phase	60	General Electric Co., Schenectady
Osaka, Japan	11	135	1,400	3,500	2 phase	60	Idaho Electric Co.
Bodley, Zurich, Switzerland	11	300	80	5,000	2 phase	60	Westinghouse
Hripen, Montana	11	3,500	500	15,000	2 and 3 phase	60	Westinghouse
Fairfax, Va.	11	300	2,500	2,500	2 phase	60	Idaho Electric Co.
Hartford, Conn.	11	4,000	500	10,000	2 and 3 phase	60	Idaho Electric Co.
Weib City, Mo.	10	200	1,000	5,000	2 phase	60	Idaho Electric Co.
Anderson, S. C.	10	1,000	10,000	10,000	2 phase	60	Idaho Electric Co.
Minneapolis, St. Paul	10	5,000	3,500	11,000	3 phase	60	General Electric Co., Schenectady
Manchester, N. H.	10	75	1,100	10,000	2 phase	60	Idaho Electric Co.
Tucuman, Arg.	10	135	500	10,000	2 phase	60	Idaho Electric Co.
Cripple Creek, Col.	10	300	6,300	6,300	2 phase	60	Idaho Electric Co.
Betsried-Weissen, Switzerland	10	500	3,000	3,000	2 phase	60	Westinghouse

TABLE II.—SOME COMPARATIVE APPROXIMATE FIGURES OF ELECTRIC LIGHT, POWER, AND TRACTION STATIONS IN EUROPEAN COUNTRIES AND THE UNITED STATES OF AMERICA AT THE PRESENT DAY.

NAME OF COUNTRY	Station Kilowatts Available for Lighting and Power	Station Kilowatts Available for Traction	Miles of Single Track Electrically Equipped	Number of Motor Cars Running	Total Electrical Station Capacity Available for All Purposes in Kilowatts	Population of Country	Area of Country in Square Miles	Total Approximate Capital Invested in Pounds
Great Britain	200,000	40,000	600	2,000	180,000	40,000,000	121,115	35,000,000
Germany	170,000	50,000	2,300	5,000	220,000	53,000,000	211,168	29,000,000
France	70,000	25,000	400	1,000	95,000	38,000,000	261,461	12,000,000
Switzerland	30,000	7,000	250	350	37,000	3,000,000	15,000	4,000,000
Belgium	15,000	3,000	150	300	18,000	4,000,000	11,371	2,100,000
The whole of Europe	400,000	150,000	3,000	8,500	600,000	100,000,000	1,700,000	100,000,000
U. S. A.	1,200,000	800,000	11,000	35,000	2,000,000	70,000,000	3,500,000	1,000,000,000

TABLE III.—DATA OF CONTINENTAL ELECTRIC TRAM AND RAILWAYS, 1884 TO 1899.

NAME OF COUNTRY	1884		1885		1886		1887		1888		1889		
	Miles of Track	Capacity in Kilowatts of Power	Miles of Track	Capacity in Kilowatts of Power	Miles of Track	Capacity in Kilowatts of Power	Miles of Track	Capacity in Kilowatts of Power	Miles of Track	Capacity in Kilowatts of Power	Miles of Track	Capacity in Kilowatts of Power	
Great Britain	70	200	120	300	150	400	180	500	200	600	250	700	
Germany	164	2934	305	4254	432	664	714	857	1333	1900	2200	2400	
Austria-Hungary	42	1115	72	1620	139	174	1948	157	134	2,300	184	140	2,400
Belgium	2	20	35	118	45	66	113	45	96	122	73	118	2,415
Spain	12	239	12	23	12	12	47	80	58	74	80	67	100
France	68	1798	134	3610	182	231	449	225	485	678	432	657	1,150
Italy	11	720	12	870	33	62	180	64	106	450	220	321	6,000
Russia													6,200
Holland													3,150
Portugal													3,000
Romania													37,100
Russia													49,200
Norway and Sweden													29,110
Switzerland													14,800

The first car over the Indianapolis & Greenfield Rapid Transit interurban was run on June 14th.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The idea that all the heat rendered "latent" when water is evaporated into steam is necessarily wasted was once a very common one, and perhaps this is yet the case. Many of the inventors and their financial backers who have wasted time and money in trying to develop substitutes for steam have been misled by this erroneous belief. A recent inquiry suggested a method of demonstrating that the so-called latent heat of steam as well as the sensible heat is effective in doing work, and it may be of interest to give it here.

Take as a concrete example the results of the test of a tandem compound condensing engine in a street railway plant in Detroit made some years ago. The boiler pressure was 126 lb. per sq. in. absolute, the vacuum gage showed a pressure of 2.3 lb. per sq. in. absolute, and the engine used 24.55 lb. of water per i. h. p. per hour.

The total heat of 1 lb. steam (measured from the freezing point of water) at 126 lb. absolute is given in the steam tables at 1187.1 B. t. u., and the total heat of 1 lb. of steam at 2.3 lb. absolute is 1121.9 B. t. u. That is, if 1 lb. of steam be taken into the engine cylinder at 126 lb. and exhausted at 2.3 lb. it will have lost only $1187.1 - 1121.9 = 65.2$ B. t. u. of heat. Multiplying 65.2 B. t. u. by 778 the number of foot-pounds in a heat unit we get 50,725.6 ft. lb. per lb. of steam. This multiplied by 24.55, the number of pounds of water actually used by the engine per horsepower per hour, gives 1,245,313 ft. lb. Now a horsepower-hour is equal to 1,980,000 ft. lb., which is nearly 60 per cent more than appears available on the assumption that no latent heat was converted into work. Further the figure 1,245,313 ft. lb. was obtained without making any allowances for wastes and losses due to cylinder condensation, radiation and friction of the steam in the pipes and other passages.

The explanation is that a portion of the steam is condensed in the cylinder and gives up its "latent" heat, and when discharged into the condenser the working fluid is partly water and partly steam.

Prof. Osborne Reynolds has recently communicated to the Royal Society, of England, the results of some experiments on the specific heat of steam. He found that the specific heat of steam at constant pressure is independent of the pressure and varies nearly as the fourth power of the absolute temperature. At atmospheric pressure the specific heat between 230 deg. F. and 246.5 deg. F. was found to be 0.4317 and between 295 deg. and 311.5 deg. to be .6482.

Heretofore, we believe, the only determinations of the specific heat of steam that have been published were those of Regnault whose experiments were for steam near the boiling point under atmospheric pressure. The values commonly taken have been 0.475 or 0.48, and in the practical application of throttling calorimeters it has been assumed that this value of the specific heat was constant for all temperatures.

In the throttling calorimeter a sample of the steam to be tested for moisture escapes through a small orifice, usually into the atmosphere; the total heat of the steam at the initial pressure being greater than the total heat of saturated steam at the lower pressure, the excess first vaporizes the water entrained in the sample and then superheats the whole. This method is not available where the entrained water in the sample is in excess 2 or 3 per cent because the difference in the total heats at the two pressures is not sufficient to vaporize more than this quantity of water.

The formula for calculating the quality of steam by means of a throttling calorimeter is $w = 100 \times [H - h - k(T - t)] \div L$, where w is the percentage of moisture in the steam, H = total heat, and L = latent heat of a pound of steam at the pressure in the steam pipe, h = total heat per pound of steam on the discharge side of the calorimeter, k = specific heat of superheated steam, T = temperature of the throttled and superheated steam in the calorimeter, and t = the temperature due the pressure on the discharge side of the calorimeter. Taking, as is usually the case, $t = 212$ deg. F. and $k = 0.48$, the formula becomes $w = 100 [H - 1146.6 - 0.48(T - 212)] \div L$.

Taking T as 280 deg. F. and the pressure in the steam pipe at 185 lb. per gage, this formula gives the moisture in the steam as 2.35 per cent. With the value of k taken as 0.54, which is the mean of Professor Reynolds' determinations for the upper and lower limits of range of superheating, we get the moisture as 1.86 per cent.

ADVANTAGES OF RECORDING WATTMETERS ON SWITCHBOARDS.

Read Before the Northwestern Electrical Association by W. Worth Bean
General Manager of the St. Joseph & Benton Harbor (Mich.)
Electric Railway & Light Co.

For the past three years recording wattmeters have been used on the switchboards of the St. Joseph & Benton Harbor Electric Railway & Light Co., and the following advantages may be given as resulting from their use:

In the first place, it enables the central-station manager to make contracts with the coal dealers and mine-owners in an intelligent manner, because the output from the station in kilowatt-hours is shown every 24 hours, thereby giving each grade or quality of coal an equal test. No coal dealer can laud the virtues of his coal above that of his competitor. It puts at rest all vague statements concerning the quality of the coal, making it stand upon its actual merits and test, and showing to the central-station manager whether it is best to use mine run, screen lump or slack, and proving which can be used to the best advantage in each particular station.

Next, the fireman understands before using the coal that the meters on the switchboard are going to give actual results of his firing, making superfluous any statements of the fireman with regard to inferior coal or heavy loads.

It will further show that the employe who produces the best results with the least amount of coal consumed is the one who should draw the most money. Then, given the proper fuel and firing, a test for engines is necessary, in order to show that the engineer is not responsible for any possible waste.

The electrician must see that the proper speeds in his generators and dynamos are kept up by having a sufficient steam pressure at all times, the engineer furnishing it to him for the varying loads. Then, with the proper connections from machine to switchboard current is furnished at the most economical price to the meter. The given amount of current leaving the switchboard being known to the station manager, he is enabled to tell if his current is wasted in motors, transformers, lamps or wire connections.

A further advantage to be derived from meters would be to have all central-station switchboards equipped with them, where records could be taken monthly, and comparisons made with plants in that locality, for the purpose of showing still greater economy, if possible.

I consider the meter on the central-station switchboard a most indispensable instrument, because properly looked after it is conducive to the greatest economy in fuel, in firing, in engine and dynamo, all of which, combined, will produce the necessary economy at the meter.

The cost of meters is a mere bagatelle, as compared to the saving in coal alone.

After my experience with them, I would strongly advise that all central stations adopt meters on their switchboards, for their own advantage and economy.

In the course of the discussion which followed his paper Mr. Bean said that the plant being a combination one and the company having flat lighting rates as well as meter rates, he could not give information as to the discrepancy between the wattmeter on the

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION.	MONTH. 1899 1900.	Monthly Output, Kilowatt- Hours.	Cost of Electrical Output per Kilowatt- Hour Cents.					Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricat- ing Oil per 10,000 k. w. h.	Lbs. Water per Lb Coal.	Lbs. Fuel per k.w.h.	Price of Fuel per Ton of 1,000 Lbs.	Kind of Fuel	
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re- pairs.							Total.
1.....	Dec.	1,762,860	.357	.135	.041	.028	.046	.507	3.62	.882	10.76	2.44	\$2.93	Bituminous
1.....	Jan.	2,140,720	.262	.111	.035	.027	.031	.466	3.36	.669	10.64	2.22	2.36	"
1.....	Feb.	2,124,872	.254	.111	.039	.026	.031	.461	3.90	1.01	10.07	2.42	2.08	"
1.....	March.	2,470,163	.279	.107	.027	.034	.017	.464	3.49	1.01	11.28	2.53	2.20	"
1.....	April.	1,710,168	.347	.128	.037	.031	.036	.579	3.20	1.05	10.57	2.43	2.86	"
5 Metropolitan Elevated, Chicago...	Jan.	1,868,937	.441	.150	.016	.025	.029	.661	2.53	1.15	5.13	5.06	1.76	"
5 "	Feb.	2,012,069	.406	.140	.023	.018	.032	.619	3.76	1.66	5.20	4.67	1.82	"
5 "	March.	1,972,184	.436	.146	.022	.014	.035	.653	4.41	.80	5.34	5.05	1.63	"
5 "	April.	1,452,072	.421	.186	.025	.017	.029	.678	3.30	1.59	5.81	5.19	1.63	"
6.....	Jan.	591,014	.732	.258	.024	...	.101	1.115	...	...	...	2.45	.913*	Oil.
6.....	Feb.	551,262	.679	.249	.025	...	.104	1.075	...	...	...	2.27	.953	"
6.....	March.	676,174	.668	.221	.041	...	.077	1.007	...	...	...	2.20	.948	"
6.....	April.	680,704	.634	.225	.055	...	.069	.983	...	...	...	2.19	.903	"

* Price of oil per barrel.

switchboard and the combined wattmeter on the system. A wattmeter is on each of the machines, which include a 50-light Thomson-Houston machine, a 75-light Thomson-Houston machine, a 120-light Brush machine, all arc; one 1,000-light alternator, two 2,000-light alternators, three 250-horsepower compound condensing engines. Two engines are connected to the 57-ft. line shaft. One of the engines on the end of the line shaft is connected to a multipolar 90-kw. generator, old-type, and one 225-kw. generator, new-type, running at 425 revolutions, and a meter for each circuit is on the switchboard, showing the output in current from the station.

STORAGE BATTERIES FOR SMALL STATIONS.

Abstract of a Paper Before the Northwestern Electrical Association by Louis A. Ferguson.

The adoption of storage batteries for use in central stations will depend upon the character of the load curve of the station, and the principles which apply to the use of batteries in large stations will hold true, to a large extent, in the stations of moderate or small capacities.

In considering the question of the use of a storage battery we must take into account, first, the relative cost of the battery as compared with that of engines, boilers and dynamos to provide for equal capacity. The cost of capacity in steam and electrical generating equipment is dependent solely upon the maximum power to be generated at any one time, and is not dependent upon the number of hours of use per day of the equipment. In the case of the storage battery, however, the cost is dependent not only upon the maximum energy to be supplied at any one time, but also upon the length of time that the battery is required to do this maximum work. In other words, the cost of steam and electrical generating equipment is dependent upon the maximum kilowatt capacity, whereas the cost of a storage battery is dependent upon the kilowatt-hour capacity.

This being the case, we must consider carefully the load curve of the station, and if the characteristic of the curve is such that the average width of its peak is more than 1½ hours, then the initial cost of steam and electrical generating equipment to provide capacity for this peak will be less than that of the necessary storage battery equipment, at the present market prices, to do the same work. If the curve has an average peak width of less than 1½ hours, then the initial cost of the storage battery will be less than that of the steam and electrical generating equipment to take care of this peak.

The diagram shows the capacity of a battery at various rates of discharge. This curve represents the discharge capacity, at from one to eight hours, of a battery having a capacity at the eight-hour rate of 11,200 ampere-hours. The discharge capacity of this battery at the eight-hour rate is 1,400 amperes, while at the one-hour rate it is 5,600 amperes; or, in other words, the discharge capacity of the battery in amperes at the eight-hour rate is one-quarter of what it is at the one-hour rate, the total capacity in ampere-hours of the battery at the one-hour rate being equal to one-half of its capacity at the eight-hour rate. The curve shows the rate of discharge for

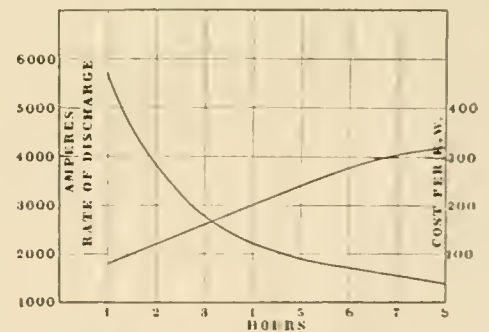
various hours' use of the batteries of other sizes, following the same general characteristics.

The cost of a storage battery of moderate size, taking, for instance, one having a capacity of 500 amperes at the one-hour rate, would be, at the various rates of discharge, approximately as follows: One hour, \$80 a kilowatt; two hours, \$116 a kilowatt; three hours, \$160 a kilowatt; five hours, \$249 a kilowatt; eight hours, \$320 a kilowatt. These figures include switchboard, end-cell switches and the battery erected complete, not including building investment. (These costs are based on the present price of lead and are higher than those obtaining two or three years ago.)

The cost of a steam and electrical generating plant will, of course, vary widely with the class of apparatus employed. Assuming, however, \$100 a kilowatt as a reasonable price for boilers, engines, steam piping, generators, stack and switchboard, we find, by referring to the curve of costs that, as I before stated, where the average width of the peak of the load which is to be taken care of by the storage battery is 1½ hours, the cost of installation is the same for the storage battery as for the steam plant.

In these figures the cost of the building has been excluded, as it may be assumed to be the same for either installation.

The question of first cost, however, is not the only thing to be considered. The question of depreciation on the two classes of



CURVES OF COST AND DISCHARGE RATE.

apparatus, economy of operation and the value of each class of apparatus as a reserve or guarantee to the customers of uniformity and reliability of service must also be taken into account.

We have all had sufficient experience in the use of steam and electrical generating equipment to determine to our own satisfaction what might be considered a reasonable depreciation on this class of apparatus. This, however, is perhaps not as easily determined in the case of the storage battery, as the question of its life in central station use is as yet to some extent uncertain. The principal battery companies, however, have guaranteed to maintain some batteries sold by them up to the original standard of capacity and efficiency for a term of years, upon payment by the purchaser annually of a sum equal to a certain percentage of the original cost of the battery. I am not certain, however, that these

battery companies are prepared to make such guarantees in all cases, as there are many conditions surrounding the use of the battery which must be considered; and the effect of these various conditions upon the life of the battery is perhaps as yet undetermined.

The operating expenses incident to the use of the storage batteries are comparatively small. In very large and important installations it is desirable to have in charge a special man thoroughly experienced in the maintenance of a storage battery, but in moderate sized stations it is unlikely that any additional labor would be required on account of the use of a battery beyond that ordinarily employed in the station. The amount of material necessary is almost negligible. Distilled or filtered water is the principal item, and perhaps once or twice a year additional acid will be required.

A storage battery operated under favorable conditions would show upon test an energy efficiency of 75 per cent and an ampere-hour efficiency of 90 per cent. The yearly energy efficiency of a storage battery operated under ordinary central-station conditions, would, in all probability, not exceed 65 per cent.

The rest of the paper discusses the application of storage batteries to lighting systems.

OPERATING ECONOMIES IN CENTRAL STATION PRACTICE.

In our last issue, page 314, we published Mr. Abbott's paper on this subject, read before the National Electric Light Association, and below will be found an abstract of the discussion of this paper.

Replying to a question, the author said that automatic stokers show better results than hand firing. They can be made to show any kind of results, but it does not require as much skill to operate an automatic stoker and get good results as it does to get good results in hand firing.

Professor Goldsborough considered the matter of adjusting the number of boilers in a station to the work which the boilers have to perform as very important, and stated he had noticed as one of the prime defects in station management the heating up water and boiler iron without getting any return for the coal so expended. In some cases it has been demonstrated that several thousand dollars could be saved each year by simply giving attention to this one matter of adjusting the boiler capacity to the load upon the station.

Mr. H. L. Doherty said that in about 100 central stations with which he was familiar, there is not one in which they make an analysis of flue gases at regular intervals, and if they ever analyze them at all it is a very unusual thing. He would like to see some of the members of this association put on a committee to tell how to operate boilers and analyze the flue gases. In one plant he knew of the flue gas is analyzed by the firemen, or, at least, determinations are made for carbon dioxide, and from this it is concluded that there are other conditions. The method in general is simply to draw off a certain portion of the flue gas and pass it through an alkaline solution, which absorbs the CO_2 , and the difference in volume before and after this treatment represents the amount of carbonic-acid gas which was produced. He had not seen the econometer Mr. Abbott spoke of, but had for several years adopted an old gravity balance, which he had used for that purpose, going a little further and making it a recording instrument.

Continuing Mr. Doherty said: "In the smallest central stations I doubt if any great effort ought to be made to economize in the matter of oil and waste. It often forms almost an insignificant item. Boiler fuel has always been believed to be the most important thing we should economize on, and it certainly represents the biggest part of our actual operating expenses, and Mr. Abbott, in calling especial attention to the boiler results, not engine results, has done a service to the entire electrical fraternity. The amount of saving engineers can make on engines is small, compared with the amount of saving which can be made on the boilers. Where no effort is made to determine the efficiency of the average boiler, it is apt to run below 40 per cent; but with a load curve such as Mr. Abbott enjoys, he should be able to get a boiler efficiency of over 70 per cent. His statement that the coal having the greatest heating value per financial unit of value should be selected is a point in which I can hardly agree with him. I think he must go back and take that class of coal which will give the greatest amount of steam for a given financial value; and I have found that you cannot make a calorimeter test of your coal, and be sure that you are

going to get the same volume of heat, that is, that you are going to transfer a given percentage into useful heat. Many coals which are not high in quantity of heating value are much higher in their efficiency, because you get a much higher flame temperature and produce a great activity in your furnace, which enables you to reduce the over-ventilation. Mr. Abbott did well when he tried to impress on the members the great source of loss in over-ventilation. If just the correct amount of air could be used, so that the gases could have contact with it without absorbing the surplus of it, we could probably double the temperature that they now furnish."

Prof. D. C. Jackson said that even in a small station a good fireman could readily get 8 per cent of carbon dioxide in the flue gases, but that in most cases it did not average 5 per cent; this is because the fireman does not know, and the manager has not yet recognized the advantage of teaching him. If coal is fired properly and the right amount of air admitted a great saving can be effected. He had seen some plants of 1,000 h. p. or less with automatic stokers where there was not more than 2 per cent carbon dioxide shown by analyses of the flue gases, and it was not unusual to find less than 5 per cent in plants equipped with automatic stokers, where the supervision was not careful.

Mr. Bement described the working of the econometer mentioned by Mr. Abbott as follows: "If the conditions prevailing are those of a thin fire or a strong draft and the indication of carbon dioxide shown by the econometer is low, it is an indication of an excess of air. If, on the other hand, the fire is thick or the draft low, and the indication is low, it is proof of incomplete combustion. In the first case the total volume of gases is increased, owing to the large amount of air present and which is not used, causing the carbon dioxide to be small in amount in relation to the total volume; second, the carbon dioxide is less with incomplete combustion, because carbon goes to carbon monoxide instead of to carbon dioxide. If the indications of the instrument are irregular, it shows an uneven condition which may be, and usually is, accompanied by both an excess of air and incomplete combustion. If the highest carbon dioxide obtainable in a furnace is 15 per cent, and the instrument indicates less than this, it is apparent that something is wrong, and any change in firing conditions is immediately and automatically indicated.

"For a chemical analysis we use the absorbing econometer, the Orsat apparatus—a modified or improved form of the Orsat—which I consider has some advantages. I have also used a method by which it was possible to gather a gas sample and make analysis for carbon dioxide and carbon monoxide at two-minute intervals. I found, however, that the method, which is excellent where there is little oxygen present, is not satisfactory when oxygen exceeds about three per cent. The absorbing econometer is a very simple instrument; it is used for carbon-dioxide determination, and is employed where the gravity instrument is not available. The gas is pumped into a measuring and absorbing chamber, where it is confined, and by the movement of a partition the gas is brought in contact with the reagent and the reduction in volume is indicated on a graduated tube by a water column at atmospheric pressure. This is the most rapid of all chemical instruments. I have been able, by its use, to determine carbon dioxide at one-minute intervals, while riding on the front end of a locomotive, and also to make 75 analyses and 75 observations of temperature of escaping gases, and make a record of each in 75 minutes.

"We employ the more elaborate methods of analysis where it appears that such are the best means to obtain the desired information, and these investigations would not be confined to the two carbon oxides and oxygen if there were occasion to go further, but would be extended to hydrogen and hydrocarbon compounds. The only rapid method of determining carbon monoxide that I am aware of is that which I employ. It is very expensive and rather difficult, and the cost of the apparatus was about \$200, and while very interesting, I consider that it can have no industrial application. The simplest methods are always to be desired, and if such give the best results, they are preferable to more elaborate laboratory methods."

Mr. Doherty briefly described the Delwick gas process which has been developed in Europe and somewhat disturb our theories on the combustion of fuel. They start in with a fuel body of about 44 in., and find that by determining the velocity of the blast they can drive air through the incandescent fuel and produce more than 90 per cent of the carbonic-acid gas which we would theoretically

figure. This is apt to surprise any man who confines his work to boiler firing. There is no question they have obtained results with this system that have never been equaled in boiler firing.

Mr. Abbott in conclusion said: "The recording steam gage is a great thing, but if we had a device which would check up the efficiency of the fireman as well as the pressure, there would be no steam plant which would be without it. The average plant which will burn \$500 worth of coal in a month could, by such a device, save not less than 20 per cent of it. One speaker complimented me on the load curve we are able to show and suggested we have an efficiency of possibly 70 per cent. While I think we have a good efficiency, as far as efficiency goes, speaking candidly, when anyone asks me what it is, I am ashamed to tell them, because efficiencies are so little understood—the actual results you get in 24 hours are so little understood—that if you would tell anyone candidly what the results actually obtained are, they would set you down at once as a very poor manager. I do not think the average results in the plants throughout the country, as someone suggested, are over 40 per cent of the efficiency of the coal. By careful valve setting, you might be able to make an addition of 5 per cent in the extreme in the results obtained by an analysis, or by selection of transformers, at considerable expense, you might save an equal amount; but there goes on, from day to day, unobserved, and without causing any concern, a loss at a place where there is a possibility of saving not less than 30 per cent in many cases, 20 per cent in the average case, which is in the form of fuel consumed and the labor which it costs to handle that fuel. This does not cause anyone any anxiety, but if it occurred where it could be seen, as in the case of losing a couple of gallons of oil a day, or in the throwing away of a few pounds of dirty waste, it would set the manager to work at once to make a saving. It is a great illustration of the saying, 'saving at the bung-hole and wasting at the spigot.'"

DAMAGE BY LIGHTNING.

The severe thunder storms of last month caused considerable damage to electric power stations in different parts of the country. At Appleton, Wis., on June 22d, lightning entered the auxiliary power house of the Fox River Valley Electric Ry. and burned out the armature of the railway generator, causing the road to shut down for a few days till it could be replaced. June 11th, lightning entered the Dunlaps station of the Indiana Railway Co. and discharged heavily into a tank arrester, which did not take care of the full discharge, however, and a portion passed through one of the armatures. June 27th the switchboard of the South Bend station of the same company was slightly damaged by lightning.

Lightning also entered the sub-station of the Chicago & Milwaukee electric at Winetka, burning out one transformer.

STORAGE BATTERY MEN MEET.

The executive staff of the Electric Storage Battery Co. held its annual conference at Hotel Walton, Philadelphia, from June 4th to 7th inclusive. The meeting was attended by over 40 representatives from the company's various departments and agencies. Papers were presented during the convention covering a wide range of subjects relating to the making and operating of storage batteries and the business of the Electric Storage Battery Co., and valuable discussions followed the reading of each paper.

The subjects treated were as follows: "The Sales Department," by Chas. Blizard; "Preliminary Engineering," by J. Lester Woodbridge; "Results Obtained from Installations," by Hugh Lesley; "The Relation of the Construction Department to the Sales Department," by Jos. Appleton; "Some Details of Construction Department Methods," by R. H. Klauder; "Characteristics of Standard Cells," by Bruce Ford; "The Use of Boosters," by J. B. Entz; "The Law of Contracts," by Aug. B. Stoughton; "Street Railway Business in New England," by Frank J. Stone; "The Application of Chloride Accumulators in Isolated Plants," by Albert Taylor; "The Operation of Batteries in Connection with Long-Distance, High-Speed, Railway Service," by R. C. Hull.

The delegates were entertained at several elaborate luncheons and dinners during their stay in Philadelphia.

TWO WIRE THIEVES.

By the courtesy of Mr. John F. Dolan, chief of police, Wilmington, Del., we are enabled to show the accompanying portraits of Charles McAteer and George F. Walsh, now in prison at New



CHARLES McATEER.

GEORGE F. WALSH.

Castle, awaiting trial on a charge of stealing copper bond wire from the Wilmington & Brandywine Springs Electric Railway Co. McAteer was arrested in Philadelphia with a quantity of the wire in his possession.

IMPORTANT CONSOLIDATION IN OHIO.

We are indebted to Mr. F. T. Pomeroy, treasurer and general manager of the Cleveland, Elyria & Western Railway Co., for the following facts concerning the merger of three important inter-urban lines near Cleveland.

The Cleveland, Elyria & Western Railway Co. was incorporated June 20, 1900, as a consolidation of the Cleveland, Berea, Elyria & Oberlin Ry., which runs from Cleveland to Linndale, Puritas Springs, Berea, Elyria and Oberlin; the Lorain County Ry., which connects Elyria, North Amherst and Lorain; and the Oberlin & Wellington Ry., now building from Oberlin to Wellington, O. When this line is completed the Cleveland, Elyria & Western Ry. will comprise 65 miles of track.

The officers of the new company are: President, A. H. Pomeroy; vice-president, A. E. Akins; secretary, E. F. Schneider; treasurer and general manager, F. T. Pomeroy. The capital stock of the company is \$2,000,000, and \$1,500,000 in first mortgage bonds have been authorized.

In the articles of consolidation provision is made for the extension of the system to Norwalk, a distance of 20 miles, which will bring the total mileage of the consolidated properties up to 85 miles.

ACCIDENT AT HUTCHINSON, KAN.

A fatal grade crossing accident occurred at Hutchinson, Kan., June 13th, when a car of the Hutchinson Street Ry. was struck by a freight train while crossing the Santa Fe tracks. The time was 11:45 p. m. The street car slowed up before coming to the railroad, but seeing no train and hearing no warning, the motorman started to cross; when almost over the track the car was struck by a train consisting of an engine pushing four stock cars. Three women were killed, one very seriously injured and six other passengers more or less hurt. The street lights were not burning, it being moonlight, and the view of the railroad was somewhat obstructed by cars on a side track. The statements of passengers are to the effect that the crew of the freight train did not ring the bell nor blow the whistle, and that there was no watchman at the crossing and no brakeman on the front of the train.

TEST OF TRUCK FRAME.

The Peckham Truck Co. is now building 60 motor trucks for the South Side Elevated Railroad Co., of Chicago, and Mr. J. F. Morrison, superintendent and chief engineer for the Elevated company, recently had a transverse test of a side frame of one of these trucks made at the Peckham works, under his supervision.

The results are as follows:

Stress in Tons.	Deflection in Inches.
20	1-8
30	3-16
35	1-4
40	7-16
45	5-8
50	15-16
55	Broke in yoke

The fractured yoke when examined was found to be uniformly malleable throughout and showed no flaws.

As there are two side frames in the truck it appears that the ultimate breaking stress per truck is about 110 tons, which is eight or ten times the weight of half the car body and passengers.

ADVERTISING PLEASURE RIDES.

Commencing the latter part of June the Chicago Union Traction Co. has been advertising rather extensively in the daily newspapers the attractions it can offer in the way of pleasure rides. These advertisements were the idea of Pres. J. M. Roach and are novel in arrangement and wording, and four of them are reproduced here with the expectation that they will prove suggestive to the managers of other roads. On the first five week days the space

USE AND ABUSE OF TRANSFERS.

A liberal system of free transfers is generally recognized by street railway managers as an advantageous thing for the company; people are taught to ride more than they otherwise would and this traffic results in a direct gain to the company. A liberal policy and the absence of what appear to be arbitrary rules and restrictions assure the public that the company believes in fair treatment and such a belief disseminated in a community should do a great deal toward taking the wire edge off of unreasonable demands proposed by councilmen who like to pose as friends of the people and enemies of corporations.

But no matter how much the manager may wish to avoid cumbering his transfer system with restrictions that may irritate patrons, he must endeavor to protect his company against that class of persons who appear to believe that it is no wrong to cheat a corporation, particularly if it is a transportation company. This class is entirely too numerous.

What is probably the principal abuse of transfers, the traffic in them by newsboys, is to be found only in the larger cities, but where it does exist it is a veritable thorn in the manager's side and often causes a serious loss of income. It is rather a difficult matter to punish the boys for dealing in transfers because of their youth; the courts are inclined to be lenient, and public opinion endorses the policy. It may have some effect to cite the offenders for contempt of court, as was recently done by one of the Chicago companies, which had secured an injunction restraining the traffic in its transfers; but the moral effect upon a street arab of even a chancellor is doubtless not as lasting as could be wished. In the Chicago case, while a number of offenders were brought before the court, none was punished except by a reprimand.

The only effectual methods of preventing this abuse, it appears

OUTINGS For a DIME

On The Trolley Car

CHAPTER I.

To all believers in Teddy's theory of a "Fretful Life"—
Go in Elston-av. to Irving Park to-day:
You'll get action for your money all the way;
Change of scenery every minute,
For there's not a dull block in it.
You'll believe it when you are riding

On The Trolley Car.

Cars start at State and Randolph. Round trip, 36 minutes; cost, 10 cents.

OUTINGS For a DIME

On The Trolley Car

CHAPTER III.

For Rest, Recreation and "Blind Pigs"—Go to Evanston.
Solid comfort, healthful enjoyment and pure air served without extra charge on the Evanston Trolley Cars to-day. The scenery changes every minute and there is always something to please. At Evanston notice the fine trees, the University buildings, Rest Cottage, and the "Blind Pigs"—if you can find them. Take the babies along; this is great weather for babies and they all like to go—

On The Trolley Car.

Cars start at Clark st. Limits Station. Round trip 30 minutes; cost 10 cents.

OUTINGS For a DIME

On The Trolley Car

CHAPTER V.

For good Chinamen
Go to Rose Hill.
When reading about John Chinaman, his "Boxers" and their cruelty, remember that all "Chinks" are not bad. There is a colony of them in Rose Hill cemetery which never causes trouble to missionaries and diplomats. Their surroundings are interesting and worth a visit from all who desire an outing for fresh air and a pleasant ride to-day

On The Trolley Car.

Use Lincoln-av. cars, transfer to Robey-st., round trip from Monroe and Dearborn two hours; cost 10 cents

OUTINGS For a DIME

On The Trolley Car

CHAPTER VII.

For relief from the heat,
Go up Halsted Street.
When the nights are hot and everything is sizzling on the West Side, board a Halsted-15th-st. trolley car and go to Sheridan road. There and near the lake, is surrounded by beautiful houses and lawns, and is within a few blocks of the Marine Hospital. The lake front and Sheridan road is a good place to cool off while watching the ever-changing throng on the boulevards. Notice the hundreds of queer sights along Halsted-st. as you go by

On The Trolley Car.

Cars start at Halsted and 21st-st. Round trip 120 minutes, cost 10 cents.

A FEW CHAPTERS FROM PRES. J. M. ROACH'S NEW BOOK.

occupied is small, one column wide and about three inches long, and contains one "chapter" of the serial publication entitled "Outings for a Dime." We show four of these chapters. Saturdays and Sundays the advertisements take more space—about four columns wide and six or eight inches long, and are illustrated with a park or country scene; the reading matter is longer, but the refrain is the same—all about what one can see "On the Trolley Car."

COMPROMISE AT WESTFIELD, MASS.

The employes of the Woronoco Street Railway Co., of Westfield, Mass., last month presented a petition for an increase of wages from \$1.75 per day to \$2 per day, or to 20 cents an hour. The company could not see its way clear to grant this, but decided to pay its men 20 cents an hour from April 1st to December 1st, of each year, and 17½ cents from December 1st to April 1st, and if in any year the receipts enable the company to declare a dividend of 6 per cent on its capital stock, it will pay the higher rate throughout the 12 months. The employes are satisfied with the compromise.

to us, are those which will reach the man who sells or gives away his transfer check and the man who buys and uses it.

The Board of Supervisors of San Francisco, Cal., recognized the injustice of the transfer traffic and passed an ordinance requiring passengers to use transfers within the time limit and prohibiting their selling them or giving them away, under penalty. The ordinance was attacked on the ground that it was a violation of the guaranty of personal liberty contained in the Federal and state constitutions. The Supreme Court of California has recently held the ordinance valid.

The St. Joseph Light, Heat & Power Co., of St. Joseph, Mo., last month decided to make a trial of what is known as the Smith system of transfers, the invention of Mr. W. D. C. Smith, of Kansas City. The abuse here sought to be remedied is the use of transfer checks a longer time after issue than the rules permit, and the aim is to restrict the use of transfers to continuous passage on the first train leaving the transfer point. The system is as follows:

All trains are numbered consecutively, the number of each train displayed both on the front and rear car. The first conductor to go on duty on a train is provided with a bunch of transfer checks sufficient for the use of the train during the entire day. These

checks are numbered to correspond with the number of the train, and require only the punching of the hour which follows the time on which the ticket is punched. For instance, if the transfer is issued at 9:30 a. m. the hour of 10 is punched.

There are two perforated corners, on each ticket, one marked "in," and the other "out," and the conductor clips off the corners in accordance with the direction in which the car is moving at the time the transfer is issued. At each junction point a box is provided where the conductor of each train, when he arrives at that point, deposits a duplicate of the transfers he has just issued, one for each connecting line. These checks are fac similes of those he has issued to his passengers, but they bear also two punch marks near the top to distinguish them from transfer checks. Each conductor, when he hangs his duplicate transfers on the hooks in the box, takes up those left by other conductors for him. Passengers who get on his car at the junction point must be provided with transfer checks which correspond in number, color and hour punched with the duplicate checks which he takes from the box.

In case passengers alight from a car at a junction point and are required to run for a car which is pulling out before the conductor has come into possession of the duplicate check, it is the duty of the conductor to look out for the train number and honor the transfer. Whenever a train is crowded beyond its capacity so that all of the passengers in waiting cannot board the train, the conductor does not remove the duplicate or guide check from the box, but leaves it for the next conductor. He, however, honors the transfers of all those who are able to board his car.

CROWDED CARS.

An ordinance providing that passengers on street railways who are unable to secure seats shall pay a fare of 2½ cents only, and requiring the companies to sell "no seat" tickets in books of 10, being under consideration by the Board of Supervisors of San Francisco, Mr. W. Clayton, secretary of the San Francisco & San Mateo Electric Ry., some weeks ago appeared before the street railway committee and presented his objections at length.

Our readers are well acquainted with the facts that there are "rush hours" on street railway lines and that patrons will habitually board a crowded car in preference to waiting a few minutes, and we need not give Mr. Clayton's analysis of the condition at San Francisco. His objections to the proposed ordinance are interesting and we give a brief abstract of his arguments, which are:

To reduce the rate for standing passengers will aggravate the evil instead of alleviating it, because patrons who have bought "no seat" ticket books will prefer to board a crowded car and save the 2½ cents.

In case a car has some seats vacant and a greater number of passengers, who wish to take standing room only, board it, either an injustice is done the company or incessant and bitter disputes will arise between the conductor and the passengers as to who shall occupy the seats and pay full fare. On wet days outside seats are not available and if "no seat" passengers can ride for 2½ cents, the question of the degree of wetness will also cause disputes.

The ordinance provides that transfers shall be given on the 2½ cent tickets and that these shall give all the rights that 5-cent passengers have excepting the privilege of a seat on the first car boarded. This evidently entitles the 2½-cent passenger to a seat on the second car he boards and works an injustice to the 5-cent passenger whom he displaces as well as to the company.

The company (San Francisco & San Mateo) in order to give seats to all passengers would have to operate three times as many cars during the busy hours as is now the case, which is not physically safe on the heavy grades, because of the short headway that would be necessary, nor financially practicable. Even if it were practicable to operate the cars, it would not be possible to get men to operate them; the extra men would work only two hours a day at most, and could not expect a day's wages for two hours' work. Again, the receipts of the company not being increased, the total sum available for wages would be the same, which means a decreased rate for the men now employed.

The low "no seat" rate would depreciate real estate in the suburbs by making it to the financial advantage of persons using the street cars to live nearer the heart of the city, where they would always be sure of getting a crowded car to ride in.

THE BAKER CAR HEATER.

The well-known Baker system of heating cars by hot water circulated from a heater within the car itself, was introduced by the inventor, Mr. W. C. Baker, in 1866, and its good features of reliability and uniform heating led to its very wide adoption by steam railroad.

This heating system may be truthfully said to have been an important factor in the growth of the luxury which is now found in railroad travel. Numerous improvements have been made as experience showed them to be needed and the latest designs of heaters are fire-proof, non-freezing and self-regulating. The fire is enclosed in four cylindrical casings, the outer one of soft flexible steel, and the inner one a jointless close wound water coil, which is the generator coil of the heater.

For street cars there are two types of these heaters made. The one illustrated herewith is known as the "Mighty Midget" and embodies all of the latest improvements; it is made in various sizes. This heater has a generator coil equivalent to 25 ft. of 1¼ in. pipe, which is over 50 per cent more than in older designs, yet it is 7 in. smaller in diameter than the "Perfect"



BAKER HEATER FOR STREET CARS.

or the "Old Style" heaters. The hot water pipes are carried around the car and are at the feet of every passenger, while the heater proper may be located in the vestibule, in the car, or projecting into both, as may be desired.

Among the street railway companies using the Baker heaters are the Detroit, Ypsilanti & Ann Arbor, the Detroit, Lake Shore & Mt. Clemens, the Waterloo & Cedar Falls, the Milwaukee Electric Railway & Light Co. and the Twin City Rapid Transit Co. The Twin City company has quite recently placed an additional order for 75 heaters.

For small cars the "No. 6" heater, 16 in. outside diameter and 26 in. high to the base of the smoke pipe, is made; this is as small as it is practicable to make a hot water heater.

The Baker heaters are now made by W. C. Baker, successor to the Baker Heater Co., No. 143 Liberty St., New York.

TAX DECISION IN DETROIT.

A decision was handed down on June 29th, by the Circuit Court at Detroit denying the Detroit street railway companies' application for a mandamus to compel the common council and city assessors either to change their tax assessment or to give the companies another hearing. The court holds that the assessors acted in good faith; that franchises are taxable; and that the assessors did not have to separate the franchise assessment from the assessments on other property. The case will be carried to the Supreme Court.

The tax valuation which the companies are endeavoring to have set aside amounts for all roads in Detroit to \$10,247,000 as against \$2,600,000 valuation last year.

A bill apportioning the expenses of abolishing grade crossings in the state has been reported favorably to the Massachusetts Legislature by the railroad committee. Not more than 65 per cent is to be paid by the steam road, 25 per cent by the state, 10 per cent by the city or town, and not more than 5 per cent by the street railway, the exact proportion to be settled in each case by a special commissioner.

PERSONAL.

MR. JAMES BROWN recently resigned as superintendent of the Rome (N. Y.) City Street Ry.

MR. G. P. MAGNER has resigned the office of treasurer and general manager of the Newport (R. I.) Street Ry.

MR. C. L. HANY was last month appointed general manager of the Jackson (Miss.) Electric Railway Light & Power Co.

MR. PHILIP W. MOEN, of the American Steel & Wire Co. Worcester, Mass., has gone on a five months' European tour.

MR. W. D. SARGENT, general manager of The Sargent Co. Chicago, returned from Europe on June 23, after a two months' trip.

MR. W. J. CLARK, manager of the foreign department of the General Electric Co., is in England, where he expects to remain until August.

MR. C. F. LUTHER, secretary and general manager of the Pawtucket Street Ry., of Providence, R. I., tendered his resignation last month.

MR. GORDON ABBOTT has been made president of the Massachusetts Electric Cos. to fill the vacancy caused by the death of Mr. Amos Breed.

PROF. GEORGE W. BISSELL, of the mechanical engineering department of the Iowa State College, Ames, Ia., was a "Review" caller recently.

MR. PETER KLING has resigned his position as general manager of the St. Louis Car Co. to accept a similar position with the John Stephenson Co., of New York.

MR. C. B. BEEBE, of Syracuse, N. Y., having purchased an interest in the Oswego (N. Y.) Traction Co., has been made a director, succeeding Mr. G. P. Turnbull.

MR. WILLIAM B. McVICKER, of the Dearborn Drug & Chemical Works, of Chicago, has been making an extended Eastern trip. He reports business in excellent condition.

MR. HARRY DE STEESE, who was formerly with the Western Electric Co., and is now representing the Sturtevant Engineering Co., of London, is making an extended European tour.

MR. EDWIN R. CASE, of Jersey City, N. J., will accept the office of president of the New Paltz (N. Y.) & Poughkeepsie Traction Co., made vacant by the resignation of Mr. W. L. Supplee.

MR. H. C. SPAULDING, Exchange Building, Boston, has severed his connection with the H. W. Johns Co. to become the New England representative of the Craghead Engineering Co., of Cincinnati, O.

MR. C. P. WILSON has resigned as chief engineer of the Milwaukee Electric Railway & Light Co., owing to poor health. He was at one time general manager of the Sioux City (Ia.) Traction Co.

MR. CHARLES W. FORD, recently with the Galveston (Tex.) Electric R. R., will be manager of the Marlin (Tex.) Electric Light & Power Co., recently purchased by Mr. F. W. Fratt, of Jefferson, Texas.

MR. EDWARD QUIRK, of Oswego, N. Y., was on June 23, appointed receiver of the Fulton & Oswego Falls division of the Lake Ontario & Riverside Ry. This position was formerly filled by Mr. F. H. Tidman.

MR. W. C. GILES, president of the Newark (N. J.) & Hackensack Traction Co., has commenced suit for libel against the proprietor of the Bergen County Herald and others as the result

of an article printed in the Herald making certain charges against the traction company.

MR. E. TAYLOR, assistant engineer at the tramway electric power station, Sheffield, England, has been appointed chief assistant engineer for the Birkenhead (Eng.) Corporation Tramways to supervise the installation of electrical equipment.

MR. F. S. STEVENS on June 21st, succeeded Mr. George Truesdell as president of the Washington (D. C.) Traction & Electric Co. On the same day Mr. George H. Harries was elected vice-president in place of Mr. C. A. Lieb, resigned.

MR. CHARLES OLIVER, one of the railroad commissioners at Sydney, New South Wales, is visiting America in order to inspect a number of street railway systems with the view of making improvements in the tram lines at New South Wales.

MR. EARL POOLER was last month elected president of the Onalaska (Wis.) & La Crosse Street Ry., succeeding his father who recently died. Mr. Pooler has just attained his majority and is probably the youngest street railway president in the country.

MR. EUGENE KLAPP, who has been connected with the elevated roads of Chicago, was last month appointed division engineer to the New York Rapid Transit Commission and will supervise the construction of the viaduct for the rapid transit railway.

MR. JOHN W. TAYLOR, chief engineer of the East St. Louis (Ill.) Electric Street Ry., will hereafter also fill the office of chief engineer of the Terminal Railroad Association of St. Louis. Mr. Taylor is a young man of considerable reputation both in street railway and steam railroad circles.

MR. L. D. MATHES is general superintendent of the Norfolk (Va.) & Atlantic Terminal Co. which expects to open its new electric line from Norfolk to Old Point Comfort, Hampton and Newport News before August 1st. The company will also operate a line of twin screw steamers on Hampton Roads.

MR. H. G. MADDEN, representing the Bridgeport Brass Co., of New York City, spent several days in Chicago early this month. Mr. Madden is planning an extensive Western trip in the interests of his company and will devote a considerable portion of his time to the introduction of a new composition trolley wire that has recently been brought out.

MR. H. J. SOMERSET, formerly general manager of the Winnipeg (Can.) Street Ry., has entered upon his new duties as manager of the electric tramway at Perth, West Australia, to which office he was appointed last January. Mr. Somerset succeeds Mr. S. W. Childs, who is about to return to the United States. The Perth Tramways were built by J. G. White & Co. of New York City.

MR. YUTARO SASAKI, of Osaka, Japan, assistant general manager of the Nankai Ry., spent several days in Chicago. He is on his way home from a trip of study and inspection round the world. His system is forty miles in length, extending from Osaka to the ocean; it is operated by steam and does an exclusively passenger business. He reports a growing interest in electric traction and that the line in Tokyo is doing a good business. In most Japanese cities the narrow streets render track construction difficult.

 OBITUARY.

MR. GEORGE T. SMITH, secretary and cashier of the San Mateo & San Francisco Electric Ry., died at his home last month. At the funeral employees of the company acted as pall bearers.

MR. ISAAC ENGLE, who has been chief engineer of the City Ry., of Dayton, O., for the past six years, died on June 14th. He was a member of the Stationary Engineers' Association, and was honored and esteemed by his employers and associates.

MR. WILLIAM BACON CRITTENDEN, vice-president of the Duplex Car Co., of New York, died at his home in Brooklyn on June 6th, aged 44 years. Mr. Crittenden has been a regular attendant at the conventions of the American Street Railway Association for some time past and it is mainly to his efforts that the successful introduction of the Duplex car is due.

ELECTIONS.

THE SANDUSKY (O.), MILAN & NORWALK ELECTRIC RAILWAY CO. has chosen directors as follows: T. B. Taylor, Jas. D. Parker, Henry Kelley, Jacob Kuebler, John Whitworth, Howard J. Curtis, Wm. H. Gilcher, S. E. Stokes, Reuben Turner, A. Streck, Abram Lebensburger. All but Mr. Taylor were on the old board; Mr. G. H. De Witt, formerly president, disposed of most of his holdings and retired. The officers are: Truman B. Taylor, president; Henry Kelley, vice president; Jas. D. Parker, manager and secretary; Otto Stuerzinger, assistant manager; Howard J. Curtis, treasurer; John D. Mack, assistant secretary; Jay D. Parker, M. D., surgeon.

THE KANSAS CITY-LEAVENWORTH ELECTRIC RAILWAY CO. has made a number of changes in its operating staff. Mr. H. W. Wolcott who has been manager of the interurban division will be made general manager of the entire system. Mr. O. D. Henry, formerly with the Lorain Steel Co., of Johnstown, Pa., has taken the office of general superintendent of the interurban line. Mr. H. S. De Neefe will be train dispatcher at Wolcott. Mr. E. E. Combs, superintendent, and Mr. Z. T. Herndon, chief engineer, have severed their connection with the road.

THE TIFFIN (O.), FOSTORIA & EASTERN ELECTRIC RAILWAY CO. elected the following new officers: President and general manager, S. B. Sneath; vice-president, C. F. M. Niles; secretary and treasurer, R. D. Sneath; superintendent, A. Kaup.

NEW PUBLICATIONS.

MODERN ELECTRIC RAILWAY MOTORS. By George T. Hanchett. Published by the Street Railway Publishing Co., of New York City. Price \$2. This book relates entirely to the description, design and management of electric railway motors, the author assuming from the first that the elements of electricity and magnetism have been previously understood. All the standard types of the modern street railway motor are described and their theoretical and practical advantages compared and discussed. The book will be of the greatest value to students and motor repair men.

THE MECHANICAL EQUIPMENT OF THE NEW SOUTH STATION, Boston, Mass. Sent free on request by the Westinghouse Co., of Pittsburg, Pa. This is a reprint of a paper presented at the New York meeting of the American Society of Mechanical Engineers by Mr. Walter C. Kerr of the engineering firm of Westinghouse, Church, Kerr & Co., which designed, constructed and completely equipped this great terminal. The subject matter is treated under twelve headings as follows: Power-house, interlocking switch and signal system, the electric plant, heating and ventilating, disposal of drainage from waterproofed structure, roof drainage, ice-making, refrigerating and water-cooling plants, car-heating in train shed and yards, air-brake charging, steam and hot water supply to head-house, fire protection, elevators, baggage and express lifts.

STREET RAILWAY TAXES AT CINCINNATI.

The following table of taxes paid by the Cincinnati Street Railway Co. to the city for the year 1899 is published by City Government:

Car license, at \$4 per lineal foot for cars in service, \$24,869.60.
 Five per cent on gross earnings for the year, \$144,283.55
 State excise tax of 1/2 per cent on gross earnings, \$14,428.35.
 Eighth St. viaduct rental, \$1,000.
 Eden Park right of way, \$234.
 Vehicle licenses, \$185.
 County taxes for 1899, \$48,268.94.
 Total taxes paid during the year, \$233,269.44.

JOHN BLAIR MAC AFEE.

Mr. John Blair MacAfee, vice-president and general manager, and one of the organizers of the Railways Company General and the American Engineering Co., of Philadelphia, was born in Canada, but moved to the Quaker City when a child. He was educated at private schools, and at the University of Pennsylvania, becoming a member of the Philadelphia bar upon his graduation from the latter institution. He immediately began the practice of law, acting as attorney for several railway corporations. In addition to his legal work he gradually became interested in street railway construction work, one of his early achievements being the building of a 2 1/2-mile electric road in 24 hours. He is now



J. B. MAC AFEE.

building and equipping the Ohio River Electric Ry., extending from Middletown to Racine, O., and which will be operated by electric locomotives for heavy traction service.

The Railways Company General controls the following street railway and lighting companies: Michigan Traction Co., of Kalamazoo and Battle Creek; Elmira (N. Y.) & Seneca Lake Railway Co.; Lewisburg, Milton & Watsonstown Passenger Railway Co.; Montoursville Passenger Railway Co.; Philadelphia & Bristol Passenger Railway Co.; Milton Electric Light & Power Co.; Montoursville Electric Light Co. The American Engineering Co. during 1899 and up to the present time has constructed about 100 miles of electric railways in different parts of the United States and expects to commence work on a number of foreign tramways in the near future.

THREE-PHASE LINE IN ITALY.

One of the exhibits at the Paris Exposition is a model of the 3,000-volt three-phase electric railway system which the Adriatic Railway Co. is installing in the vicinity of Colico, Italy. The railways connecting Colico with Lecco, Sondrio and Chiavenna, three towns located at the vertices of a triangle of which Colico is the center, are at present operated by steam and will be converted for electricity; the aggregate length of the three lines is about 65 miles. Power will be derived from a 98-ft. fall in the River Adda, where 10,000 h. p. will be available; the power house is 10 miles from Colico. The station is to be equipped with three 2,000-h. p. units generating a three-phase current of 20,000 volts potential and a periodicity of 15. Transformer stations will be located 6 1/2 miles apart, and at these the current will be stepped down to a potential of 3,000 volts for the trolley wires; both primary and secondary lines will be on the same poles. Both the motor cars for passenger service and the locomotive for freight service will have four 150-h. p. motors; passenger trains will be run at a maximum speed of 38 miles per hour and freight trains at 19 miles per hour. It is intended that but two of the motors will be used on ordinary grades to attain the maximum speeds, the other two being thrown in circuit on grades over 1 per cent which are surmounted at half speed; when the four motors are in use two take current from the trolley and these supply the other two motors, which reduces the speed to one-half without loss of energy. The line is to be divided into blocks, the switches interlocked with the signal so that when a signal indicates stop the section next ahead is not supplied with current.

The company is said to be already contemplating the equipment of even larger lines for electricity.

The mayor of Chicago in his Fourth of July proclamation made the following special provision: "The placing upon the car tracks of any street railway or upon the rails of any railroad within the limits of the city of Chicago any torpedo, bomb or other thing containing any substance of an explosive nature, is hereby absolutely prohibited under penalty of \$10 for each offense."

CALIFORNIA TRANSFER DECISION.

On Apr. 30, 1900, the Supreme Court of California rendered its decision in the case of Henry Lorenzen, who had been convicted and sentenced for the misuse of a street railway transfer check and sued out a writ of habeas corpus. Four of the five members of the court concurred in sustaining the ordinance; one justice "while favoring many of the views of the majority dissented from the conclusion."

The main opinion is given below:

The petitioner was convicted of the violation of a penal ordinance in the city and county of San Francisco. He sued out this writ of habeas corpus, alleging that the ordinance under which he was convicted and sentenced is void. The ordinance in question is as follows:

"Order No. 2992. Providing regulations in the operation of street railroads and prohibiting the issuance or delivery of transfers to passengers except upon or within the car from which the passenger is transferred.

"The people of the city and county of San Francisco do ordain as follows:

"1. Every person, firm and corporation operating street cars within the city and county of San Francisco that issue transfers to passengers to enable them to transfer to other cars operated by the same or different owner, shall issue and deliver said transfers upon or within the car from which the passenger is transferred, and not elsewhere.

"2. Every person, firm and corporation operating street cars within the city and county of San Francisco that receives transfers as fare from passengers shall take said transfers from the passengers who received the same within or upon the car to which the passengers are transferred, and not elsewhere.

"3. No person, except a duly authorized conductor or agent of a person, firm or corporation operating a line of street railroad within the city and county of San Francisco, shall within said city and county issue, deliver, give or sell, or offer to issue, deliver, give or sell, to any other person whatsoever, any transfer, transfer check or ticket, issued or purporting to be issued by such person, firm or corporation so operating such line of street railroad, for passage on any street railroad car or line.

"4. Every person, firm or corporation violating the provisions of this order shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment."

Lorenzen was charged with having given and disposed of a transfer in violation of section 3 of the ordinance.

Against the validity of this ordinance it is urged that it violates the guaranty of personal liberty contained in the Constitution of the United States and of the State of California (Constitution United States, Amendment XIV, Sec. 1; Constitution State of California, Article 1, Sec. 1); that it is an unconstitutional interference with a right of private property; that it is arbitrary, oppressive and unreasonable; and, finally, that it is an illegal attempt to enforce the obligations or assumed obligations of private civil contracts by penal legislation.

As to the nature of the "transfer," it is well recognized and admitted that the street railroads of the city and county of San Francisco have provided that passengers upon their cars who have paid the usual fare may receive transfers entitling them to leave the car at a certain designated point, and there within a limited time and without further payment of fare, but upon presentation and delivery of the transfer check, pursue their travels upon the connecting line. It is, then, a part of the passenger's contract with the company that he may thus transfer to and ride upon the connecting road. As conditions of this privilege, it is further a part of the contract that the passenger shall board the cars of the connecting line at a designated point, and within a time limit after the issuance to him of the transfer indicated by a punch mark upon its face, and that the transfer shall not be transferable or assignable to another, but, if used at all, shall be used by the person to whom it is issued. The paper slip or ticket designated a transfer, when in the hands of the passenger, thus serves a twofold purpose: First, to the passenger as an evidence of his contract by which he is entitled to continue his journey upon the connecting road; and, second, to the company as a means of identification afforded to its conductors and

servants by which they may know that the passenger presenting the transfer is entitled to ride without further payment of fare.

Such being the nature of the contract between the company and its passenger, consideration may be paid to the objections raised against the validity of this ordinance. The power of the general legislature, acting within constitutional limitations to make penal an act theretofore indifferent, or even innocent, may not be doubted. *People vs. West*, 106 N. Y., 293. This, however, is not a statute of the general legislature, but a municipal by-law, and while it is true that article XI, section 11, of the Constitution of this State, expressly confers upon a city the power to make and enforce within its limits "all such local, police, sanitary and other regulations as are not in conflict with general laws," this language is not to be construed as enlarging the powers which municipalities theretofore enjoyed in these respects; but it is merely an express grant of a power which formerly they possessed by implication. *People vs. Wiltshire*, 96 Cal., 607. The ordinance in question, then, is to be scanned and judged like any other municipal ordinance. So judging it, regard is to be had to the end sought to be accomplished—whether that end be a reasonable one, and one within the powers of the municipality to accomplish; and regard is also to be had to the question whether the mode adopted to accomplish the end is itself reasonable or unreasonable.

Street car companies are public utilities, which are almost necessities to our present mode of life. While in one aspect their ownership is private, and they are operated for private gain, in another they are servants of the people, and the law-making powers reserve and freely exercise the right to regulate and control them in their operations. It is upon the theory, and only upon the theory, that they may be operated for the public good that a franchise permitting their existence may be given; and the power to pass reasonable regulations for their operation and management is expressly granted by section 503 in our Civil Code. It is strictly within the power of the municipal authorities of the city, and properly within the exercise of their duties, to pass any reasonable regulations affecting street car lines, to remedy a threatened or actual interference with the comfort, convenience and general welfare of the traveling public. It is urged against this ordinance that it is an attempt by penal legislation to enforce a private civil contract; in other words, that it is an attempt to compel the passenger who has received his transfer to use it within the limits of his contract, and not to violate that contract by giving it to a person who may make improper use of it. Could it be perceived that this was the only purpose, or even the main purpose, of the ordinance in question, we should be inclined to hold that the objection was fatal; but we cannot perceive that its main object or design was to accomplish this result. Rather we think it clear that its primary object is to protect and advance the convenience and welfare of the traveling public. For if to the legislative mind an abuse of the transfer system has grown up, the inevitable result of such unrestricted abuse must be one of two things: either that transfers would be discontinued entirely, to the material injury of the community, or the transfer system would be hedged and safeguarded by onerous conditions and requirements for the protection of the company, which would work great inconvenience to the passengers. It was certainly right for the supervisors, if they saw or anticipated the existence of such an evil, to destroy or avert it by proper legislation tending to correct the abuse, and it is no objection to the validity of an ordinance designed for this purpose that it may incidentally tend to prevent frauds and compel men honestly to abide by their contracts. It is concluded, therefore, upon this point that the purpose of the legislation to promote the convenience and welfare of the traveling public in regulating the business of the street car companies of San Francisco in their dealings with their passengers, is legitimate and within the scope of the powers expressly granted to the municipal authorities.

But are the means adopted to accomplish this end unreasonable or oppressive, or in violation of any constitutional rights of the citizen? It is here first insisted by petitioner that the transfer issued to him by the company is his property, and that an essential and inalienable right to the enjoyment of property is the right to sell, give it away, or otherwise dispose of it. This, however, is but partially true. A man may not be deprived of his property or of his property rights for any private considerations whatever, nor for considerations of public good, without compensation first made; but the legislature has the unquestioned right, and every day exer-

cises it, of restricting the use to which private property may be put. As is said in *Burdick vs. The People*, 149 Ill., 600: "The franchises of railroads acting under charters or acts of incorporation are of a public nature so far as the safety, convenience and comfort of passengers are concerned. The reasonable regulations affecting the conduct of such public employments are fit subjects for legislative action. The law-making power may provide means for remedying such evils as in its opinion may exist in the management of these public agencies of transportation, and in doing so it may sometimes impose restrictions which are deemed to be necessary upon the use and enjoyment of property. A man is not deprived of his property unless it is taken away from him so that he is divested of his title and possession. To limit the use and enjoyment of property by legislative action is not to take it away from the owner, when the property whose use and enjoyment are so limited is invested in a business affected with a public use, or used as an accessory in carrying on such business." But, aside from this, in the case of this ordinance it cannot be perceived that its terms limit or circumscribe any of the just and legal rights which a passenger receiving a transfer theretofore enjoyed. In receiving it he took it under the conditions above set forth. It was a part of his contract that, if used, he alone would use it, and if he sold it or assigned it, or gave it to another to the end that that other might use it, he clearly violated his contract, and put a fraud upon the company. A court will not hear with much patience one insisting upon his right to violate his contract and consummate a fraud. The ordinance in question, therefore, so far as the passenger is concerned, leaves him all the rights which theretofore he enjoyed under his contract, and interferes in no way with any legal or legitimate use which at any time he could have made of the transfer. At the most, so far as he is concerned, it has but made penal what before was illegal and against good morals.

Finally, it is urged against the ordinance that by the generality of its terms it is unreasonable and oppressive; that every person who taking a transfer shall hand it to any one other rather than the person authorized to receive it, no matter how innocent the act may have been in fact or intent, is guilty of a misdemeanor. In illustration of the position it is said that if the conductor should give to the father traveling with his family three or four transfers, and he in turn should hand them over to his wife and children, he would at once become amenable to the ordinance; that so, too, would be the passenger who handed his transfer to another upon the car to be delivered to the conductor; so, too, would the witness in court who gave the transfer to the judge for inspection, or the judge who in turn might deliver it to the clerk. To some of the objections thus presented answer may be made that the life of the transfer ends with the passage of the time indicated upon its face. It ceases then to be a transfer, to have any value at all other than that which may attach to it as a bit of paper. But for the more substantial objection that the ordinance by its terms would oppress and lead to the conviction of persons guilty of no fraudulent act, it is to be remembered that the letter of a penal statute is not of controlling force, and that the courts, in construing such statutes, from very ancient times have sought for the essence and spirit of the law and decided in accordance with it, even against express language; and in so doing they have not found it necessary to overthrow the law, but have made it applicable to the class of persons or the kind of acts clearly contemplated within its scope. The rule was thus early expressed in Bacon's Abridgment: "A statute ought sometimes to have such an equitable construction as is contrary to the letter." The oft-recited instance of the Bologna law, which enacted that whoever drew blood in the streets should be punished with the utmost severity, was wisely held not to apply to the barber who opened the veins of a sick man to aid in his cure. The statute of Edward II, declaring guilty of a felony any person who broke prison, was held upon considerations of the most ordinary common sense not to apply to one who did so to escape from a burning jail. The law declaring it a felony to lay hands upon a priest, by the same principles of common-sense reasoning, was held not to apply to one who did so by way of kindness or warning, but only to those who acted with illegal or improper intent. In *U. S. vs. Kirby*, 74 U. S., 482, the act provided: "That if any persons shall knowingly and willfully obstruct, or retard the passage of the mail, or of any driver or carrier, etc. * * * for every such offense shall pay a fine not exceeding one thousand dollars." A mail carrier was arrested by a state officer on an indictment for

murder. The act came within the letter of the law. Mr. Justice Field, delivering the opinion of the court, discusses the exemption of mail carriers from detention under civil process, but declares that they are liable to arrest and detention under criminal process for acts *malum in se*. Therefore, notwithstanding the fact the defendant had "knowingly and willfully" retarded the mail carrier, it is said: "When the acts which create the obstruction are in themselves unlawful, the intention to obstruct will be imputed to their author, although the attainment of other ends may have been the primary object. The statute has no reference to acts lawful in themselves, from the execution of which a temporary delay to the mail unavoidably follows. * * * All laws should receive a sensible construction. General terms should be so limited in their application as not to lead to injustice or oppression or an absurd consequence. It will always be presumed that the legislature intended exceptions to its language which would avoid results of this character. The reason of the law in such cases should prevail over its letter." In *Donnell vs. State*, 2 Ind., 654, a statute prohibiting the retailing of spirituous liquors without license contained no exception in favor of a druggist selling for medicinal purposes. A druggist who had so sold liquor was discharged after conviction as being clearly excepted from the intent, though not the letter of the law. In *State vs. Clark*, 29 N. J., 96, the statute made it a misdemeanor for any one to willfully open, break down, injure or destroy any fence. It was held not to apply to the destruction of a fence by one who was in its lawful possession, and it is said that the literal import of the terms and phrases implied will be controlled by the objects which the act was designed to reach. In *Holmes vs. Paris*, 75 Me., 559, it is said: "It has been repeatedly asserted in both ancient and modern cases that judges may in some cases decide upon a statute even in direct contravention of its terms." In all of these cases the apparent defect of the statute is cured by making it apply according to its spirit to the act in its nature illegal or fraudulent. So here, notwithstanding the generality of the language, no lawful or innocent use of the transfer would subject the passenger to the penalties of the ordinance.

It is concluded, therefore, that the ordinance is valid and the prisoner is remanded.

The dissenting opinion objects to the concluding portion of the main opinion and discusses the cases cited therein, the Bologna "blood-letting law" and others. The objection of the justice is that the decision injects the words "with intent that it shall be used by some other party" into section 3 of the ordinance, which the justice contends is inadmissible.

NEW LINE AT FLORENCE, ALA.

Mr. E. A. Schubert, of Fostoria, O., writes us as follows concerning a street railway line projected in Florence, Ala.: "The system will comprise eight miles of track laid with 60-lb. steel rails. The power house will be of brick, 50 x 90 ft., with three engines, two of 600 h. p. and one of 300 h. p.; the larger engines will have direct connected generators of 400 kw. capacity, and the small one will be belted to a lighting generator. The cars will be of the double truck type with separate compartments for the two races; at least ten cars will be operated. The organization has not yet been perfected and the plans and specifications will hardly be completed before July 25th; as soon as possible thereafter construction work will be commenced. It is the intention to develop interurban lines in connection with the Florence road, and the company will also light the city streets and furnish light for commercial purposes. At present mail should be addressed to E. A. Schubert, Fostoria, O."

New club rooms with pool and billiard tables, a library and other attractions are being fitted up by the employes of the Birmingham (Ala.) Railway & Electric Co.

Suit was brought last month to set aside the sale of the Capital Ry., of Washington, D. C., to the Washington Traction & Electric Co., and have a receiver appointed for the first named company. The complainants were injured in an accident on the Capital Ry., July 10, 1898, and claim that judgments for damages have never been paid.

FOREIGN FACTS:

Colchester (Eng.) Corporation has decided to apply for a tramway provisional order.

Devonport, Eng., is to have electric trams. Mr. C. Furness is borough electrical engineer.

It is proposed to change the horse tramway at San Luis Potosi, Mexico, into an electric line.

La Compagnie des Tramways Electriques d'Hanoi has been formed to build electric trams at Hanoi, Tonquin, Indo-China.

The Cardiff (Wales) Tramways Committee is about to invite tenders for 1,000 tons of rails, fishplates, bolts, copper bonds and other track material.

The Pietermaritzburg (Natal, S. A.) Corporation is seeking powers to construct electric tramways within the borough at an estimated cost of £75,000.

The Havre (France) Tramways are to be extended several miles by the Compagnie Generale Francaise de Tramways, 60 Rue de la Chaussee d'Antin, Paris.

A syndicate of New York and Philadelphia capitalists has incorporated the Uva Commercial Co., to build electric railways in Honduras, Central America.

Gas tram cars at Blackpool, Eng., are to be displaced by the overhead electric system. The Blackpool, St. Anne's & Lytham Tramways Co. owns the lines.

The town section of the electric tramways at Southampton, Eng., was formally opened to traffic last month. It is hoped the entire system will be completed by August.

A bad tramway accident occurred near Buda-Pesth lately when an electric car filled with passengers ran down a hill, overturning at a curve near the bottom and killing four persons.

The Glasgow (Scotland) Corporation Tramways report for the year ending May 31, 1900, gross receipts of £464,763, as compared with £433,128 for the previous year, an increase of £31,635.

A bill granting the Croydon (Eng.) Corporation powers to construct electric tramways and borrow £170,000 for the purpose has been reported favorably by a House of Commons committee.

The Italian Government is encouraging capitalists to undertake the building of electric tramways in that country and within the past three months has granted a number of tramway concessions.

The corner stone of what it is said will be the largest street railway car barn in Europe was laid at Manchester, Eng., last month by Mr. D. Boyle, chairman of the Manchester Tramways Committee.

A company has been formed at Gijon, Spain, with the title, El Credito Industrial Gijones, to develop coal mines, construct narrow-gauge railroads and exploit electric tramway concessions in Spain.

Electric cars have now been substituted for the old horse cars on all the tramways of Nice, France. The tram lines have been extended to Villefranche, and will ultimately be extended to Monte Carlo.

The work of equipping the Newcastle (Eng.) Tramways for electric traction is proceeding at a rapid rate. At a recent meeting of the Tramways Committee it was decided to lay down several additional lines.

Tampico, Mexico, is to have a new street car line. This town had a mule tramway years ago, but it is said that the very first car sent out ran over an Indian and the natives raised such a row that the entire project was abandoned.

The first annual report of the Blackburn (Eng.) Tramways since their purchase by the municipality shows a net loss of \$4,500. Half of the line is operated by electricity and half by steam. Under private ownership the road earned a surplus.

The Societa delle Strade Ferrate del Mediterraneo has proposed a scheme for changing the Naples (Italy) Castellammare trunk line, a 22-mile steam road, to electric motive power with a third rail. Power will be derived from the river Tusciano.

The citizens of Buenos Ayres know how to deal with scheming politicians. The City Council has persisted in blocking electric tramway enterprises contrary to the wishes of the inhabitants and now the people have about decided to abolish the City Council.

It is estimated at least a score of towns in South Africa will demand electric tramway systems as soon as hostilities cease, and this country promises to become a rich field for dealers in electrical supplies. Mr. J. G. Stowe is the United States consul general at Cape Town.

Mr. William Doull, of Montreal, Can., an officer of the Cuban Electric Ry., which runs from Regla to Guanabacoa, Cuba, states that the new enterprise has fulfilled all the expectations of the promoters, the net receipts for the first month having been between \$5,000 and \$6,000.

The Kingdom of Saxony, Germany, has 143 miles of electric railways in operation, according to statistics prepared by the Royal Bureau of Electric Railroads at Dresden. The equipment of the roads includes 731 motor cars and 289 trailers. During the year 1899 there were 113,592,390 passengers carried.

The city of Halle, Germany, has been negotiating with the company owning the street railways of that city for their purchase. The company, whose concessions run till 1929, was willing to sell for \$678,000, and after an examination of the property by experts the city offered \$595,000. The matter is as yet undecided.

The Leeds (Eng.) Corporation Tramways makes the following report for the year ending Mar. 25, 1900: Total revenue, £129,138; operating expenses, £99,110; earnings from operation, £30,028; interest on loans, £12,051; sinking fund charges, £11,809; net income, £6,167, an increase of £2,278 over the previous year. Several additional routes will be equipped for electric traction during the summer.

A London paper prints the following: "There was to be a bull fight at Seville, Spain, and, the tramway directors refusing to stop the cars, the running of which would have interfered with the sport, the people rose in a riot, quelled only with bullets. In order to preserve their property from utter destruction, the directors hoisted the German flag, and this, according to the Herald, had something to do with the rigor with which the riot was put down."

The House of Commons has passed the following bills: Blackpool (Eng.), Lytham & St. Anne's Tramways, Ipswich (Eng.) Corporation Tramways, Baker St. (London) & Waterloo Ry., Charing Cross (London) & Strand Electricity Supply, Wirrall (Wales) Ry., Hamilton (Wales) Motherwell & Wishaw Tramways, Aberdeen (Scotland) Corporation Tramways, South Lancashire Tramways, London United Tramways, Cork Electric Tramways. Bills have recently been passed by the House of Lords granting powers to build electric tramways to the following: Aston Manor (Eng.) Tramways, Stockport (Eng.) Corporation Tramways, Charing Cross (London), Euston & Hampstead Ry., Aberdeen (Scotland) Corporation Tramways, Cork (Ireland) Electric Tramways, City & South London Ry., Wellingborough (Eng.) & District Tramroads, London County Council Tramways (Bill No. 2).

MECHANICAL DEPARTMENT

HOW TO PAINT A STREET CAR—FROM THE STANDPOINT OF A PAINT MAKER.

By Edw. W. Williams, Sales Manager, Railway Department, The Sherwin-Williams Co.

To treat satisfactorily in a short article a subject on which so much can be said is hardly possible. To lay down hard and fast rules by following which good work will be assured, without reference to differing conditions of weather, temperature, surface and facilities is still less possible. It is quite practicable, however, to offer certain general suggestions, by following which, with such modifications as conditions necessitate, any intelligent painter may turn out work which for appearance, durability and economy will be gratifying to his company and creditable to himself.

No effort will be made in this article to take up any of the numerous methods of "cutting in," "touching up," etc., of old cars. Suffice it to say that when the paint and varnish on a car have perished beyond a certain point or show cracks which go below the varnish into the paint, a good job of repainting can not be done without first burning or scraping off all the old paint and starting anew. It will cost a little more to do this, but the added expense will be made good twice over by the better appearance of the car and the much longer time during which it can be kept in service without repainting. Let us then take up a system of painting a new car or one which has been burned off.

In the first place the shop should be one which can be kept dry at all times and in which the temperature may be maintained fairly constant. Good car painting can not be done in a cold and damp shop nor under hot sun. If shop facilities in this respect are not entirely satisfactory, the work should be planned for such seasons as offer the best conditions of weather, but a company operating a large number of cars can as a measure of economy, well afford a paint shop that is properly lighted, heated and ventilated.

Painting material should be bought only from a reputable house and one that has made a particular study of the conditions and methods of street car painting. Such a house, having a wide acquaintance with street railway officials through its representatives and experts, is able to avail itself of the experience of many of the best painters, and with its own facilities for independent investigation and research is better able than others to suggest what is good in materials and methods.

The foundation coats are the first and all important ones. A proper surface must be obtained before the color and varnish coats can be safely applied. A good schedule is about as follows: First day, one coat of primer; second day, putty; third day, first coat of surfacer; fourth day, second coat of surfacer; fifth day, third coat of surfacer; sixth day, rub to surface. This schedule applies particularly to the surfacing system of the company with which the writer is connected, and will have to be modified to suit the materials of other makers.

The primer should be well brushed in, especial care being taken to see that it gets into all cracks, joints, nail holes, etc. It should be allowed to stand two days before the first coat of surfacer is applied, but the second of these days may be used for puttying. When the car has been primed and putted, not less than three coats of surfacer should be applied.

When the last coat of surfacer is dry, that is, the day after it has been applied, the car is ready to be rubbed. Care must be taken not to rub through to the wood. It is safer to apply what is termed a "guide coat" before beginning to rub. This is generally just a thin stain which gets into all the depressions, brush marks, etc., and serves as a guide to prevent rubbing too far. Where the guide coat is used an extra day is of course necessary.

The best way to get a surface is with the use of block pumice

stone and water. Satisfactory work, however, can be done with sandpaper if that method is preferred.

The car is now ready for the color coats. The method of procedure from here on depends largely on the character of the color to be used, both as regards shade and also more particularly as regards the way the material is made and put together.

In the first place japan color should be used. A common way in the past has been to give one or two coats of flat (japan) color, a coat of the same color mixed in rubbing varnish, which last coat is mossed or rubbed for striping and lettering and then one or more coats of finishing varnish. Although much good work has been done and probably will be done in this manner, it is now generally admitted that a great part of the difficulties of the car painter are due directly or indirectly to the use of rubbing varnish. Practically all of the large steam railroad companies have discarded its use, either as a thinner for japan color in small proportion to turpentine or as a color varnish and also as a coat of clear varnish.

A much safer and more durable way is that now in vogue in the most up-to-date shops, which is as follows: Having rubbed to a surface, apply two or more coats of flat color, the number depending on the opacity of the paint, which varies with different shades. Stripe and letter directly on the last coat of flat color and then finish with finishing varnish. Two coats will answer, more will give better results.

In the case of cars finished in a bright red shade the first coat of flat color should be what is known as "red ground." This is a red varying in shade according to the character of the bright red which is used in finishing. The bright red gets its brightness from the use of carmine or certain lakes which although necessary in order to secure the beautiful tone are more or less transparent. It is therefore best to use under a coat of the brightest red one coat of a red which is not so bright perhaps, but which is of good opacity and which is chosen as well calculated to bring out the best results in the finishing coat of the rich, bright red.

This covers the best method for finishing the bodies, including side panelling or sheathing, letter boards, running boards, door and corner posts and dashes, whether of metal or wood.

Now as to trucks. It has been the custom in the past to use japan color with a liberal percentage of oil or varnish or color ground in oil in paste form which is thinned so as to dry flat or semi-flat. Striping is done on top of this and then the work is given the varnish coats. This manner is gradually being discarded as too expensive for this part of the car. A cheaper way by far and one much better is to buy the truck color ready for use and ground in varnish.

In my opinion it is not desirable to go to any expense in striping or ornamenting the trucks. These parts are so near the ground and so quickly gather the dirt and become worn by the friction of sand and gravel that a car can run but a few trips before the effects of any fancy work on the trucks is entirely effaced. Why then go further than to give the trucks a coat of paint which will stay on, will protect the metal and wood parts and will give a surface that is easily cleaned.

It is customary in some shops to use slush, that is, the odds and ends of paint and varnish for mixing up paints for the floors and roofs. From an economical standpoint the less mixing in the shop and therefore the less varied the paint stock, the better it is. Get a paint for each part made to serve the purpose for which it is intended. The paint stock can then be limited to about the following: Car primer, car surfacer, car body color in japan, trimming color in japan, letter color in japan, truck color in varnish, roof paint in liquid form, floor paint in liquid form, varnish, oil and turpentine.

Of course there will be need of other things, but it will be found that by adopting standard shades and buying the material matched to the standards, a greater degree of economy and convenience will be obtained.

BAKING ARMATURES.

Inquiry among shop superintendents and electricians of street railways shows that it is the general, though not universal, practice to bake motor armatures after they have been rewound.

In the opinion of some this is an unnecessary precaution since with motors of the more modern types the coils are wound and painted with shellac or other insulating compound and then dried before being inserted in the core. We may assume that the core and the paper insulating shells are themselves dry, so that there should be very little moisture in the armature when wound. It may be argued that there is no necessity for baking the completed armature because even if the insulation should not be perfectly dry when the armature is put in service the heat generated will quickly dry it out. If the motors receive a heavy starting current when in service it is considered better to thoroughly dry them in a baking oven though, as stated, the precaution would be needless if the current were fed slowly at starting.

The present practice on the North Side division of the Chicago Union Traction Co. is not to bake armatures. Mr. V. T. Lynch, superintendent of the North Side shops, states that until about a year ago the rewound armatures were baked for from two to five days before being returned to service. It was found, however, that the heat had a detrimental effect on the insulation, as when taken from the ovens, the varnish and shellac on the windings would be as dry as chips, and in a condition best described as "lifeless." Noting these defects, it was determined to try the experiment of putting the armatures back into the motors, just as they came from the winding room, without baking or drying. The results were so satisfactory that this has been made the regular practice, and it is found the number of faults in the windings has decreased, and the life of the armatures has been materially prolonged. The company still uses its oven, however, for drying out armatures that have been subjected to an unusual degree of moisture, as in sweeper and snow ploy service, etc. The armature varnish that has always been used is orange shellac cut with wood alcohol; for fields "P & B" electrical compound is used. No change in varnish has been made since discontinuing the practice of baking.

The oven is on the second floor of the "Limits" shops, and is about 7 x 12 ft., and 7 ft. high, with walls of Holstein clay. Two narrow gage tracks are laid the full length of the oven, and on these run low trucks which carry the armatures. At one end of the oven is an ordinary steam radiator, and along each side are electric heaters.

The Indianapolis (Ind.) Street Ry. for some time past has not baked rewound armatures for the reason that the electric heaters in the oven were not of sufficient capacity to raise the temperature to the point desired for baking.

At the West Side shops of the Chicago Union Traction Co., armatures are baked for about three days after rewinding. The oven used for this purpose is 7 ft. wide, 10 ft. long, and 6 ft. high, inside dimensions, and has 8-in. walls of ordinary brick. The roof consisting of a layer of sheet iron on which is laid 4 in. of brick, is supported from the side walls by I beams. An iron sliding door is placed in one side. The oven is heated by live steam circulating through 12 coils of pipes running the full length of the interior. The temperature is maintained at about 175° F.

The practice of the Boston Elevated Railway Co. is to bake all armatures rewound in its shops. The coils after being wound are dipped in "Armalac" and air dried; the coils are not baked because it renders them less pliable for winding. After the armatures are rewound they are baked for 9 or 10 hours at a temperature of 90° C. (194° F.). The oven 10 x 12 ft. and 7 ft. high, heated by steam pipes arranged on three sides. Concerning the method of heating to be used, Mr. C. F. Baker, superintendent of motive power and machinery, says: "In my opinion steam is the best mode of heating, especially when the oven can be situated near a steam plant, for the steam pressure can be regulated by pressure regulating valves and the condensation can be returned to boilers by trap or pump. Also, I think this method would require less care to give the coil an even temperature than would be required if using coal, coke, coal gas, or even electricity, although all of these could be regulated by automatic dampers or devices controlled by thermostats, and in

some places might be used more advantageously than steam. In some cases this would depend on local conditions."

Mr. J. B. McClary, general manager of the Birmingham (Ala.) Railway & Electric Co., writes that his company bakes all armatures and considers the baking necessary even when the coils have been covered with shellac or insulating paint and dried before being put in the armature. The armatures are baked by putting them in a box 2 x 2 x 4 ft., lined with asbestos, in which are 20 16-c. p. incandescent lamps. This method of heating is the only one the company has ever used and has been found perfectly satisfactory. The time of heating is 36 hours.

Mr. M. M. Martin, superintendent of the Oakland (Cal.) Railroad Co., writes us as follows: "We have just commenced rewinding our W. P. 30 armatures after a service of nearly eight years. We intend baking them and will use an electric heater. The temperature and length of time of baking will have to be determined by experiment, also the kind of insulation to use."

Mr. C. W. Smith, general manager of the Los Angeles (Cal.) Railway Co., in answer to our inquiry states that it is the practice on that road to bake all rewound armatures for not less than 12 hours at a temperature of 180° F. It is not considered absolutely necessary to bake armatures that have been wound with insulated coils, but it is a good precaution; the superintendent is governed by the insulation test after the armature is completed. The oven is 4½ ft. wide, 6 ft. long and 6 ft. high; the outside is of 1-in. flooring and next come 2 in. of mineral wool, a layer of red fiber ¾ in. thick, 2 in. of magnesia, and sheet asbestos ¾ in. thick, in the order named. The oven is heated by steam, which method, taking into consideration fire insurance rates, is regarded as better than the use of coal, coke, coal gas or electricity.

The Chicago City Railway Co. in its repair shops has an armature oven built of brick, 12-in. walls, with double doors of sheet iron; the roof is of corrugated iron. This room is 6 ft. wide, 15 ft. long and about 9 ft. high. Along both sides and across the closed end of the oven 30 steam pipes, 1-in. diameter, are fastened to the walls; the supply of steam, exhaust from the power station, is regulated by a valve located outside the door. A thermometer is placed inside the oven and the steam regulated so as to give a temperature of from 160° to 180° F. It is found that in practice the oven is opened at intervals of 30 to 45 minutes to put in or remove armatures and this inspection of the thermometer is frequent enough to keep the temperature approximately constant. The armatures are subjected to the temperature mentioned from 12 to 24 hours, never longer than the latter period.

For handling, outside the armature repair shops, which includes removal to and from the oven, and then to the car houses, etc., each armature is placed in a frame which keeps the winding from abrasion by coming in contact with the floor or walls. These frames are rectangular, made of 2-in. oak, 28 x 14 in. inside measurement and 9 in. deep; the corner joints are made with square tongues and mortises. Each end piece has a semi-circular notch cut in the top to receive the armature shaft and prevent the windings from coming in contact with the side pieces. For the convenience of the men in handling the loaded frames, in lifting them on and off trucks, etc., a hole is bored near each corner and a loop of ½-in. rope put through. The loops serve as handles.

Mr. M. O'Brien, master mechanic of the Chicago City, states that when he was with the National Railway lines of St. Louis the same practice of baking armatures for from 12 to 24 hours at a temperature of from 160° to 180° F. was followed. The oven he then used was of brick 10 x 12 ft. built in one corner of the armature repair shop. It was lined with a 1-in. layer of asbestos which had previously been used as a boiler covering. For heating the oven an ordinary car stove was set up inside, with a rod for manipulating the damper extending through the wall. A small window with glass was located in one wall and a thermometer hung before it, so that the temperature could be observed without entering the oven. The stove required no attention after being filled with coal once each day. The use of a stove such as this would perhaps not be deemed desirable in some cases because of the increased insurance rates. It has also been suggested that gases escaping from the stove might injure the insulation and even the copper.

One of the most novel methods of "baking" of which we have read is one described by Mr. J. F. Hobart. The method is only applicable to the coils before they are placed in the armature, and consists of burning out the alcohol of the shellac. The coil having been covered with shellac, applied preferably before being removed from the form, it is heated over a gasoline torch or bunsen burner until the shellac ignites. It will blaze fiercely and at the proper time—determined by experience—the blaze is extinguished, after the shellac has become hard but before it burns. The object of this method is to quickly dry a coil when needed for immediate use.

From the foregoing it will be remarked that the use of steam is regarded as a very satisfactory mode of heating armature ovens, the ease of regulating and the low fire risk being the principal advantages. The use of incandescent lamps as described by Mr. McClary, is also a simple and convenient method of heating.

While there is a general uniformity as to the temperature, 180° to 200° F., at which the armatures are dried, one cannot fail to note the wide differences in the length of time they are subjected to this temperature. On the roads mentioned the time varies from 9 to 72 hours. This is quite surprising, even allowing for a variety of types, since no good results can be expected from baking the armature longer than is necessary to thoroughly dry it; on the contrary the continued heating would naturally injure the cotton of the insulation, and perhaps the shellac as well, as found by Mr. Lynch.

CLEANING CARS.

At the meeting of the American Railway Master Mechanics' Association one of the subjects for topical discussion was: Good methods for terminal cleaning of passenger cars, and is it advisable to have oil in the cleaning mixtures?

Mr. A. M. Waitt, of the New York Central, described the two kinds of terminal cleaning—temporary cleaning, which is done every day. It consists, in some cases, of washing the car down with a large Turk's head brush and water, and the wiping of the trucks. The latter is done in most cases by going over them with waste saturated with kerosene oil, and in some cases ordinary car oil, although that is rather expensive. Then the trucks are wiped off in good shape or indifferently; if indifferently, making a good foundation for the trucks to be well painted with mud at the time they get to the end of the next run. Then the inside of the car is generally swept out, and the wood-work dusted once a week, or sometimes oftener in dusty countries.

On some roads it has been considered inadvisable to wash cars at all except in weather when it is impossible to dry-wipe them. A large number of roads during the past few years have abandoned in dry weather the washing of cars on the outside, because it is considered that ordinary water is as injurious to varnish almost, as anything that can be put on it.

On the New York Central the success met with in dry-wiping cars has been very gratifying and the company has done away with the washing of cars with water at terminals, except during damp weather, when there are cinders on the car which can not be wiped off because the surface is moist. The varnish has stood better and the equipment looks better. There are times after three or four months, or it might be after three or four days, if the car goes through a great many tunnels, when it is necessary to treat them in a different way and give them a thorough scrubbing in some manner. Various methods of doing this have been adopted, some of which are satisfactory and some others are not. Some methods are diametrically opposed, and yet they are suited to the respective roads using them.

The question is brought up in the topic as to the advisability of having an oil-cleaning mixture. The idea of the introduction of oil in cleaning mixtures as it has been introduced by several roads during the last year, is to put in something which will give a little polish; a little renewal of the life of the varnish. Different kinds of oils are used, and it is probably due to this fact that the difference in results is obtained. If an oil, such as linseed, is used, which by the action of the sun will dry and leave a skin on the surface of the car, any dirt there may be in the cracks or grooves is impossible to get out until the car is scraped with soap or pumice stone or something of that kind. Other oils may be used which will not dry with anything like a skin or surface at all. With these oils the difficulty just stated is entirely avoided. The considera-

tion as to what oils shall be used in a cleaning compound, is worth looking into.

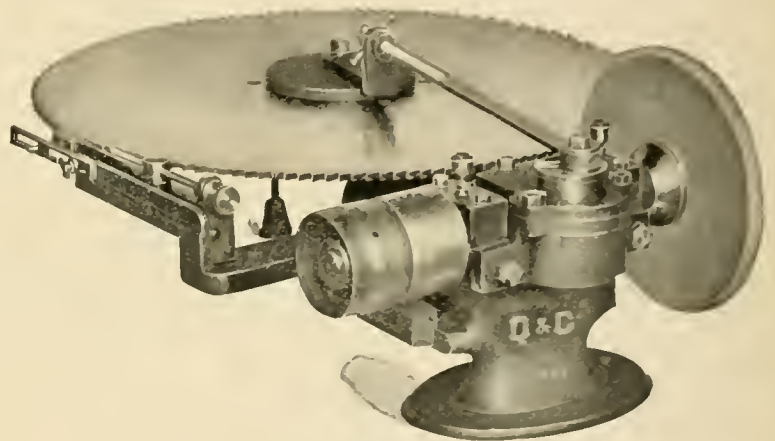
Mr. H. M. Pflager, of the Pullman Co., stated his company cleaned cars by dry-wiping and also by using water, and found very little difference in the appearance of the car after twelve months as to which method is used. In some cases the dry-wiping seems to be best, but in other cases the washing serves best; and on the whole it seems to make very little difference.

Mr. W. S. Morris, of the Chesapeake & Ohio, said that for light colored cars his road used a cleaner in which was a sufficient quantity of evaporating oil combined with the linseed oil to neutralize the alkali in the quantity of soap deemed necessary for the composition. This cleaner is used about once a week on light cars. On darker cars the dry cleaning can be used longer without introducing the liquid cleaner.

AUTOMATIC SAW GRINDING MACHINE.

The machine illustrated herewith is especially designed for sharpening circular saws for metal sawing machines, and is entirely automatic in its action, requiring no attention when once adjusted to properly grind the blade.

The arbor carrying the saw blade is given a reciprocating movement to and from the emery wheel by a crank and connecting rod, actuated by worm gearing driven by the emery wheel spindle. This movement is varied to suit the blade by changing the position of a stud on the slotted crank disk. The length of the connecting rod is adjusted by means of thumb nuts, and the blade can be brought



AUTOMATIC SAW GRINDING MACHINE.

forward to lightly touch the emery wheel at each movement of the disk, insuring true work under all conditions. The saw blade is held in position by a friction collar and nut and its motion is limited by a pawl at the side, which engages each tooth in turn and holds the blade until the emery wheel spindle has completed the revolution and the connecting rod has returned the friction collar to a position ready for the next stroke. The pawl has a fine adjustment and may be set to give exactly the movement required.

The machine is made by the Q & C Co., of Chicago. It weighs 130 lb., occupies 36 x 48 in. of floor space, and will grind saws up to 36 in. diameter, and having teeth with 2½ in. pitch or less.

NEW WORK AT INDIANAPOLIS.

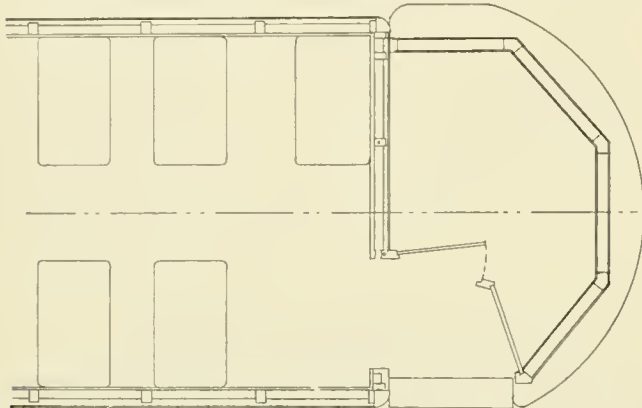
Last year, shortly after the reorganization of the company, the shops of the Indianapolis Street Railway Co. were remodelled, the brick floors being replaced by wood, a fire wall put in between the paint shop and machine shop, the machinery rearranged, skylights placed in the roofs, and new woodworking machinery installed. These changes were made under the direction of Mr. Charles Remelius, who assumed charge of the shops as master mechanic in July last.

The most extensive addition to the shop equipment was the woodworking machinery, which comprises 1 planer, 2 mortising machines, 1 rabbitting machine, 1 molding machine, 1 universal wood worker, 1 shaper, 1 boring machine, 2 rip saws, 1 cross-cut saw, 1 jig saw, 1 band saw. All of these machines were furnished by the

J. A. Fay & Egan Co., of Cincinnati. This machinery is driven by an electric motor. The wood shop is 53 x 314 ft. with two tracks along one side; of the remaining floor space one end is occupied by the machines and the other by benches. About 95 men are at present employed in this shop.

The paint shop is a room 100 x 125 feet with six tracks. Under the same roof, but separated by a fire wall are the machine, forge and armature repair shops. The equipment of the forge shop comprises 3 forges, 1 power hammer, 1 hydraulic wheel press, 1 drill, bending rolls, and thread cutting machine. In the machine shop are 1 milling machine, 1 planer, 4 lathes, 1 drill press, 3 sensitive drills, 1 power hacksaw and 1 tool grinder. Including the men in the car shop about 200 men are at present employed.

Near the other shop buildings is a wash house for cleaning the cars. This is a narrow brick building with cement floor and is long enough to receive two cars. At each side is a gallery supported by



FRONT END OF INDIANAPOLIS CAR.

rods depending from the rafters; the gallery floor is on a level with, and quite close to, the edge of the car roof as it stands on the track, so that the men can direct a hose on the roof at short range or can easily reach it with a brush or broom.

The remodelling of the shops was completed early in November last, and since then 30 box cars and 65 open cars have been built, and the force last May began rebuilding 65 of the old cars.

In the new rolling stock built in the Indianapolis shops Mr. Remelius has embodied a number of features he developed while in charge of the shops of the Detroit Citizens and allied roads. Thus the closed cars built last winter have vestibules at the front end, as shown in the cut. All the cars run one way only (being turned on Y's or loops) and this arrangement of the front end provides a closed vestibule for the motorman in which he cannot be disturbed, and at the same time affords a practicable entrance for passengers at the front of the car. The rear platform is 6 ft. wide inside the dash and has the gas pipe rail as illustrated in our May issue, page 266. Steel side panels are also used. These cars are mounted on du Pont single trucks, with a wheel base of 7 ft. 6 in.

The open cars recently completed are 33 ft. 10 in. over all, 28 ft. between bulkheads, and have 11 benches, all inside the bulkheads. The width is 7 ft. at the floor and 7 ft. 10 in. over the side posts. The front platform is only 31 in. inside the dasher, while the rear platform is 42 in.; none but the motorman is permitted on the front platform. The cars running only one way, a running board is placed on one side only. The front bulkhead is closed with sash and the rear bulkhead is open above the level of the seat backs. The side sills are of Southern pine, 5½ x 7½ in., with a steel plate 5¼ x 8 in. bolted to the outer side. The plates are 8 in. wide up to 7 ft. from each end, from which point they taper down to 4 in. at the end; the total length is 32 ft. The plates are peened till they have a camber of 3 in. The cross sills, nine in number, are of oak 4 x 6½ in. The special feature wherein these cars differ from the general practice is in the use of joint bolts instead of dowells; all the posts, rails and carlines are joint-bolted.

The old open cars now being rebuilt were originally 24 ft. over all. The floor and underframing are removed, the car body being swung from rods overhead until the new floor is ready for it; after the body is let down on the new floor the additional new posts are put in, the rails and roof extended, and new hoods added. The rebuilt cars will be 32 ft. 6 in. over all and in general appearance quite similar to the new open cars.

The signs placed on the Indianapolis street cars are admirable in being few in number, conspicuous, legible from a distance, and simple in wording. Each car carries four signs, one at each end and one at each side of the monitor in the roof; each route is named for two of the streets over which it runs and the end car signs bear the name of one of these and the side signs the name of the other. The signs are of ½-in. poplar wood with the letters 5½ in. in height sawed out; the width of each element of the letters is 1 in. The boards are painted black, with white stripes ¼ in. wide around the edges of the letters; on the back is a sheet of white celluloid. At night the car lights shining through the celluloid backing show white letters on a dark background. In addition to these signs there are smaller signs made of sheet steel stencils with white celluloid backing, which are placed at the edges of the hoods to distinguish such of the cars as only run part way to the terminus of the route. On these smaller signs the letters are 3 in. high. Both types of signs are mounted in brackets and are quickly interchangeable.

The Indianapolis Street Ry. has this spring made a number of extensions to the city parks that increased its track by 12 miles, making the total 120 miles. The new work was laid with 9-in. 90-lb. girder rails, cast-welded by the North American Railway Construction Co. At the power house there is being installed a large direct connected unit consisting of a cross-compound Buckeye engine and a Siemens-Halske generator.

ELECTRIC LINE TO HACKENSACK, N. J.

The accompanying illustration is reduced from a copy of the circular issued to announce the opening of the Hackensack extension of the New Jersey & Hudson River Railway & Ferry Co. The original was printed in two colors on a sheet 12½ x 19 in. and made a very attractive advertisement.

There was considerable rivalry as to which of several electric

JUNE 21, A.D. 1900

THE PUBLIC is hereby notified that on the afternoon of the above date

THE FIRST ELECTRIC CAR

to enter the town of

HACKENSACK

will cross the new *Hackensack River drawbridge*, arriving at the terminus at *River Street*, one block east of the *Susquehanna Station*.

THE NEW JERSEY & HUDSON RIVER RAILWAY & FERRY COMPANY announce that following this car, cars will be run in regular service, leaving HACKENSACK every half-hour for ENGLEWOOD and for the 130th Street

FERRY, NEW YORK CITY. IT IS the endeavor of our management to furnish the best of transportation facilities, and at all times to provide for the accommodation of its patrons and the convenience of the travelling public.

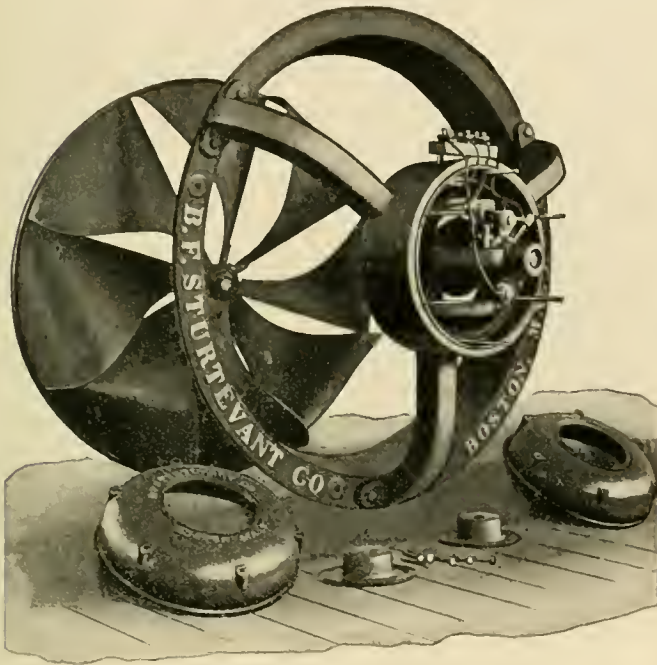
THE "HUDSON RIVER" LINE

railways would be the first to complete a line to Hackensack. The officers of the New Jersey & Hudson River company are: President, A. Merritt Taylor; first vice-president, W. H. Clark; second vice-president and general manager, Frank R. Ford; secretary and treasurer, W. N. Barrows. The manager's office is at 149 Broadway, New York.

A rate war has been declared by the Southern Pacific and the Santa Fe Pacific railroads against the Los Angeles (Cal.) Pacific R. R. operating an electric line to Santa Monica. The steam roads have started the fight by cutting the round trip fare from 50 cents to 30 cents.

WARM WEATHER FANS.

For moving air to or from buildings or through ducts, the B. F. Sturtevant Co., of Boston, is now building the type of electric ventilating fan shown in the accompanying illustration, which has been found to meet the requirements. The fan wheel is carefully designed to act against reasonable resistance and to move the air in lines parallel to the axis of the shaft. It is contained within a special circular frame casing which is conoidal in its form as it approaches the circumference of the wheel; this offers low resistance to the entering air. The frame carries a tripod support with annular center within which is accurately centered a bi-polar motor, consisting of a circular field ring to which the pole pieces are attached. Extending out from either side of the field ring is a yoke with the ring oiler bearings. The bearings are self-aligning and self-oiling, and fitted



STURTEVANT VENTILATING FAN.

with composition sleeves which are removable from the outer end of the boxes.

Hard carbon brushes carried in holders of a modified reaction type are employed and permit of easy adjustment when it becomes necessary to reverse the direction of rotation of the motor. Special light end casings with removable centers are provided, which when applied and bolted in place entirely enclose the motor, protecting it from dust. This is a most important feature in a machine of this type where the air, possibly laden with dust, is drawn directly across it. The movement of this air is of great service in maintaining a low temperature of the surface, while the motor itself is designed with the utmost care to avoid excessive heat. This motor is capable of continuous operation for 10 hours with a maximum temperature rise which does not exceed 60° F. The entire apparatus is ordinarily shipped complete and may be bolted directly to an opening in the wall through which the air is drawn or forced. These are built in sizes from 18 in. to 120 in. in diameter with capacities ranging from 2,000 to 175,000 cu. ft. per minute and driven by motors ranging from 1-6 h. p. to 14 h. p.

Corsicana, Tex., is having difficulty in securing a street railway system. A franchise granted Mr. M. M. Bright and others has just been declared forfeited by the city council owing to the failure of the promoters to fulfill its conditions.

A check for \$12,153.42 was paid into the Chicago city treasury last month by the Union Loop Co., this being the 5 per cent of the gross receipts for the years 1898 and 1899 claimed by the city as its due. The money was paid under protest, the company claiming that the contract on which the city bases its demand is void.

NO ELECTROLYSIS FOR BRISTOL, ENG.

To prevent all possibility of electrolytic action by stray currents from its tracks, the Bristol (Eng.) Tramways Co. has taken the following precautions: Five plates are placed at each joint and firmly bolted together, one on each side of the web in the usual manner, one covering the entire under side and two strips on the upper side of the bottom flange. The rails are double bonded at each joint with copper bonds 7-16 in. in diameter and in addition Edison plastic bonds are placed beneath the fish plates. As a further precaution the rails are cross connected every 120 ft. by double copper wire bonds 7-16 in. in diameter and capable of carrying the full current should any individual joint bond fail. Not less than \$1.75 per single joint was spent for bonds by this company.

In addition to this elaborate bonding a sucking dynamo or negative booster is placed at the power station for the purpose, states the Electrical Review, of London, "of retaining the return current and making the rails the way of least resistance."

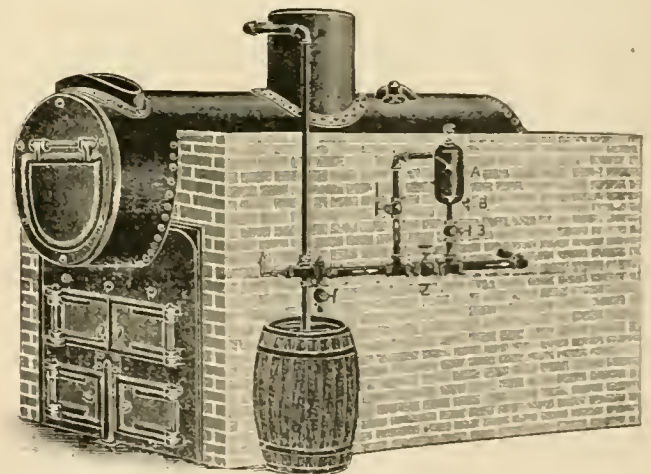
PAINTS AND VARNISHES.

The Sherwin-Williams Co., of Cleveland, which claims to be the largest grinder of paint in the world, has a special department devoted to the street railway trade. In addition to primers, surfacers, paints and varnishes for car bodies, it carries a full line of materials for special purposes, including wood and metal fillers, stains, enamels, graining colors, bridge paints, building paints, japan colors, colors in oil, varnishes and dryers, truck paints, etc. The company has branches in Chicago, New York, Montreal, Boston, Toronto, San Francisco and Kansas City, Mo.

In another column of this issue will be found an article by Mr. Williams, sales manager, railway department, The Sherwin-Williams Co., containing a number of valuable suggestions on car painting and the management of the paint shop.

BOILER FEEDER.

The accompanying illustration shows a simple and substantial feeder for boiler compounds which is made by the International Boiler Compound Co., No. 47 Market St., Chicago. The feeder is adapted for use with pumps, injectors or inspirators; it may be attached to the feed line on either side of a pump, but if used



INTERNATIONAL BOILER COMPOUND FEEDER.

with an injector it should be placed between the injector and the boiler. The reservoir of the feeder is 6 in. in outside diameter and 12 in. high. To fill it with the compound the valves 1 and 3 are closed and the plug C removed. Where it is desired to feed a considerable quantity of the compound into the boiler at one time the valve 2 is closed and 1 and 3 are opened, in which case all the water injected is carried through the reservoir. For gradual feeding 1 is left open, 2 nearly open, and 3 throttled so as to allow only the desired flow of the compound.

Newspaper booths will be built under the approaches to the elevated stations in Chicago.

NEW PENNSYLVANIA LINE.

On July 7th an electric railway between Ashland and Centralia, Pa., was opened for traffic. This line connects the system of the Schuylkill Traction Co., of Girardville, with the system of the Centralia, Mt. Carmel & Shamokin Ry., and gives an electric line over fifty miles long in the middle anthracite coal region of Schuylkill, Columbia and Northumberland counties, connecting the towns of Mahanoy City, Shenandoah, Girardville, Ashland, Centralia, Mt. Carmel and Shamokin. The line is a great convenience to the inhabitants and the traveling public.

The Schuylkill Traction Co., of which Mr. Dallas Sanders is president, on May 1st leased the Lakeside Electric Ry. for a term of 990 years. The latter line is six miles long, connecting Mahanoy City and Shenandoah; the Schuylkill Traction Co. at that time operated 22 miles of track.

ANOTHER VICTORY FOR THE AURORA & GENEVA RY.

In 1897 the Aurora (Ill.) & Geneva Ry. sought to condemn a right of way for about a mile through private property in order to get a safe and practicable route to Geneva and avoid some steep grades and dangerous railroad crossings. After long litigation the right of the company to condemn a right of way was affirmed by the Illinois Supreme Court. (This decision was given in full in the "Review" for March, 1899, page 252.) The result was accepted by all save two of the abutting owners, Messrs. Pope and Peckham, and the case was thought settled.

These two gentlemen, however, persuaded the council of Geneva to pass an ordinance purporting to debar the street railway from the right to enter the limits of the corporation upon the private property and streets intended by the company.

New proceedings having been brought the Circuit Court held this ordinance void; the case was carried to the Supreme Court, which on June 21st rendered a unanimous decision to the effect, "That a city has no power to locate a street railway and that the ordinance in litigation is void because it attempts to prohibit the street railway from taking a certain route, and because it further attempts to locate a route for the company."

This is believed to remove the last bar to the completion of the road, though the defendants may petition for a rehearing and delay matters for a short time longer.

MILE A MINUTE BY ELECTRIC CARS.

The New York, New Haven & Hartford R. R. has been experimenting with high-speed electric cars on its New Canaan branch and on July 1st the record of a mile a minute was made with some cars intended for use between Providence and Fall River. The New Canaan branch extends from Stamford, Conn., to New Canaan, and is operated on the overhead electric system. The car tested was fitted with four 80-h. p. motors. The highest speed reported was 60 miles per hour. Officials of the Metropolitan Street Ry., of New York, the Brooklyn Rapid Transit Co., and the Boston Elevated Ry. were present at the tests.

ELECTRICITY IN BOMBAY.

Mr. William T. Fee, U. S. consul at Bombay, India, writes the State Department that he has many inquiries from American electrical manufacturers for the names of agents to act for them in Bombay, but cannot answer these requests because the names of suitable persons are not to be had at the consulate. General merchants and dealers are not sufficiently acquainted with electrical goods to make good agents, and the demand is also quite limited.

It is believed that electric railways must soon be introduced in the city to relieve the overcrowding. The Bombay Tramway, an American company with its principal office in New York, has made application for the privilege of converting its lines for electricity, but this has not been granted as yet.

The city of Little Rock, Ark., has decided to petition the Federal Court in charge of the road to order the receiver to make improvements in the physical condition of the property.

FATAL ACCIDENT AT TACOMA, WASH.

On July 4th one of the most appalling street railway disasters that has ever taken place occurred at Tacoma, Wash., where a car loaded with nearly 125 passengers plunged from a trestle into a gulch 125 ft. deep, killing 44 persons and injuring 70 others.

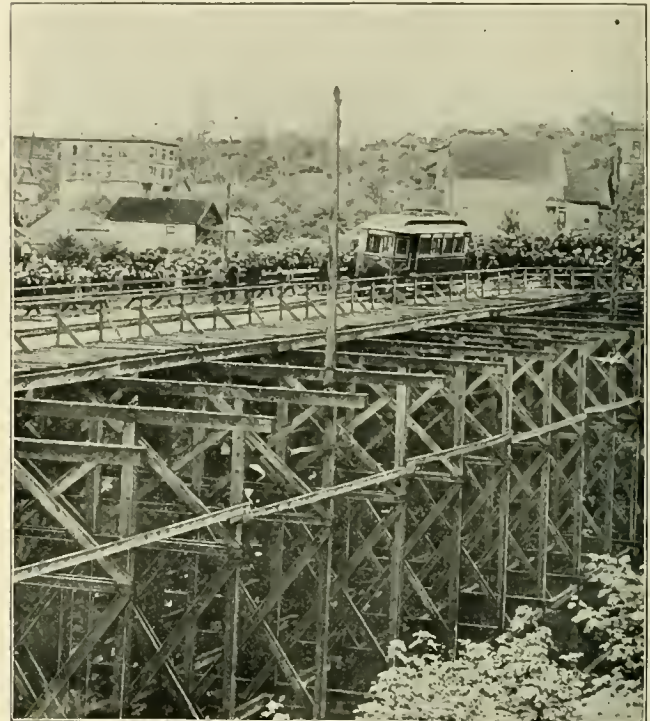


FIG. 1—VIEW OF THE BRIDGE.

The ill-fated car left South Tacoma and Spanway Lake filled to its utmost capacity with a holiday crowd going to Tacoma to view the Fourth of July parade. Both platforms were crowded and passengers were hanging on from the rear dash and step. As the car was descending a grade approaching the trestle at 26th



FIG. 3—BOTTOM OF GULCH.

and C Sts., the motorman in some way lost control and the car rushed on until it struck a sharp curve on the bridge approach, when it swerved to the right, left the rails and plunged over into the ravine. Its momentum caused it to overturn so that it fell top first with the passengers penned inside, till it struck the side of the gulch, 75 ft. below, where the framework of the car was

smashed to pieces and the wreck crashed on down the steep side of the gulch, grinding and tearing its way through the brush and stumps until there was little left of it but kindling wood. Many of the passengers were killed or injured by jumping before the car left the bridge, others were thrown from the windows and platforms while the car was falling, and many were buried under the timbers, motors and trucks.

A few moments after the accident occurred fully a thousand people were at the scene to aid in the work of rescue. Policemen, firemen and citizens joined in the work of passing the injured and dead up the side of the gulch, which was so steep as to require the use of ropes. Every physician in the city was called on for help, and ambulances, patrol wagons, express wagons, and public and private carriages were pressed into service to carry the scores of injured to hospitals and their homes.

Eye-witnesses state that the spectacle immediately after the accident almost baffles description. A volunteer soldier just returned from the Philippines, who was the first to arrive at the scene, declared that he had never witnessed a battlefield that presented a more heartrending sight than did the side of this ravine just after the car had rolled down leaving in its path heaps of battered, mutilated humanity. Women and children had formed the greater part of the car's load, and the cries of these for other members of the family in the wreck, with the cries of the wounded and dying as they lay on the side of the gulch or at the bottom, it is said, could be heard for blocks away.

A subscription list was immediately started for the benefit of the bereaved families. This was headed by the street railway company with \$1,000, followed by the mayor of Tacoma with \$100, and several thousand dollars were quickly raised.

Our illustrations are from photographs taken a short time after the accident. Fig. 1 shows the bridge from which the car dropped;



FIG. 4—BRIDGE FROM BELOW.

it rolled off the structure at about the point where the car is shown in the illustration.

Fig. 2 is a view of the wreck as it appeared below the bridge. Fig. 3 is the bottom of the gulch near the scene of the accident; the building is one of the city pumping stations; dead bodies are in the foreground.

Fig. 4 shows the bridge from the bottom up. In point of the number of persons killed, this is among street railway accidents



FIG. 2—THE WRECK.

second only to that at Victoria, B. C., May 29, 1896, when a car broke through the Point Ellice bridge and 63 passengers were drowned. Among other accidents now recalled are the following: Nov. 1, 1893, a car went through a drawbridge at Portland, Ore., 6 persons being drowned. Feb. 4, 1895, a car at Milwaukee went through a draw into the river and 3 persons were killed. Nov. 16, 1895, a car ran into an open drawbridge at Cleveland, 17 persons being killed. July 7, 1897, a car on the Inter-Urban Ry. of Saginaw, Mich., went through an open draw into the river and 7 persons were drowned and 5 injured. Aug. 6, 1899, a car of the Milford Street Ry. fell from a trestle near Bridgeport, Conn., killing 29 persons and injuring 12 others.

CLEANING WATER TUBE BOILERS.

The Union Boiler Tube Cleaner Co., of Pittsburg, has sent us copies of the reports of tests made on boilers before and after cleaning which show that in one case the effect of cleaning was to increase the equivalent evaporation from 7.8 lb. to 9.1 lb. of water per pound of coal, and in the other to increase the equivalent evaporation from 5.9 lb. to 7.9 lb. per pound of coal. Expressed in percentages these gains due to cleaning are 16.3 and 24.8 per cent, respectively. This company makes apparatus for cleaning water-tube boilers and will either sell or lease the apparatus, or take the contract for cleaning the boilers at a fixed price per tube. The company states that it has never taken its cleaning device away from a plant where it has been given a trial. The device and the method of operation were described in the "Review" for June, 1899.

FRANCHISE EXTENSION ASKED AT CLEVELAND.

The Cleveland City Railway Co., the Little Consolidated, has asked for a 25-year extension of its franchises. The company agrees to sell six tickets for 25 cents, replace its cable system with electric lines, pave and sprinkle its tracks, and to pay a percentage of the gross receipts to the city. This percentage is 1½ to July 1, 1908; 2 to July 1, 1913; 3 to July 1, 1918; 4 to July 1, 1923; 5 thereafter.

HOT WATER HEATERS FOR ELECTRIC CARS.

The hot water heating system shown in the accompanying illustrations is intended to provide an economical and safe method of keeping the interior of long electric cars at an agreeable and uniform temperature. As will be seen from Fig. 1, the heater comprises a coil of heavy piping, supported on a cast iron base, and enclosed in a double iron casing, between the walls of which is an air space to prevent the outside casing from becoming overheated and injuring the woodwork near by. Coal is put in at the top; the lower part of the heating coil constitutes the fire pot.

The grate is shaken without opening the ash pit door, thus avoiding all dust or dirt in the interior of the car. The gas damper at top is of special design and prevents gas from entering the car when the top door of the heater is opened. After leaving the coils the hot water enters a small tank, from which it is led through pipes along the floor under the seats, returning to the heater after hav-

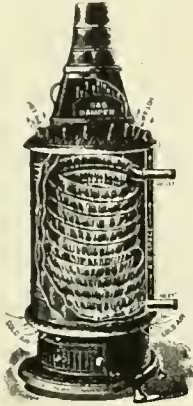


FIG. 1.—SMITH CAR HEATER.

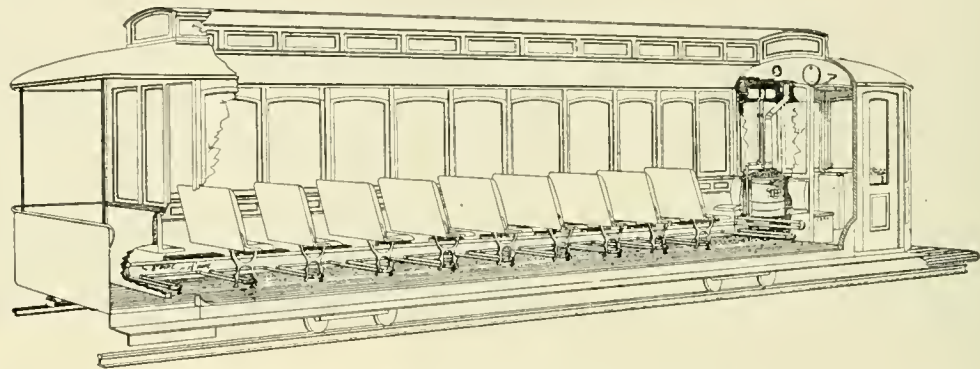


FIG. 2.—CAR EQUIPPED WITH THE SYSTEM.

ing made the circuit of the car. A floor space 22 inches in diameter is all that is necessary to accommodate the heater, which may be placed in one corner or in the vestibule as desired. It is claimed the consumption of coal never exceeds 75 pounds for 24 hours in the coldest weather.

The system is furnished by the Peter Smith Heater Co., 337 Montcalm St., East, Detroit, Mich., and is in use on a number of the interurban roads entering that city, including the Detroit & Pontiac Ry., the Rapid Ry., Detroit & Northwestern Ry., Detroit, Lake Shore & Mt. Clemens Ry., and Detroit, Wyandotte & Trenton Ry.

SUGGESTIONS TO EMPLOYES.

On July 10th, Mr. J. M. Roach, president and general manager of the Chicago Union Traction Co. issued a letter to his motormen, gripmen and conductors, calling their attention to some of the criticisms that have reached him regarding the actions of the employes towards the public and making a number of suggestions as to the best ways of bringing about a more cordial relation between the patrons of the road and the company's servants. At the same time he notified the men that a substantial increase in their wages would be made on August 1st.

Mr. Roach's letter will be of interest to other managers, and we reprint it herewith in full:

To the employes of the Chicago Union Traction Co. Gentlemen: In the management of great interests like the Chicago Union Traction Co., and in order to successfully meet all the requirements of the public, it is necessary that the management and the employes thoroughly understand each other. With this object in view, it is my desire in this communication to call your attention to the many criticisms which are being passed upon your actions, principal among which are the alleged ungentlemanly treatment of passengers and general carelessness which results in accidents.

Before taking unnecessarily harsh measures, it is the desire of the management to better present conditions and also retain the employes who are now in its service; therefore I especially and most earnestly request that conductors, gripmen, motormen and all other employes so conduct themselves in every act that their

conduct towards the public may be such that it will commend both the employes and the management to the entire community. In other words, an employe of this company must be a gentleman under any and all circumstances.

An impression seems to be prevalent that the employes are aggressive toward the public instead of conciliatory as they should be. It is my sincere desire that this feeling be changed, and in order to bring it about, I appeal to you to consider your own welfare as well as that of the company. A close observance will be kept upon the conduct of employes and strict compliance to the above expected.

In reference to accidents, I wish to say that there are conductors, gripmen and motormen who have been in the service of this company for a number of years and have never had a serious accident, at the same time running upon streets where others meet constantly with annoying and expensive accidents, caused by lack of attention and forethought to see impending danger.

I wish to state most emphatically that avoidable accidents must be stopped. I am of the opinion that this can be brought about without the dismissal of men, and call upon you to demonstrate, by your actions, commencing this day, that accidents may be materially reduced. If this cannot be accomplished by mild measures, the management will be forced to act more severely.

I am positive that if each employe should devote himself to the faithful performance of the duties assigned him and avoid the unnecessary things, there will be a great improvement. There are a few things to which I wish to again call your attention.

Be gentlemanly at all times. Remember that deportment is considered in the general standing of an employe, and neatness of person and attire is as much necessary to success in the railroad business as elsewhere.

Elderly persons and women with children should have assistance when getting on or off your car.

Don't start your car before your passengers are safely on or off. Don't follow wagons too closely. Many accidents happen through anticipating their getting out of the way when they do not do so.

Don't run by passengers without good reason for doing so. The use of a little judgment in this will save much unfavorable criticism. Remember you are on the street to accommodate the public and not simply to run a car from one end of the line of the other.

Don't be in too much of a hurry at transfer points. Wait for passengers wishing to catch your car. Many complaints are being made of conductors purposely failing to see passengers hurrying to catch their car from the side or rear. Wait for them.

Conductors should look out for passengers alighting from their car when another train is approaching from the opposite direction. Be particularly careful at transfer points.

Look out for your passengers and your car on rough tracks, when passing vehicles, crossing bridges and viaducts and places where there are obstructions.

When a passenger asks for a transfer and is entitled to one, he should receive it without question or display of temper on the part of the conductor, even though he had been offered one before and had refused it. Transfer rules differ in different cities and strangers to the regulations here should be cared for properly.

Chewing tobacco is offensive to many persons and numerous complaints have been made of careless expectorating by employes

while on the cars. This lowers you in the estimation of the general public.

Don't approach street crossings at a high rate of speed. Stop for boulevard crossings and intersecting lines.

Don't sit carelessly on the dash board or seat of your car. Stay in your proper place when not otherwise engaged. Watch your trolley at crossings and overhead switching points.

Don't hold unnecessary conversation with fellow employes, passengers or others while on duty. When questioned, give the desired information, if you know.

Look to the comfort of your passengers; keep the seats and floor of your cars clean and adjust the curtains or windows so as to offer protection from sun, rain, or cold winds.

Handle your controller so as to get the greatest efficiency from the least amount of current.

Remember that in the railroad business as well as elsewhere, gentlemanly deportment, neatness of person and good common sense will sooner or later meet with their proper reward. Each day you are on trial before the public. Your work will become easier and your life more pleasant if you so conduct yourself as to gain the good will of those with whom you come in contact.

Next month you will meet with thousands of strangers from all parts of America, here to attend the annual encampment of the Grand Army of the Republic. I wish to particularly request that each of you take pains to act in so gentlemanly a manner that any visitor who patronizes our lines will carry away with him a pleasant memory of courteous treatment at your hands. Give them any assistance in your power so as to make their visit to Chicago a pleasant one.

As further evidence of the close relations existing between employer and employe, the management has concluded (at a time when no demands are being made) to pay all trainmen in the service of the Union Traction Co. a uniform rate by the hour. On and after August 1, 1900, the employes of that part of the system known as the old North Chicago Street R. R., will, if they prefer this system of payment, receive the same rate of wages as now paid to those of the West Side lines of this company, as follows: Gripmen, 23 cents per hour; motormen, 21 cents per hour; cable grip car conductors, 23 cents per hour; cable trailers and electric car conductors, 21 cents per hour.

TRACK MATERIAL QUOTATIONS.

There has been no change in prices for steel rails since last month. Standard T-sections are quoted f. o. b. Pittsburg or Chicago, \$35 to \$37 according to lengths. Girder sections are quoted at \$42 to \$44. Good relaying steel T-rails can be purchased in Pittsburg at \$27.50 with splices. Spikes are selling at \$2.15 (Tidewater); splice bars at \$2.00 (Tidewater); angles, \$1.80 (Pittsburg).

Cedar ties are quoted f. o. b. Menominee, Mich., 25 cents; hemlock, 20 cents. At New York yellow pine ties are selling as follows: 7x9 in. x 8½ ft., 64 cents; 6x9 in. x 8 ft., 59 cents; 6x8 in. x 8 ft., 54 cents.

Newspapers print the following dispatch under date of June 20th: A big drop in the price of structural steel was announced today. The price of beams and channels was cut several dollars per ton; of angles \$9 a ton and of bars \$10 a ton. There has also been a decline in the price of steel plate of \$14 per ton within the past four or five weeks. No big sales have yet been reported at the reduced prices, yet the booking of large orders is looked for.

Among the theses presented by the graduating class of Lehigh University were two on plans and estimates for electric railways by L. B. Abbott and J. P. Martin, and one on an electrical survey of the electrical railway earth currents of the Bethlehems.

The Denver (Col.) City Tramway Co. has made a proposition to spend \$45,000 in remodeling its old power house on Lawrence St. and lease it to the state of Colorado for the period of 20 years to be used as an armory.

The assessment made against the Indianapolis Street Railway Co. for 1900 is \$2,500,000, as against \$3,000,000 for 1899. The county board of review justifies its reduction of \$500,000 by asserting that at the time the state board raised the valuation to \$3,000,000, last year, there was prejudice against the company.

INGENIOUS TROLLEY CATCHER.

Mr. D. A. Hegarty, general superintendent of the Railways Company General, of Philadelphia, sends us the following description of a simple method of keeping the trolley pole from damaging itself or the overhead span wires when the trolley wheel leaves the wire. A weight 2 lb. greater than the upward pull exerted by the springs at the base of the pole, is attached to the trolley rope and is hung on a hook fastened to the rear dasher, as shown in the sketch. Enough slack is left in the rope to allow for inequalities in the height of the wire above the ground. When the pole jumps from



INGENIOUS TROLLEY CATCHER.

the wire the first jerk lifts the weight over the hook, but the weight being the heavier it pulls the pole back and prevents it from springing upward, until the weight is raised.

As an extra precaution a short piece of rope may be fastened to the signal-bell cord and to the trolley rope by means of snap catches so that when the pole pulls off and the weight drops the bell rope will be given a jerk, signalling the motorman to stop. Mr. Hegarty states he has been using these contrivances with great success on a number of the roads owned by his company.

A SUMMER TRIP UNSURPASSED ON THIS CONTINENT.

The trip to Salt Lake City or the Pacific Coast via Salt Lake City by way of the Rio Grande Western Railway in connection with the Denver & Rio Grande or Colorado Midland roads is the grandest in America. No European trip of equal length can compare with it in grandeur of scenery or wealth of novel interest. Then Salt Lake City itself is a most quaint and picturesque place and well worth the journey to see. Its Mormon Temple, Tabernacle, Tithing Office and Church Institutions; its Hot and Warm Sulphur Springs within the city limits; its delightfully temperate sunny climate and its Great Salt Lake—deader and denser than the Dead Sea in Palestine—are but a few features of Salt Lake City's countless attractions. There are parks, drives, canyons and beautiful outlying mountain and lake resorts. Imagine, if you can, a bath in salt water, a mile above sea level and in water in which the human body cannot sink. Inquire of your nearest ticket agent for low tourist rates to Salt Lake City or write for information and copy of "Salt Lake City—the City of the Saints" to E. Copland, General Agent, 215 Dearborn St., Chicago, or Geo. W. Heintz, General Passenger Agent, Salt Lake City.

Milwaukee had a parade of electrically operated floats running on the car tracks last month, similar to the one recently held in New Orleans and described in the "Review" for March 15th last.

Orders have been issued to conductors of the Detroit Citizens' Street Ry. not to issue transfers on 3-cent tickets. Conductors are also told not to allow large dogs on the cars.

HALF FARES.

The Providence (R. I.) & Taunton Street Ry. will equip all its cars with air brakes.

Governor Crane of Massachusetts has signed the bill requiring street railway companies in the state to vestibule their cars.

Several new combination open and closed cars, 29½ ft. long, are being built in the shops of the Colorado Springs (Col.) Rapid Transit Co.

The Manufacturers' Gas Co. has filed a suit against the Indianapolis Street Railway Co. asking \$50,000 damages, alleged to be due to electrolysis.

The Springfield (O.) Railway Co. last month was compelled to have one of its car house employes arrested for stealing brass and copper from the scrap heap.

The Newburg (N. Y.) Electric Ry. has been placed in the hands of W. H. Pouch, receiver, pending foreclosure proceedings instituted by third mortgage bond holders.

In order to bring its cars alongside the lake steamers landing at Buffalo and save passengers a long walk, the International Traction Co. is building a spur track to the lake front.

The new Medfield (Mass.) & Medway Street Ry. was opened last month. Guests were taken over the road in special cars, after which they were entertained at an open-air clam bake.

By failing to deposit \$1,000 in cash the promoters of the Milford (Mass.), Upton & Grafton Street Railway Co. have forfeited the franchise recently granted by the selectmen of Milford.

The Chicago city council last month passed an ordinance granting the Metropolitan West Side Elevated Railway Co. permission to extend its Garfield Park and Douglas Park lines.

The Fond du Lac (Wis.) Street Railway & Light Co. has recently installed a 500-h. p. unit at its power house. It consists of an Allis-Corliss engine and Westinghouse generator.

The vice-chancellor of New Jersey in a recent decision follows the ruling now generally accepted that electric railways on public highways do not impose additional servitude on the land.

An anti-trust bill will probably be passed by the Louisiana Legislature. The bill not only prohibits the formation of combinations in restraint of trade, but forbids alien trusts to operate in the state.

Thieves carried off a mile of wire from the Ogden Ave. line of the Chicago Union Traction Co. on the night of June 26th, the loss preventing all traffic on the line for six hours the following morning.

A storm on June 28th blew down a number of poles on the Brighton Beach line of the Brooklyn Rapid Transit Co. resulting in stalling a long line of closely filled cars. The blockade commenced at 9 p. m.

The city council of Jacksonville, Fla., recently granted a franchise of a street railway, the cars on which "shall be automotor cars, and the road to be constructed without wires or poles to mar the streets."

An attempt last month to wreck a car on the Kingston, Portsmouth & Cataraqui Electric Ry., Kingston, Ont., by placing a large stone on the track failed to result in serious damage, though the car left the track.

The consolidation of the Chicago Consolidated and the Chicago Union Traction Cos. has been attacked by Sutro Bros., of New York, who have filed a bill in equity against the two companies

and the officers and former directors of the Consolidated, praying for the cancellation of the consolidation agreements and the appointment of a receiver for the Consolidated.

An incident of the St. Louis strike is a suit brought against a bakery company by another bakery company because parties interested in the former stated that the latter had sold bread to the St. Louis Transit Co.; \$15,000 damages are asked.

A young woman clerk employed in the auditing department of the Union Traction Co., of Philadelphia, has been detected stealing uncanceled exchange tickets. When arrested she put in the plea that she had been hypnotized into committing the act.

Numerous attempts to wreck cars have occurred on the lines of the Conestoga Traction Co., of Lancaster, Pa. Last month a pile of fence rails was discovered on the tracks near Rossmore just in time to prevent the last car over the line at night from being thrown from the rails.

The Duluth (Minn.) Street Railway Co., which is defending a suit for damages brought by a man who was injured while riding in a car during the strike last year, contends that as the passenger must have known of the existence of a strike, he rode at his own risk and was guilty of contributory negligence.

The board of directors of the Toledo Centennial Association on June 29th decided to close its office except one room which will be kept open for 30 days to settle up all business. This course was adopted because the Supreme Court had decided that the centennial appropriation was not available to meet current expenses of the board.

Some stockholders of the Chicago & South Side Rapid Transit Railroad Co., the property of which was acquired by the South Side Elevated Railroad Co. after a foreclosure sale, have secured the appointment of a receiver, Mr. Robert M. Wells, and propose to attack the reorganization. No opposition was offered to the application for a receiver.

Conductors employed by the United Traction Co., of Albany, are said to be dissatisfied with the present system of spotters, as they think it is humiliating to them to have their honesty questioned before the public. They forget that in every body of men there are always a few that need watching, and honest men should never object to being watched.

WYMAN LEAVES NEW ORLEANS.

Mr. C. D. Wyman, general manager of the New Orleans City Railroad Co., resigned on July 11th, and will leave the company August 1st. He will become a member of a well known firm of street railway promoters in the East, and will make his home in Boston. Mr. Wyman has had some such connection in mind for several years past, and will now be able to carry out his wishes. His large acquaintance and popularity among street railway managers, together with a long and practical experience in the railway field particularly, will qualify him for great success in his new work.

During his four years' management at New Orleans, Mr. Wyman has brought about many improvements, both in the physical and operative conditions of the property, and has maintained the most cordial relations between his company, employes and the public.

Mr. Wyman will identify himself with the firm of Stone & Webster, and will still be actively connected with street railway interests.

TWO MORE FATAL ACCIDENTS.

A fatal collision between a freight train and an electric car occurred at Webb City, Mo., on July 4th. The car, crowded with passengers en route for the Carthage fair, was crossing the Missouri Pacific tracks, when the freight train, which was being backed onto a siding, struck it, killing one passenger and seriously injuring a dozen more.

On the same day a car on the recently opened Cincinnati, Lawrenceburg & Aurora Electric R. R., while going at a speed of 30 miles an hour, left the rails and plunged down a 10-ft. embankment, landing on its side at the bottom and killing two men. The cause of the derailment is not known, but newspaper reports state it was due to the breaking of the rear truck.

MR. OWSLEY PRESIDENT OF NORTH-WESTERN ELEVATED.

Mr. L. S. Owsley has been elected president of the Northwestern Elevated R. R., of Chicago, succeeding Mr. D. H. Londerback, who resigned to take a year's vacation in Europe.



L. S. OWSLEY,

Mr. Owsley was born in Chicago in 1870 and received his education in the Chicago public schools and at Yale University. Upon his graduation he returned to Chicago, and at the age of 21 became connected with the city's traction interests as secretary and treasurer of the West Chicago Street R. R. Since that time his advancement has been rapid, his ability to understand and solve the difficult financial problems that are constantly arising in the management of large corporations rendering his services of great

value to his business associates, who have not hesitated to place him in important positions of responsibility and trust.

Mr. Owsley, in addition to his connection with the West Chicago company, has filled the offices of assistant treasurer of the Union Traction Co., president of the Suburban Railroad Co., and vice-president of the Consolidated Traction Co.

AMERICAN ECONOMIZER CATALOG.

Messrs. Broomell, Schmidt & Co., Ltd., of York, Pa., the well known manufacturers of the American fuel economizer and the induced draft system, have just issued a new illustrated catalog describing their economizers in detail, which will be greatly appreciated by those contemplating the installation of such apparatus. That the advantages of the American economizer are appreciated by steam users is indicated by the number of large orders now in hand and the fact that the firm now has under consideration the erection of additional shops. A special feature of the induced draft apparatus, to which attention is directed, is the heavy construction of the fans. Parties interested may secure copies of catalogs on application.

Among orders now under way are economizers as follows: One of 224 pipes for the Bemis Bros. Bag Co., Jackson, Tenn.; one of 320 pipes for the Marine City Sugar Co.; one of 400 pipes for the New York Steam Co.; two of 536 pipes for the Lehigh Valley Coal Co., Lost Creek, Pa.; one of 144 pipes for the Nagoya Electric Light Co., Yokohama, Japan. Complete installations are building for the Port Huron Salt Co. and for the Tracy Engineering Co., San Francisco; the former has two 240-in. induced draft fans in connection with two economizers of 704 pipes, and the latter one fan and one 120-pipe economizer.

FAST TRAINS ON THE WABASH.

A new Wabash morning train for Detroit now leaves Chicago at 9:25 a. m., and arrives Detroit 6:30 p. m. Through cars. Other trains for Detroit via the Wabash leave Chicago at 12:40 noon, 3:15 p. m. and 11:00 p. m.

One may spend the evening at home or at the theater—leave Chicago at 11:30 p. m. and be in St. Louis before 8 o'clock next morning. Try this popular train.

Commencing June 27 the Continental Limited leaves Chicago at 12:40 noon, instead of 12:02, and arrives New York 3:15 and Boston 5:20 the following afternoon. Through sleepers to both points.

STEAM PLANT FOR AUSTIN, TEX.

Mr. Frank E. Scovill, general manager of the Austin, (Tex.) Rapid Transit Railway Co., spent last week in Chicago, combining business with calls upon his many acquaintances. Mr. Scovill returns to erect a power house and install the machinery for a steam plant to operate his lines, which have been dependent on mules since the loss of the big dam. Mr. Scovill has been in electric work from the start, and is one of 23 men who at one time constituted the entire manufacturing force of what is now the General Electric Co.

The Austin company will now abandon its use of water power, as it is doubtful when the big dam will be rebuilt. The new steam plant will run condensing direct connected engines, working one unit, with one always in reserve. At present the cars are being drawn by three mules each, requiring 18 mules per car per day.

Water for condensing will be carried in an 8-in. pipe 1,500 ft. from the river to the new structure, and the laying of the pipe involves some difficulty, as it must be laid 38 ft. below the surface and all the distance through loose sand.

GEORGE M. BRILL.

Mr. George M. Brill, who a few months ago resigned as assistant manager of the construction and mechanical departments of Swift & Co., has opened offices at No. 1143-4 Marquette Bldg., Chicago, to engage in practice as consulting mechanical and electrical engineer. Mr. Brill's technical education, he was graduated at Cornell University in 1891, has been supplemented by nearly ten years' experience in designing and building power houses, shops, transmission and refrigerating plants. During the greater portion of this time he has been with the Solvay Process Co., of Syracuse, N. Y., and with Swift & Co. He was in responsible charge of the construction of the Detroit works of the Solvay company, a particularly large plant; those familiar with the mechanical features of the Swift plants at Kansas City and Chicago will appreciate the important character of the work in which Mr. Brill has been engaged and the large interests involved. Among designs recently completed by him was one for an extensive electric railway system, and in his practice he expects to devote considerable time to this branch of engineering.

CINCINNATI, NEWPORT & COVINGTON.

Mr. J. C. Ernst, president of the Cincinnati, Newport & Covington Ry. sends us the following condensed statement for May, 1900:

	MAY.		FIVE MONTHS.	
	1900.	1899.	1900.	1899.
Gross receipts	\$94,424 02	\$59,434 69	\$293,511 21	\$262,450 90
Operating expenses	26,948 51	25,538 59	118,546 69	114,470 01
Net earnings	37,475 51	33,896 10	174,964 52	147,980 89
Tolls, damages, taxes, etc.	12,479 00	7,993 48	61,737 40	67,466 02
Net profit	24,996 51	25,902 62	113,227 12	80,514 87
Ratio of expenses to earnings:				
With tolls	52%	55%	55%	59%
Without tolls	41%	42%	46%	47%

THROUGH COLORADO.

The "Scenic Line of the World," the Denver & Rio Grande R. R., offers to tourists in Colorado, Utah and New Mexico the choicest resorts, and to the trans-continental traveler the grandest scenery. Two separate and distinct routes through the Rocky Mountains, all through tickets available via either. The direct line to Cripple Creek, the greatest gold camp on earth. Three trains each way daily with through Pullman palace and tourist sleeping cars between Chicago, Denver, San Francisco and Los Angeles, and Denver and Portland. The best line to Utah, Idaho, Montana, Oregon and Washington via the "Ogden Gateway." Dining cars (services a la carte) on all through trains. Write S. K. Hooper, G. P. & T. A., Denver, Colorado, for illustrated descriptive pamphlets.

TRADE CATALOGS.

PNEUMATIC TOOLS. Issued by the Q & C Co., of Chicago; 50 pages.—These tools are designed in various shapes and sizes for clipping, calking, beading, riveting, drilling, wood-boring, flue rolling and stone cutting. Many of them are well adapted to street railway repair and construction work.

EXHAUST FANS. Issued by the American Blower Co., of Detroit, Mich.—These blowers are for removing and conveying shavings and dust, elevating and distributing cotton and wool, removing smoke and fumes, and for use in connection with special heating and drying plants.

ST. LOUIS CORLISS ENGINES. Issued by the St. Louis Iron & Machine Works, of St. Louis. The catalog contains descriptions and illustrations of each separate part of the standard St. Louis corliss engine together with half tone engravings of a few of the engines installed by this company.

"METAL SAWING MACHINES." Issued by the Q & C Co., of Chicago; 40 pages.—This catalog illustrates and describes Q & C power sawing machines, portable rail saws and shop saws, of both arbor-driven and blade-driven types. The Q & C rail saws are convenient and economical, as by their use rails of any section, weighing from 60 to 100 lbs. per yard, can be cut in from 10 to 18 minutes by two men without unreasonable exertion.

ELECTRIC RAILWAY CATALOG. Issued by the Western Electric Supply Co., of St. Louis; 227 pages.—In this catalog all the pages relating to electric railway supplies appearing in the general electrical catalog of this company mentioned in the May issue of the Review have been bound together, bringing the information interesting to street railway managers into more convenient shape. A complete index at the back enables the description of any desired article to be quickly found.

IMPROVED APPLIANCES FOR ENGINES AND BOILERS. Issued by the Sherwood Manufacturing Co., of Buffalo, N. Y.—The Sherwood specialties include injectors designed to work with any pressure from 15 to 200 lbs., and which under proper conditions will handle water at 150 deg. F. The company also makes boiler tube cleaners and scrapers for any water tube boiler in use, gage cocks, lubricating cups and cylinder lubricators. The catalog closes with a long list of companies using the Sherwood "Niagara" water tube boiler cleaner; the following are a few of the more prominent concerns mentioned: Babcock & Wilcox, New York; Standard Oil Co., New York; Brooklyn Rapid Transit Co., Syracuse Rapid Transit Co., Baldwin Locomotive Works, Philadelphia; Union Traction Co., Philadelphia.

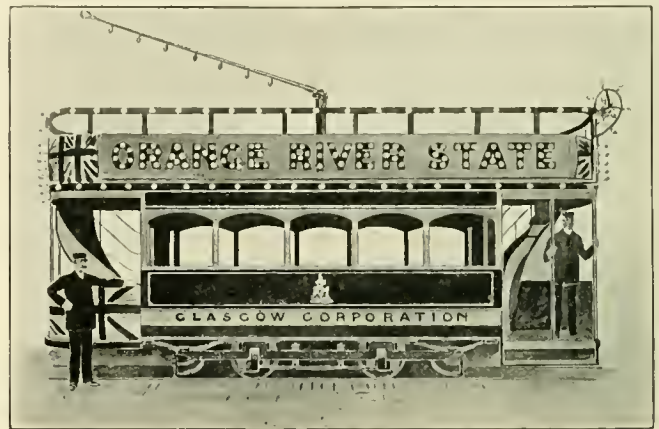
THE ARNOLD SYSTEM OF POWER STATION CONSTRUCTION. Issued by the Arnold Electric Power Station Co., Marquette Building, Chicago; 19 pages.—This is a reprint of a paper read before the Chicago Electrical Association, Jan. 19, 1900, by B. J. Arnold on his well-known system of electric power station construction, which aims to combine all the points of merit of a direct connected plant and a belted plant, without the disadvantages of either. The pamphlet is profusely illustrated with drawings and reproductions of photographs of the plants of the University of Michigan, Chicago Board of Trade, Imperial Co., St. Louis, Chicago Electric Traction Co., Chicago & Milwaukee Electric Ry., and many other important installations for which the system has been adopted. It is the third of a series of bulletins being published by the Arnold Electric Power Station Co. descriptive of its work.

THE BURT MANUFACTURING CO., of Akron, O., has just received an order for the complete equipment of the Imperial Steel Works in Japan, with "Cross" oil filters. As these works are among the most important in Japan, and the contract was given after examination of other European and American filters, the Burt company feels justly proud of the order.

The Knoxville (Tenn.) Traction Co. has offered a reward for the conviction of any person stealing copper from its line.

ILLUMINATED CAR IN GLASGOW.

The capture of Pretoria was fittingly celebrated by the city of Glasgow, and the municipal buildings facing George Sq. were elaborately decorated and illuminated for the occasion. The tramway department scored the hit of the evening with an illuminated car, decorated by Mr. Nelson Graburn, superintendent of rolling stock, and Mr. John Young, manager. Our London contemporary, Electrical Engineering, to which we are indebted for the accompanying illustration, says that "the car was a triumph of artistic treatment; and whatever may be said against the trolley by those whose esthetic taste is over-developed, it cannot be denied that it lends itself, pole and all, to artistic illumination in a manner which



GLASGOW CAR "PRETORIATING."

any other system could not even approach. It says much for Mr. Graburn's efforts that the whole was practically completed in about 20 hours."

The car was draped in khaki and Union Jacks, while round the railings and up the pole were variously colored lamps. On one side were the words "Orange River State," and the other "Vaal River State," brought out most effectively against the dark background. One end had the word "BOBS" in letters alternately clear and electric blue, while the other end had the Royal monogram and a St. Andrew's Cross. In all 456 lamps were employed on 76 circuits of six lamps in series, 83-volt lamps being used.

CHANGES AT EL PASO, TEX.

The four mule-car lines operating a belt line between El Paso, Tex., and Ciudad Juarez, Mexico, have been consolidated under the name of the El Paso & Juarez Traction Co., and it is the intention of the owners to substitute electricity for mule power this fall, or as soon as the necessary supplies can be obtained, and the bridges spanning the Rio Grande strengthened.

UNION PASSENGER STATIONS.

The Lake Shore & Michigan Southern Ry. is a line noted for its union passenger stations. At the principal junction points the traveler will find it occupying the same station with leading connecting lines, a convenience very much appreciated, insuring prompt and reliable connections. For the convenience of patrons of the Lake Shore & Michigan Southern Ry., it is arranged so that uniformed agents of the Frank Parmelee Omnibus Co., at Chicago; Toledo Transfer Co., at Toledo; Cleveland Transfer Co., at Cleveland; C. W. Miller's Omnibus & Baggage Express, at Buffalo; the Westcott Express Co., at New York City, and the Armstrong Transfer Co., at Boston, will be found on all trains via the Lake Shore, New York Central and Boston & Albany route, approaching their respective cities. It is their duty to carefully exchange transfer checks and arrange for the transfer of passengers and baggage to stations of other lines, hotels or steamer docks, and also to furnish any requisite information about their city. Vehicles of these companies are in waiting upon the arrival of all passenger trains.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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VOL. X.

AUGUST 15, 1900.

NO. 8

A Daily Edition of the "Street Railway Review" will be issued at Kansas City during the conventions of the American Street Railway Association and the Street Railway Accountants' Association. The unqualified success of the Daily Edition last year, in Chicago, renders unnecessary any remarks as to the demand for such a publication. This year the first number will appear on the morning of the second day, and continue on Thursday, Friday and Saturday mornings.

Each morning at 7 o'clock the Daily will be distributed free to all convention attendants, and a copy mailed to every subscriber to the monthly edition of this publication at home and abroad.

Our arrangements for furnishing an absolutely complete verbatim report of the proceedings in the two conventions, arrivals up to midnight of the previous day, and reporting all the other interesting features of the conventions are already arranged and of the most extensive and detailed character possible. The Daily Edition of the "Review" will be one of the strong features of the annual gathering.

In this connection it is proper to note with satisfaction the prospects for a large attendance and a fine display of exhibits. The street railway men of Kansas City, with characteristic Western enterprise, are leaving undone nothing which can contribute to the success of the meeting, and when the delegates arrive, those who for the first time visit this young giant of the Southwest will be astonished at the city and its facilities. The hotels are excellent, and of ample accommodation, and the exhibit hall is the largest ever occupied by a street railway convention.

The program this year contains subjects of vital importance to every manager, and we look for a large and enthusiastic attendance.

There was a strike of the motormen on the street railway at Dallas, Tex., two weeks ago, and while it did not last long or amount to much as a strike, there was one especially interesting side light. The strike had only been on two days when the president of the company received a telegram from St. Louis offering

the service of 300 idle motormen. Now the strike in Dallas was of union men, and it was ex-union men in St. Louis who applied for the places just vacated. Experience is a thorough teacher, though sometimes the lesson is a sad and costly one.

There have recently been two interesting decisions in Illinois on the power of a municipality to direct where a street railway shall be located. One case is that mentioned on page 414 of the "Review" for July where the city of Aurora undertook by ordinance to prevent the entrance of the Aurora & Geneva Ry. into the city over a right of way secured by condemnation of private property, and the ruling was that the city could not locate a route for a street railway. In the other case, reported in our legal department this month, a village attempted to force a street railway to condemn private property for its location; the ruling was that a street railway properly belonged in the streets and that authority for taking private property could not be conferred by ordinance.

The riding public has never suffered to any alarming extent from a lack of modesty in its demands upon street railways. Many requests are perfectly reasonable it is true, and some which are not are made in good faith, through a want of knowledge as to the difficulty or impossibility of granting them.

In some places, however, where interurban lines of one company connect with the city lines of another company at considerable distance from the business center, demand is being made for transfers. In one case we have in mind the city council refused entrance to the suburban road, and the city company would not allow the suburban cars to use its tracks. Yet the public is demanding transfers.

Even where the outside road secures traffic arrangements with the city road there is no good reason why some compensation should not be paid for the additional city service rendered, and where the distance is of any consequence it should be the full fare.

Mr. Gompers remarked the other day at St. Louis that the strike had not failed there as it had caused the people to think of the wrongs of workingmen (we presume he meant the wrongs to workingmen), and had aroused them and opened the way to something better.

The St. Louis strike as a success for the Gompers followers reminds us of an incident in the erratic career of the Marquis de Mores who spent several million dollars trying to establish packing houses in the Bad Lands of Dakota. The cattlemen declared it impracticable to raise sheep on the range on account of the severe winters. The marquis resolved to demonstrate that it could be done, and accordingly shipped in ten thousand head one fall. In the spring there were only a dozen or so alive. When his secretary remarked on the dismal failure, the marquis indignantly retorted: "Failure, failure! Why it is a success. I have demonstrated it cannot be done."

Mr. Gompers has certainly succeeded in demonstrating that when he is radically in the wrong, as in the St. Louis strike, "it cannot be done."

In our issue for April last, page 210, brief reference was made to the report of Mr. William Brophy, chief electrician of the wire department of the city of Boston, in which he recommended that the electrical construction division be discontinued, because the work done by it was costing the city a great deal more than the bids of reliable and responsible contractors. Since that time considerable has been written and printed concerning these business ventures of Boston, inaugurated under Mayor Quincy's administration, and the hope is expressed that our friends, the socialists, will now quote the results obtained with municipal ownership and operation in Boston, rather than go to Europe for data. Some of the specific examples of costly work are these: Estimates based on current prices showed that certain electrical work on some of the city's ferry-boats should cost \$6,800; it did actually cost \$10,200. The electrical work on a city building for hospital nurses should have cost \$1,528; it really cost \$4,754. The work on a city armory should have cost less than \$2,600, but the city had to pay nearly \$6,700 for it. Some work on a public school, estimated as likely to cost \$1,471 if done under contract, cost the city about \$3,600. The ice used in the city drinking fountains cost \$60 a ton made at the

city's ice plant, and could have been bought for \$3 a ton from private companies.

There have been no charges of dishonesty. The results were due to inefficient management, largely the result of loading down the pay rolls with incompetent men, who were given employment because they had political "influence."

Many of the cars built during the past year or two are fitted with electric push buttons by which passengers from their seats may signal the conductor to stop the car, but from opinions expressed by a number of managers it would appear that these have not been entirely satisfactory. In fact, we know of a number of instances where the use of the buttons has been discontinued and the batteries taken out of the cars.

In Chicago it has been found that passengers very seldom signal in this way, seeming to prefer the old fashioned method of notifying the conductor by raising the hand or by word of mouth when they desire to alight. In this connection President Roach of the Union Traction company is quoted as saying: "Push buttons for signals on street cars have been tried several times in Chicago and invariably have proved failures. They are taken as a joke by the traveling public, and would cause much annoyance were they in general use. So much frequently depends on the proper use of signals that they should be kept under control of trained employes. From an every-day, practical standpoint the push buttons are undesirable."

The same objections have been raised in New York and other of the larger cities. Many passengers appear to have the idea that the push button signals the motorman instead of the conductor and as they do not allow sufficient time for the conductor to transmit his signal they miss their corner and ill-feeling against the trainmen and company is liable to arise because of the misunderstanding. Another source of trouble has been the interference with the buttons by children and irresponsible persons who often cause delay and annoyance by ringing the signal when the car is crowded or the conductor's back is turned. Taking it all in all, the signal button seems to be an unappreciated improvement.

We publish this month a lengthy abstract of a paper on "Electrolysis of Underground Metal Structures" by Mr. Dabney H. Maury, engineer for the Peoria Water Works Co., of Peoria, Ill. While it is not so stated we infer that this paper embodies much of the evidence presented in behalf of the water company in its suit against the Central Railway Co., of Peoria, to recover damages for the alleged injury of its pipes by electrolysis due to the railway return currents. Mr. Maury makes a strong showing as to the fact that the water pipes suffered injury because of electrolysis, but the question of the liability of the railway company, which is not discussed in the paper, is of quite as much interest and importance as is the fact of the injury.

It must not be forgotten that there are two sides to the question. The suit has been pending in the United States Circuit Court for over two years, and the evidence for the water company was heard in December, 1898; the street railway presented its case last summer, but the report of the special master who heard the testimony has not yet been filed, and no other complete presentation of the railway company's contentions has been made. Among the witnesses for the railway company examined last summer were Albert B. Herrick, of New York; Oscar Stiles, of the Omaha Street Railway Co.; William Hand and J. C. Noe, of the General Electric Co.; Edwin M. Burch, then electrical engineer for the Twin City Rapid Transit Co.; Professor Seaver, of Columbia College, and I. N. Lovett, electrical engineer of the Omaha & Council Bluffs Railway & Bridge Co. As before stated, a comprehensive review of the evidence given by these gentlemen has never been made public, but from abstracts which we have seen we believe that one line of defense was that the water company was largely to blame for the trouble by reason of placing a great many of its gate boxes in metallic contact with the rails of the railway company.

All the facts which might thus have affected the extent and character of the injuries described in Mr. Maury's paper will have to be known before any conclusions can be drawn as to whether similar results are to be expected in other cities.

We would suggest as a subject for the consideration of the street railway commissions which have been appointed by various municipi-

palities, How can the municipality aid the street railways in giving the public a better service?

Street railways are permitted to occupy space in the streets because they enable the public to use the streets to better advantage than would otherwise be the case, and it is the duty of the municipality to see that so important an agency is not needlessly hampered in carrying out its purpose. In all large cities there is a district where street traffic is much congested, and one of the recognized problems is how to arrange the railways in such districts that the public may enjoy more rapid transit. For years Tremont St. and Washington St. in Boston were held up as horrible examples of congested thoroughfares, and the subway was built at a cost of \$4,000,000 to relieve it. New York is building an underground line, and in Chicago a system of subways is proposed as a solution of the question. While the delays to car traffic are more marked in the down-town districts there is a vast amount of time lost on the less frequented streets, because the general wagon traffic, and particularly loaded wagons make use of the better road afforded by the car tracks.

In the article by Mr. Williston Fish, which we publish this month, it is pointed out that the history of streets shows a constant tendency to specialization, the most marked result of which is the setting apart of the sidewalks for the exclusive use of pedestrians, and it is urged that there be a similar provision made for street cars. There is no necessity for setting aside whole streets for the exclusive use of the cars as the boulevards are reserved for light vehicles, but it is quite practicable to exclude other vehicles from those portions of the street occupied by the car tracks, save, of course, at street crossings. To do this would vastly increase the efficiency of the street railways and result in an enormous saving of time to the general public.

The substitution of a T-rail for the tram rails so extensively used in cities would do more than perhaps any one thing towards preventing the usurpation of the car tracks by coal wagons and heavy trucks.

NEW YORK STREET CAR BRAKE TESTS.

On another page of this issue will be found an extended abstract of the report of a competitive test of street car brakes made under the direction of the Board of Railroad Commissioners of New York in 1899. These tests are the only official tests of the kind of which we have knowledge, and as they will doubtless be given wide currency it is important that the results thus obtained be estimated at their proper value.

After an examination of the report a number of criticisms suggest themselves:

1. Sufficient data as to the brake leverage and the dimensions and material of the brake shoes are not given. Both of these factors radically affect the length of the stop, and while the conditions may have been strictly comparable the matter is certainly sufficiently important to make an explicit statement desirable.

2. As stated in the report nearly all the contestants labored under the disadvantage of not having opportunity to properly adjust their brakes through actual service operation of the car, which is much to be regretted.

3. Exception may be taken to using the formula $ws^2 \div d$ for comparing the various brakes, because it does not take account of the time that may elapse between the signal to apply brakes and the actual application. To make a strictly accurate comparison the formula should have two terms, one depending on the speed only and the other upon the weight of the car and the square of the speed. For a further discussion of this point see the "Review" for May, 1899, page 336. The formula $ws^2 \div d$ is probably better than the one it was at first proposed to use, $ws \div d$.

4. Also, it might properly be urged that if the formula $ws^2 \div d$ were to be used it should have been applied to each test separately or at least to the average of those at the same initial speed, instead of averaging all the results on the brake and then applying the formula.

5. The allowances made for the skidded wheels seem to be very arbitrary; also it is unfortunate that these distances could not have been measured, and the cars weighed instead of both being estimated.

These points are of minor importance when compared with the defects in the recording apparatus disclosed by the curves. It is

stated in the report of Mr. Barnes, the electrical expert of the Board of Commissioners, that "the standing of the respective brakes, as shown in the foregoing tables, is only the result obtained by the automatic recording instrument, and the record of skidding of wheels as noted." We may therefore look to the diagrams published in the report when endeavoring to form an opinion as to the value of the results thus obtained.

These diagrams, two of which we have reproduced, are 66 in number and each contains from two to four curves drawn with the distances, in feet, run by the car as abscissae and the times in seconds as ordinates. The total number of tests thus recorded on the curves as published is 220. Of these 220 stops 54 were made from an initial speed of 8 miles per hour; 51 from 12 miles; 52 from 15 miles, and 72 from an initial speed of 16 miles per hour.

A speed of 8 miles per hour is equivalent to 11.73 ft. per second. An examination of the curves for the 54 stops from 8 miles per hour shows that in every case the car traveled more than 11.73 ft. in the first second after the signal to stop was given; the maximum distance made in the first second was 23 ft. and the minimum 12 ft., corresponding to 15.7 and 8.2 miles per hour, respectively.

A speed of 12 miles per hour is 17.6 ft. per second. Curves for

velocity became as low as the initial velocity indicated for these curves.

It is not reasonable to suppose that the gentlemen making these tests could have ridden on cars going at from 30 to 50 miles per hour, and not realized that the speed was greater than 16 miles; therefore, we are forced to the conclusion that the time and velocity records shown by the curves and tables of the report are absolutely worthless. And the fact that this is true of one portion of the automatic apparatus, throws serious doubt on the other results obtained with it, and renders the table of the comparative standing of the several brakes of no value.

The Board of Railroad Commissioners is composed of men who are not versed in technical matters and must therefore rely upon the advice of their engineer, so that the responsibility for this report must be borne by Mr. Barnes; we consider it very remarkable that an engineer should have submitted such results.

Since the foregoing was written we have scanned with keen interest the editorial pages of the technical papers and find that Mr. Barnes' report must have been what Mr. Dooley would call "very imposing—to anyone who could be imposed upon." In this

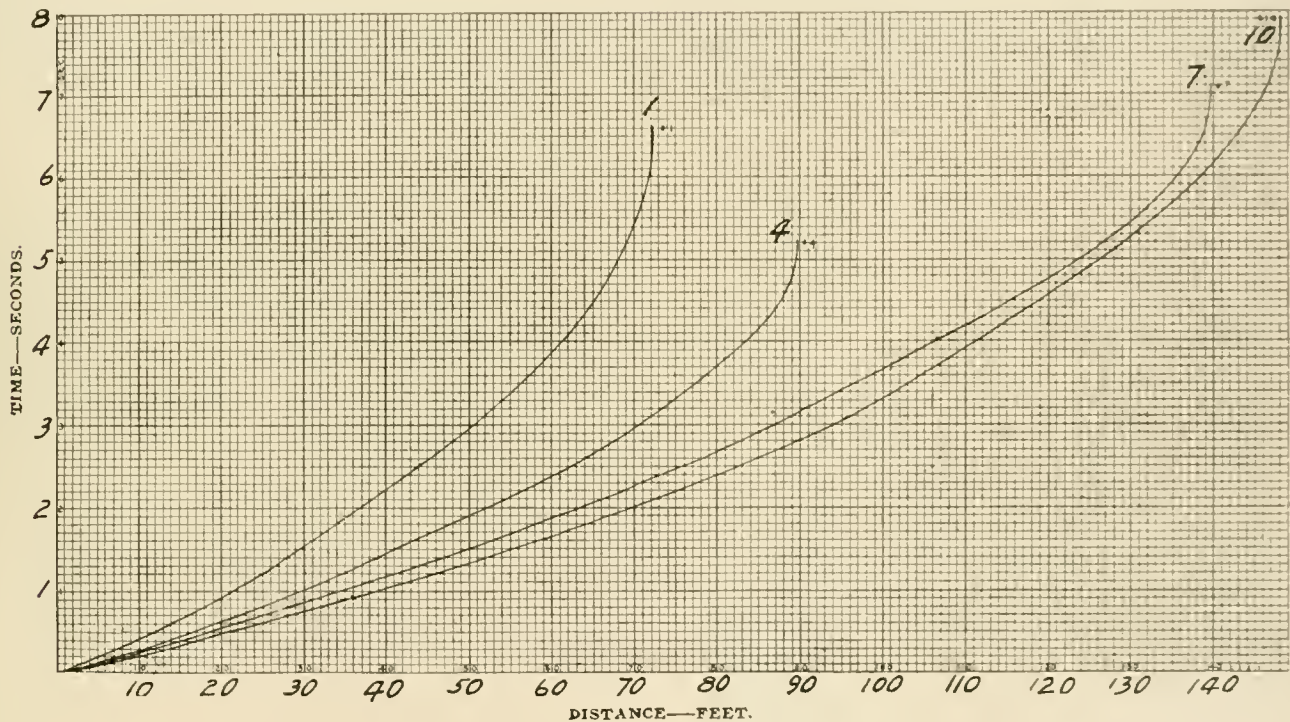


DIAGRAM NO. 21—TESTS OF STREET CAR BRAKES BY N. Y. RAILROAD COMMISSION.

this speed show that in 35 out of 51 cases the car ran farther than 17.6 ft. in the first second; the maximum was 36.5 ft. and the minimum 8.0 ft., corresponding to 24.0 and 5.5 miles per hour.

A speed of 15 miles per hour is 22 ft. per second. Curves for this speed show that in 30 out of the 52 cases the car traveled more than 22 ft. per second; the maximum was 38 ft. and the minimum 12 ft. per second, corresponding to 25.0 and 8.2 miles per hour.

A speed of 16 miles per hour is 23.47 ft. per second. Curves for this speed show that in 47 out of 72 cases a greater distance than 23.47 ft. was run in the first second; the maximum was 75 ft. and the minimum 6.7 ft., corresponding to 51.2 miles and 4.6 miles per hour.

In some cases it was found that, according to the curves, the car traveled farther during each of the second, third, fourth, and even fifth seconds of the stop, than it would have gone in one second at the initial speed.

Further, in 13 of the tests, involving four different brakes, the curves show that the car ran farther after the brake was applied than it would have gone had it been allowed to proceed unchecked at the indicated initial speed. In 7 of these 13 tests the car was running up grade.

Measurements of velocity from the slope of the curves on Cross-section Sheet No. 21 show that it was only after two-thirds or three-fourths of the total distance of the "stop" had been made that the

latter class we are grieved to find some of our most esteemed contemporaries.

The Western Electrician believes that the report is a "valuable addition to technical literature, and is the first thorough investigation of street-car braking ever made the results of which are public."

The Engineering News believes the work to be "the most important and exhaustive series of test street car brakes ever undertaken," and in its issue of August 2d the principal editorial, nearly three pages, is devoted to "an attempt to summarize the main results reached by these tests and the most important lessons to be drawn from them." The conclusion is that the commission by its conduct of the tests has rendered a great public service.

The beautiful trip from Meriden, Conn., to Compounce Lake, by way of the Meriden, Southington & Compounce Tramway, is described in an interesting illustrated pamphlet issued by the company.

The first few days of the St. Louis street railway strike recalled to the minds of the older inhabitants a period in 1871, when every street railway line in the city had to suspend operation for several weeks, owing to an epidemic of influenza among the horses.

The System of the Indiana Railway Co.

The lines of the Indiana Railway Co. serve the cities of South Bend, Mishawaka, Elkhart and Goshen, lying in the valley of the St. Joseph River in northern Indiana. The aggregate population of these four places and the intermediate country is about 70,000 distributed as follows: South Bend, 36,000; Mishawaka, 6,000; Elkhart, 17,000; Goshen, 9,000; in addition there are on the route two stations of the Lake Shore & Michigan Southern R. R., Osceola with 100 and Dunlaps with 150 inhabitants. The Indiana Ry. calls its station at the latter point Dunlap.

This territory offers almost ideal conditions for an interurban electric railway; the valley of the St. Joseph River—one of the most beautiful and picturesque streams in the state—is a rich farming country, and the four towns are all manufacturing centers. South Bend is the fourth city in size in the state; among its large plants are the Studebaker wagon and carriage works and the Oliver plow works, and there are a host of smaller factories. The Singer

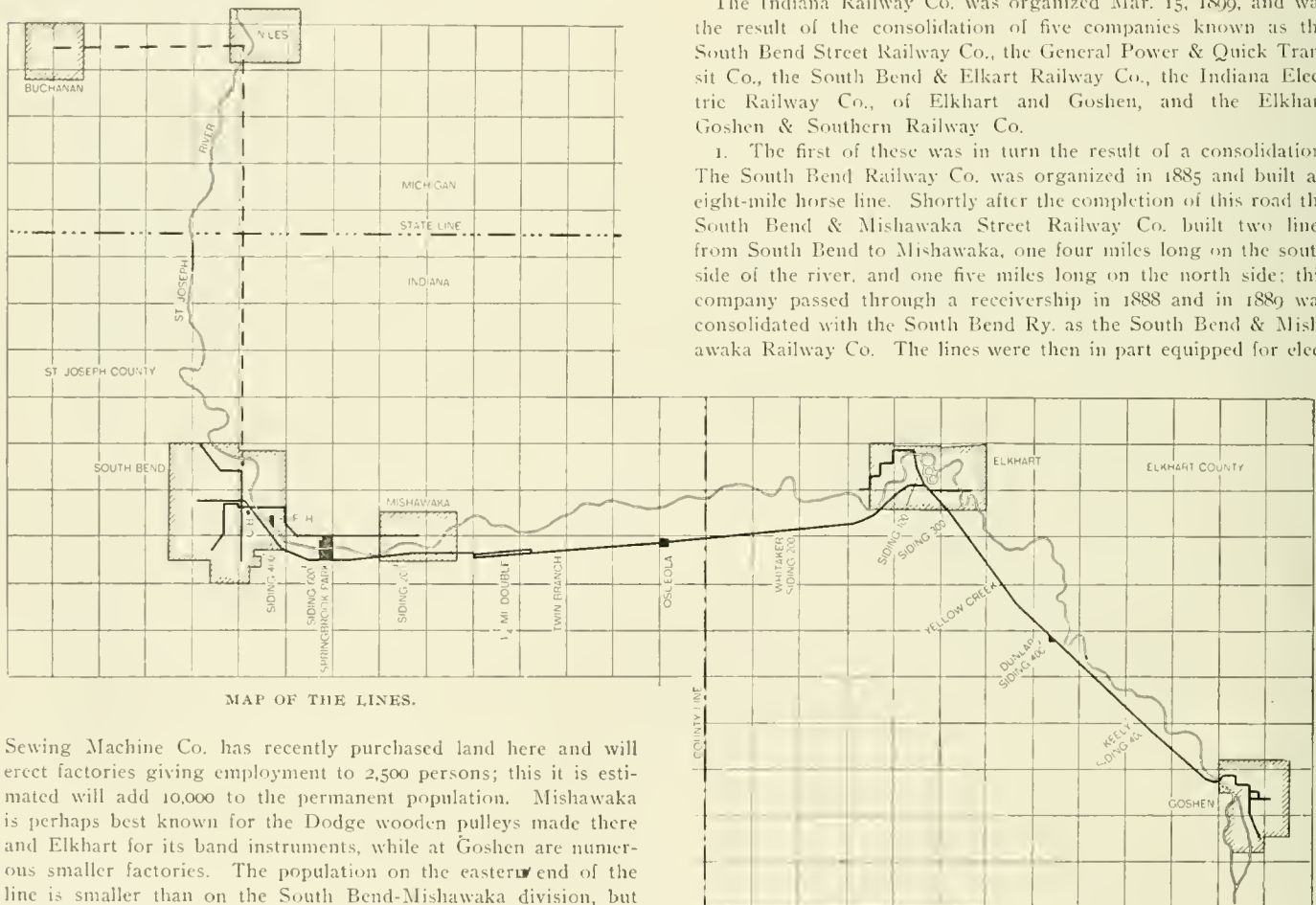
build to Niles, Mich., which is a town of 6,000 population, about 10 miles north of South Bend, and thence to Buchanan, a town of 4,000 population about five miles west of Niles. This extension would pass close to the Catholic schools, Notre Dame and St. Mary's, which are two miles due north from the city.

All the urban franchises of the Indiana Railway Co., save that for Elkhart, which expires in 1926, are perpetual; in the country about 18 miles are over a private right of way, and for the remainder of the distance, where the highway is used, the company has a perpetual franchise. The franchise conditions as to what the company shall do are not unreasonable; the ordinances require that cars be run at half-hour intervals during the day, and that the company pave between its rails in Elkhart, and between the rails, between the tracks and for 12 in. outside in South Bend, Mishawaka and Goshen.

HISTORY AND ORGANIZATION.

The Indiana Railway Co. was organized Mar. 15, 1899, and was the result of the consolidation of five companies known as the South Bend Street Railway Co., the General Power & Quick Transit Co., the South Bend & Elkhart Railway Co., the Indiana Electric Railway Co., of Elkhart and Goshen, and the Elkhart Goshen & Southern Railway Co.

1. The first of these was in turn the result of a consolidation. The South Bend Railway Co. was organized in 1885 and built an eight-mile horse line. Shortly after the completion of this road the South Bend & Mishawaka Street Railway Co. built two lines from South Bend to Mishawaka, one four miles long on the south side of the river, and one five miles long on the north side; this company passed through a receivership in 1888 and in 1889 was consolidated with the South Bend Ry. as the South Bend & Mishawaka Railway Co. The lines were then in part equipped for elec-



MAP OF THE LINES.

Sewing Machine Co. has recently purchased land here and will erect factories giving employment to 2,500 persons; this it is estimated will add 10,000 to the permanent population. Mishawaka is perhaps best known for the Dodge wooden pulleys made there and Elkhart for its band instruments, while at Goshen are numerous smaller factories. The population on the eastern end of the line is smaller than on the South Bend-Mishawaka division, but the traffic is greater than might be expected, because of the fact that while Elkhart has twice as many inhabitants as Goshen, the latter is the county seat, and business in court necessitates a trip to Goshen.

Between South Bend and Goshen the Indiana Ry. parallels the Lake Shore & Michigan Southern, and as one result a dummy service, formerly maintained by the latter between Elkhart and Goshen, has been discontinued, and the Lake Shore turns excursionists over to the Indiana Ry. at Elkhart. The most friendly relations exist between the two managements and the steam road was very accommodating in arranging for crossings, and in several instances exchanged lots with the electric line where doing so would enable the latter to secure a better location. This policy is quite different from that usually pursued by steam railroads in other places, but the position taken by the Lake Shore officials was that the electric interurban would increase general traffic; this in turn would result in increased freight business to the railroad company.

There appears to be but little inducement for any further extensions eastward, but the company has procured franchises to

tricity and operated till 1894, when they were sold under foreclosure proceedings and bought by the South Bend Street Railway Co.

2. In 1894 the South Bend & Mishawaka company forfeited its rights on the south side of the river by reason of inadequate and inefficient service, and the General Power & Quick Transit Co. was organized, and built an electric line between South Bend and Mishawaka, replacing that of the old company south of the river. This line was opened for traffic Jan. 1, 1896.

3. The Indiana Electric Ry. was organized May 15, 1894, and at foreclosure sale bought the property of the Elkhart Electric & Railway Co., operating a local line in Elkhart. The Indiana Electric Ry. was controlled by Mr. J. J. Burns, of Goshen. The local lines in Goshen originally built about 1893 were acquired by the Indiana Electric Railway Co.

4. The Elkhart, Goshen & Southern Railway Co. was organized in 1898 to build a line between Elkhart and Goshen, but had only proceeded as far as securing the rights of way when it was absorbed by the Indiana Electric Railway Co.

5. The South Bend & Elkhart Railway Co. was organized Mar. 8, 1898, to build an electric line to connect the South Bend-Mishawaka and the Elkhart systems.

The beginning of the present excellent system of the Indiana Railway Co. was in 1897, when the South Bend and the Quick Transit properties were bought by Messrs. Arthur Kennedy and Francis J. Torrance, of Allegheny City, Pa. The whole of the lines thus acquired were rebuilt in 1898, except the four miles built by the Quick Transit Company, in 1896. The rails taken up, and the whole equipments of the old companies were fit only for scrap.



PANORAMA OF SPRINGBROOK PARK.

Oct. 1, 1898, Messrs. Kennedy and Torrance bought the properties in Elkhart and Goshen of the Indiana Electric Co., and on October 10th of that year, began building the line from Goshen to Elkhart. Ground was broken on October 10th and on December 21st the new 11-mile road was opened for traffic. This particularly rapid work was done in the face of great difficulties; for the first month there were heavy rains, and then the ground became frozen to a depth of nearly two feet, so that it was necessary to blast on the last three miles. In the following spring the line between Elkhart and Mishawaka was put under construction and finished Aug. 1, 1899, connecting up and completing the entire system, which now has 42 miles of track. There are about 2 miles of double track, of which 1 1/4 miles are on the interurban line east of Mishawaka. The system does not present any startling features, but it is a model of substantial construction and good management. The work of rebuilding and extending the lines of the company was under the immediate supervision of Mr. William Cummins, and the excellent condition of the property stands today as a monument to his energy and skill as a constructor.

When the foregoing history of the companies formerly operating in this territory, and the financial condition of the street railways of the other towns of Indiana in the latter part of the 90's are considered, the courage displayed by the present stockholders of the Indiana Railway Co. will be appreciated. It was clearly seen that bonds of a paper street railway in Indiana would go begging among eastern investors, so the stockholders furnished the necessary funds and the bonds were not issued till the road was built and the results of operation had shown that the confidence of the promoters was fully justified.

The authorized capital stock of the Indiana Railway Co. is \$1,000,000, all of which is paid in. The authorized funded debt is \$1,000,000, and \$900,000 of 30-year 5 per cent gold bonds, due Jan. 1, 1930, have been issued, \$100,000 of the bonds being held in the treasury to pay for further permanent improvements already contemplated.

The directors of the company are: Arthur Kennedy and Walter Lyon, of Allegheny City, Pa., James McM. Smith and J. B. McCance, of South Bend, and W. L. Stonex, of Goshen. A controlling interest in the stock is held by Arthur Kennedy and Francis J. Torrance, of Allegheny City. The officers and operating staff are as follows: President, Arthur Kennedy; vice-president and general manager, James McM. Smith; secretary and treasurer, James B. McCance; superintendent, Mark Cummins; chief engineer, William Cummins; assistant superintendent, C. M. Cubbison.

OPERATION.

The map clearly shows the present system and also the proposed extension to Michigan. In the central business district of South

Bend is a double loop, a portion or the whole of which is used by all the cars operating in the city. Interurban cars run over the whole loop, leaving the company's office, which is at the northeast corner of the loop, on the even hours from 6 a. m. to 11 p. m.; the run to the center of Goshen, a little more than 26 miles, is made in an hour and a half, so that three cars give an hourly service both ways. On Sundays and other days when special conditions justify it, the number of cars on this line is doubled and a half-hourly service given. Interurban cars stop at signs which are placed at intervals of 1,500 to 2,000 ft.

The so-called local service in South Bend includes the two routes to Mishawaka, the cars on both of which run over the whole loop. On the North Side line to Mishawaka, which is a little over four miles long, two cars are run giving a 30-minute headway. On the South Side line are four cars, giving a 15-minute service; this route extends to the eastern limits of Mishawaka. In South Bend are three other lines: On the Michigan St. route, which is that through the city from north to south, are two cars, giving a 15-minute service. On the Washington St. route, which is that running due west, two cars give a 12-minute service, leaving the office on the even hours and each 12 minutes thereafter. On the Chapin St. route one car gives a 30-minute service. That portion of Wash-



MICHIGAN ST., SOUTH BEND.

ington St. used by the two lines is double tracked, and cars on both these routes run around the eastern portion of the loop. All these local lines are on the best residence streets.

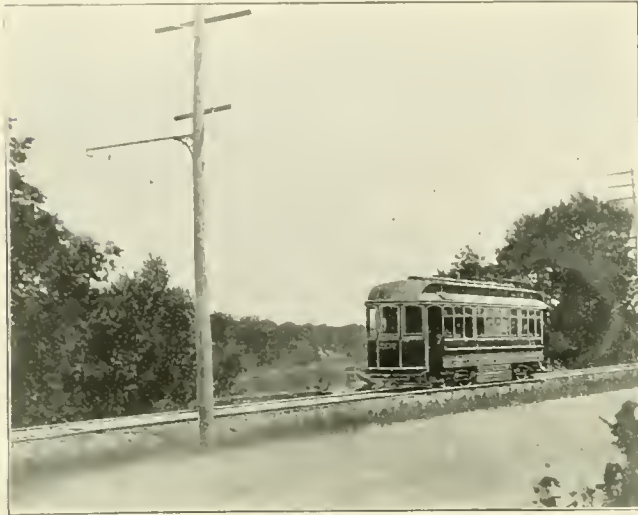
In Elkhart three local cars are operated; two are on the east and the northwest branch lines, and one on that portion of the interurban line that is within the corporate limits, running over the line ahead of the interurban and following the interurban back to avoid having the interurban cars stopping for purely local traffic. In Goshen one local car is operated.

TRACK AND OVERHEAD WORK.

All of the track is either newly laid or has been entirely rebuilt since 1898, except the four miles of the South Side line built in 1896,

and a short section of the local line in Elkhart. This year two half-mile extensions to the Michigan St. line in South Bend were made, and a half-mile more will be added to the eastern local line in Elkhart. The other Elkhart track mentioned will be rebuilt as soon as sewers and other street improvements are completed. The topography is particularly favorable, the only grades worth mentioning being two of about 3 per cent, one 400 ft. and one 800 ft. long.

In the country the track is laid with 70-lb. 4 $\frac{5}{8}$ -in. T-rails, but in all streets which are paved or which are at all likely to be paved within the next five years 70-lb. 7-in. T-rails have been used. All

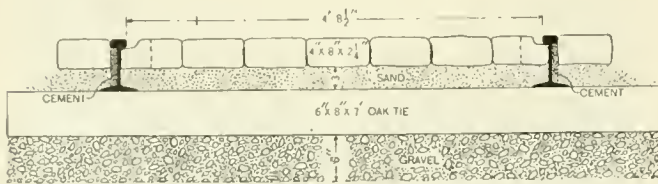


VIEW ON SOUTH BEND-MISHAWAKA LINE.

of the 7-in. rails and also those on the line between Elkhart and Goshen are in 60-ft. lengths and were rolled by the Lorain Steel Co. The rails between Elkhart and Mishawaka are in 30-ft. lengths.

The rails are laid on white oak ties, which are 6 x 8 in. x 7 ft. in paved streets, and 6 x 8 in. x 8 ft. elsewhere. The joints on low rails are made with 6-hole angle splice bars and bonded with No. 0000 stranded Washburn & Moen bonds placed under the splice bars. For the 7-in. rails 6-hole splice bars are used, and all joints double bonded, one No. 0000 Washburn & Moen bond under the plates and one No. 0000 outside. All joints are of the suspended type.

Details of the track construction are shown in the sketch. For the 7-in. rails in paved streets a bed of gravel 6 in. deep



TRACK CONSTRUCTION IN PAVED STREETS.

is put down, the ties are laid on this 2 ft. between centers, and the spaces between filled with concrete made of 5 parts gravel, 2 parts sand, and 1 part cement. The concrete comes flush with the tops of the ties, and above this is sand 3 in. deep as a foundation for the paving. Special bricks are used to give a flange way; they are made in whole and half bricks to permit breaking joints without using bats, and have given excellent satisfaction. On the outer side of the rail cement is placed as indicated in the sketch to provide an end bearing surface for the brick flush with the side of the rail head. Where the streets are paved with asphalt one row of special bricks is placed on the inner side of the rail to make the flange way, and on the outer side two rows of bricks are placed endwise, breaking joints, and the asphalt rolled against the bricks. Tie rods are placed 10 ft. apart wherever 7-in. rails are laid. The special work was all made by the Lorain Steel Co., and has "guaranteed" centers.

The soil between Elkhart and Mishawaka is gravel and sand,

suitable for ballast, and this portion of the line has been ballasted. The gravel is about 2 in. deep over the ties at the center and sloped off to give drainage. On the fills the shoulders are about 4 ft. beyond the ends of the ties. There was one cut 6 or 7 ft. deep for a short distance about two miles southeast of Elkhart, but aside from this the cuts and fills were all very light.

Between Goshen and Elkhart the soil is more of a loam, and on this portion of the line the soil is filled in over the ties, both between and outside the rails, high enough to cover the rail webs. This holds the track in line, but the intention is to remove the loam and ballast with gravel. The entire roadbed, excepting only the short section in Elkhart previously mentioned, which will be rebuilt when the street improvements are completed, is an ideal condition of alignment and surface.

Spring switches and frogs are used on the interurban line. Where interurban cars have to pass loose point switches, blocks are used with the object of preventing the rear truck of the interurban from taking the wrong track because of the switch point slipping.

The private right of way, which is from 30 to 50 ft. wide, is all fenced with wire; between Elkhart and Goshen steel posts are used. Steel cattle guards made by Fairbanks, Morse & Co., are in place at all highway crossings between Elkhart and Goshen and are to be installed on the other portion of the line.

The length and position of switches on the interurban line are as follows (see map): Keely, 400 ft.; Dunlap, 400 ft.; south limit of Elkhart, 300 ft.; center of Elkhart, 100 ft.; Whitaker, 200 ft.; east of Mishawaka, 1 $\frac{1}{4}$ miles of double track; western part of Mishawaka, 200 ft.; Springbrook Park, 600 ft.; near southeastern limits of South Bend, 400 ft.

The overhead line is carried on wooden poles, except in the main streets of Elkhart and Goshen, where iron poles are used. All except 2 $\frac{1}{2}$ miles between South Bend and Mishawaka is the span wire construction. On this section side brackets designed by Mr. Smith are used. This bracket is shown in one of the engravings. A casting is fastened to the pole by two bolts 18 in. apart; eyes in the top receive a piece of 1 $\frac{1}{2}$ in. wrought pipe, which is clamped by set screws; the yoke fits loosely in the end of the pipe, and by setting up on the bolt holding the guy wire the desired stress is put on the lower or span wire. Globe strain insulators are placed at each end of the span wire; both the span and guy are $\frac{3}{8}$ -in. stranded cables.

The wooden poles are 35 ft. long with 8 in. tops; the iron poles are 30 ft. long, in three sections, 5 in. at the top, and set 6 ft. deep. In South Bend, in order to reduce the number of poles in the streets, the railway company joins with the telephone and telegraph companies where both are in the same street, erecting one line of large poles used by both, and on the opposite side of the street, poles of the railway's standard size. In Mishawaka and portions of Elkhart and Goshen the railway company put up poles somewhat longer than was necessary, and permits other companies to use them for wires without compensation; the object, of course, is to keep the street from being disfigured by several rows of poles.

Michigan St. in South Bend, which is shown in one of our illustrations, is said to be the street on which an electric motor car was first operated in practical service in the United States.

The trolley wire is No. 00, all furnished by the American Steel & Wire Co., and the other line material is of the Ohio Brass Co's. make.

POWER HOUSES.

It is the intention of the company to build a water power plant on the St. Joseph River opposite Osceola, where a head of 18 ft. is available. This point is near the center of the system, and direct current could be distributed on the booster system or three-phase transmission lines and sub-stations installed. The plans for this are not settled as yet, however. The present power stations are regarded as merely temporary, though when the proposed central station is built a portion of the present steam equipment will be held as a reserve. The power stations are at Dunlap, Osceola, and South Bend.

The South Bend station is a brick building 40 x 90 ft., situated on the line of the Grand Trunk Ry. Its equipment comprises two Buckeye simple non-condensing engines, 26 $\frac{1}{2}$ x 36-in. cylinders, running at 125 r. p. m., belted to two 250-kw. Westinghouse generators; five tubular boilers, 60 in. x 18 ft.; one Warren Webster

500-h. p. feed water heater; Deane and Worthington pumps. The switchboard is of white marble with a panel for each of the two station generators and four feeder panels. The voltmeters and ammeters are Weston and the circuit breakers Westinghouse. Water is taken from the river and delivered to the tank, which is in a covered building adjacent to the power house, by a pump driven by a 15-h. p. electric motor. The pipe line is 600 ft. long and the lift 12 ft. The water contains considerable lime and magnesia and a solution of sodium tri-phosphate is introduced into the feed between the pumps and the heater. The steam pressure is 100 lbs. At this station is a lighting plant, intended for the company's

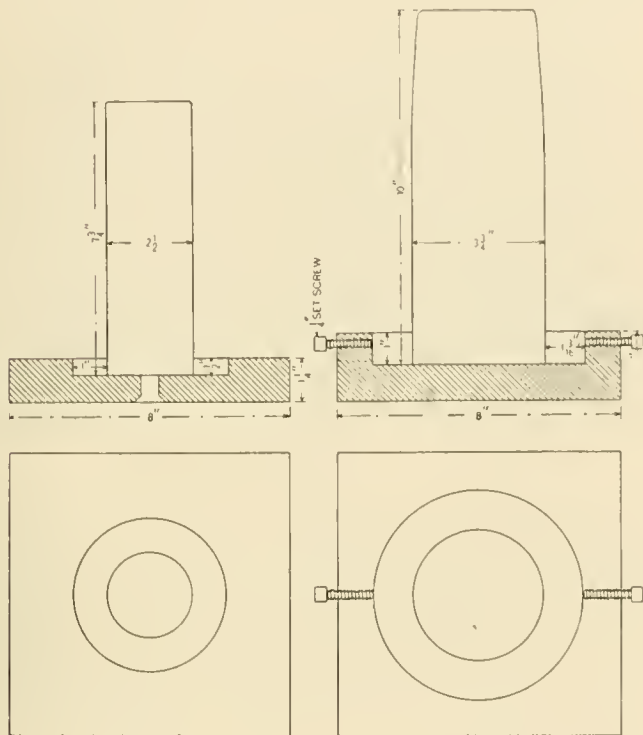


FIG. 1.

FIG. 2.

service only, consisting of a Westinghouse "Standard" engine belted to a 3,000-light Westinghouse alternator. Manhattan arc lamps will be used.

At Osceola the power station and car house are in one building, which is 40 x 300 ft. The frame is of wood and the roof and sides of corrugated steel. A sheathing of wood and tar paper is laid under the iron roof; the roof is carried on trusses, leaving a clear floor space. The equipment comprises three tubular boilers; two 22 x 33-in. simple non-condensing Buckeye engines, belted, one to a 200-kw. General Electric, and one to a 250-kw. Westinghouse generator; one Warren Webster 400-h. p. vacuum heater; Worthington feed pumps. The steam pressure is 100 lbs. On each engine is an 8-in. "Zigzag" steam separator made by J. S. Stephens. The switches and instruments are mounted on a wooden frame. Wurts tank lightning arresters are used.

The Dunlap power station is a building similar to that at Osceola, 40 ft. x 100 ft. Here are three return tubular boilers and one simple Allis-Corliss engine driving a jack-shaft, to which are belted three D-62 generators running at 900 r. p. m. The switchboard has Westinghouse instruments. The engine, generators, and switchboard were removed from the old station of the South Bend Street Railway Co. The minor equipment here includes a Wurts tank lightning arrester, Blake and Deane feed pumps, a Peneberthy injector, and an "Excelsior" feed water heater.

The South Bend station is operated from 5 a. m. to 1:15 a. m., the Osceola station from 5:45 a. m. to 12:35 a. m., and the Dunlap station from 5:30 a. m. to 1:00 a. m., and the total average daily consumption of fuel is about 17 tons of Hocking Valley coal, costing \$2.45 per ton delivered. At each station there are two shifts of three men each, engineer, fireman, and coal passer. At present the lines taking power from the South Bend and Osceola stations are connected, and those supplied from Dunlap will also be cut in.

The feeders comprise: One 300,000-c. m. line from Dunlap to

Goshen, four miles; one line from Dunlap to Elkhart, five miles, of which the first mile is 300,000-c. m. and the rest No. 0000; one line from Osceola to Elkhart, five miles, of which the first half-mile is 500,000-c. m. and the rest 300,000-c. m.; one line from Osceola to Mishawaka, five miles, of which the first mile is 500,000-c. m. and the rest 300,000-c. m.; two lines from the South Bend power station to the loop in South Bend, 3/4 mile, of which one is 500,000-c. m. and the other 300,000-c. m.; one No. 0000 feeder from

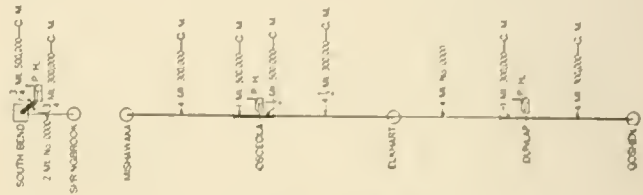


DIAGRAM OF FEEDERS.

the loop in South Bend to Springbrook, two miles. The feeders are all tapped into the trolley line at intervals of 1,000 to 1,500 ft.

CAR BARN.

The car barns are all of the wood and corrugated iron construction, similar to the power houses at Osceola and Dunlap. There are in all four car barns; one at Dunlap, 40 x 300 ft., one at Osceola, 210 x 40 ft. (part of the single building), two in South Bend, one 66 x 120 ft., and one 35 x 120 ft. In all these buildings the roof is carried on trusses, so that the floor space is left clear; in each there is a pit for the convenient inspection of motors and trucks. The trolley wires are hung below inverted flat troughs. The cost of these 40 x 300-ft. buildings was about \$1,500 each. These buildings are temporary in character and the company has recently purchased a square of ground in South Bend centrally located for the erection of a commodious and permanent car barn and shops to be built of brick and steel.

The repair shop is 66 x 50 ft., being a part of one of the power stations of one of the old companies. The front portion has four tracks, one with a pit. In the rear are the machines, which include 1 planer, 1 Barnes drill press, 1 engine lathe, and 1 emery grinder; these machines are driven by a 22-h. p. 500-volt motor. One corner of the building is partitioned off for a forge shop.

At the shop and car houses 1 machinist, 1 blacksmith, 1 carpenter, 1 painter, 3 laborers, and 4 car washers are employed. As will be apparent from the small number of machines in the shop, only light repairing is done here, wheels and axles, and motors being sent to the makers when necessary.

One man is employed as car inspector and instructor of motormen, to which he devotes all his time excepting on busy days at the park when he is occupied for an hour or so in starting cars properly. The inspector makes a careful examination of interurban

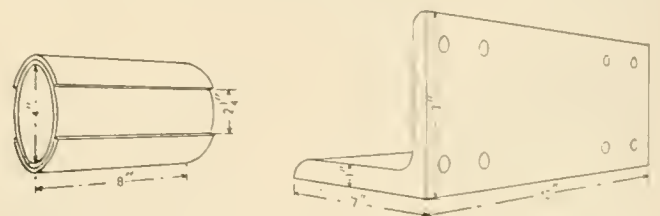


FIG. 3.

FIG. 4.

cars once each trip, and the local South Bend cars as often as their schedules bring them within reach and his time permits. Cars on the local lines at Elkhart and Goshen are inspected at Dunlap at night after they are brought into the car house. All cars are inspected for low armature bearings once each week. The inspector tries to slip a wooden gage 1-16 in. thick between the armature and lower pole pieces, and if it will not pass the bearings are renewed. All armature bearings are put in by the same gang of men, so that the personal equation is eliminated to a great extent and uniformity secured.

The superintendent, Mr. Mark Cummins, has designed a set of forms and jigs for babbiting bearings, which we illustrate and will doubtless be found interesting. All armature bearings, motor

axle bearings, and interurban journal bearings are babbitted. For armature bearings the jig in Fig. 1 is used; the two halves of the bearing are set around the mandrel and wrapped with a piece of sheet asbestos, outside of which is a sheet iron clamp, set up by thumb screws. The groove in the base serves to center the mandrel in the bearing. Motor axle bearings having an end bearing of babbitt are cast over the jig shown in Fig. 2. The flanges on the bearing shell fill the top of the groove in the base and are held at the proper distance, $\frac{7}{8}$ in., from the bottom by the set screws shown.

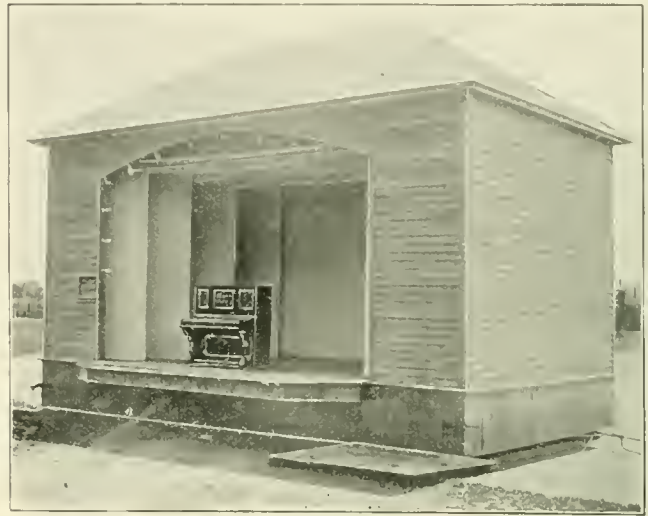
After casting, both styles of bearings are turned in the lathe. Mr. Cummins states his experience to be that special chucks for holding the bearings while being bored are not desirable, because of the fact that the outside of the shell will wear to an appreciable extent, and if bored in a chuck of uniform diameter the axes of the hole and of the shell are liable not to be parallel. The shells are, therefore, centered in a chuck with independent jaws for boring. The tool used is a piece of shafting with one end squared to fit the tool rest of the lathe and a transverse hole through the other end; in this hole the cutting tool proper is inserted, projecting at right angles to the body or holder, and held in place by a set screw.

While it is considered desirable to cast the bearings over mandrels of the exact size of the journal and thus save boring and utilize the greater wearing qualities of the metal, it is not practicable to do so, because the journals vary in size after wear.

The journals of the axles or interurban cars are $4 \times 8\frac{1}{4}$ in.; the contact surface of the bearing has a projected width of $2\frac{1}{4}$ in. For pouring these shells they are clamped to the form shown in Fig. 3. The form is a piece of tubing 4 in. in external diameter by 8 in. long, with two pieces riveted to opposite sides. For the single truck cars brass journal bearings are used, the axle bearings being $3\frac{3}{4} \times 8$ in. and the contact surface of the brass $1\frac{1}{2}$ in. wide. The contact faces are bored on the drill press. For holding the bearing a casting, such as shown in Fig. 4, is bolted to the table, and the brass clamped to the vertical face. The boring is done with a bar, the lower end of which is guided by the hole in the center of the

instruct the men how to handle their controllers, brakes, etc. There is more variety in the power house apparatus than elsewhere on the system, this being because, of all the equipment acquired from the old companies, only that in the power houses was in part serviceable.

The cars were all made by the St. Louis Car Co. and comprise 27 nine-bench open, 4 ten-bench open, and 21 closed motor cars



MOVABLE STAGE AT SPRINGBROOK PARK.

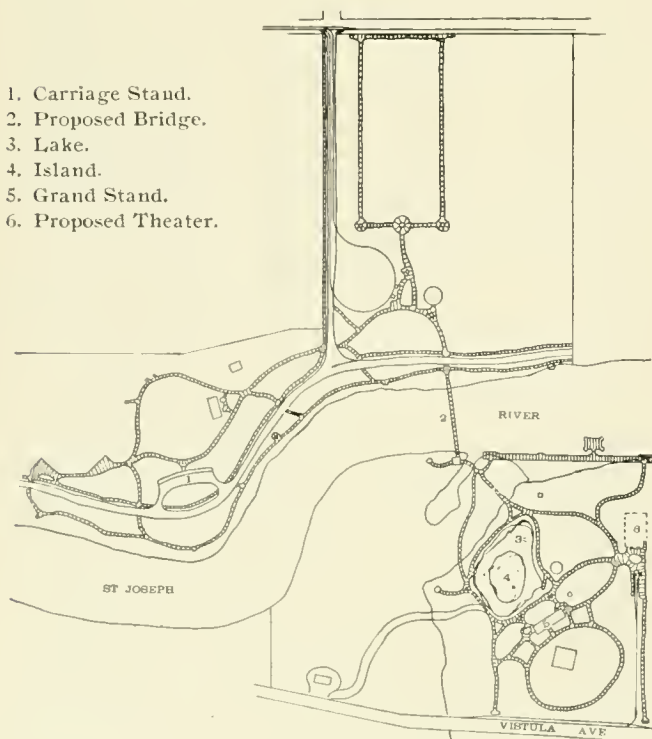
on single trucks, 10 interurban cars on double trucks, and 8 nine-bench open trailers.

The interurban cars are 42 ft. over all, mounted on McGuire No. 39 trucks, equipped with four Westinghouse 49A motors. The controllers are the Westinghouse B6. The wheels for these cars are of the double plate type and weigh 500 lb. each, made by the Griffin and Bass companies; the axles are $4\frac{1}{4}$ in. at the center, and 4 in. at the journal. Nuttall gears are used. The cars are vestibuled at both ends and plate glass is used on the interurban cars throughout; the increased cost by reason of using the plate glass was \$65 per car, but the better appearance of the car is considered to more than justify the expense. The electric heaters were furnished by the Consolidated Car Heating Co. The head-lights are the Crouse-Hinds changeable type. Each of the interurban cars has 18 full-size double seats and 4 slightly shorter seats for corners; the 18 seats have reversible backs, but the corner seats are backed against the bulkheads. The curtains on all cars are of "Pantasote." Push buttons for signalling the conductor are on the posts of all cars. For cleaning the vestibule glass in front of the motorman, a rubber window wiper is carried on each car. Interurban cars are run for only nine hours, three round trips, per day in regular service.

The smaller motor cars are mounted on McGuire single trucks, and are equipped with two Westinghouse No. 40A motors and B3 controllers. The wheels are of the spoke type, 33 in. in diameter and weigh 400 lb. The small closed cars have the same type of vestibule as the interurban and have "Consolidated" panel heaters. New Haven fare registers are used on the local cars.

The company has a full double equipment of trucks and motors. The equipment includes 2 McGuire sweepers and 1 Trenton tower wagon, and 2 Taunton snow plows have been purchased for immediate delivery.

There are 40 motormen and 40 conductors in the service. On the interurban line, the crews make three round trips per day; one crew working from 6 to 12 and from 3 to 6, and the other from 12 to 3 and from 6 to 12; these hours apply to the men running from the South Bend barn, there being a slight difference in the starting time for the other terminus. On the local lines three crews handle two cars, they are the swing crews, the early straights and the late straights. The early straights take one car from 6 a. m. to 6 p. m., with the relief at noon, and the swing men then run it till 11 p. m.; the swing men have the other car from 6 a. m. to 11 a. m. and the late straights then take it till 11 p. m. with relief at supper time. The employes other than those mentioned are 12 men and 2 foremen on track work and 1 lineman who has 1 helper.



MAP OF SPRINGBROOK PARK.

table. The drill has an automatic feed, and requires no attention until the brass is bored.

ROLLING STOCK.

The policy of the company is to have all its equipment as nearly uniform as possible, thus enabling a smaller stock of repair parts to be kept on hand, and making it much easier to thoroughly

The management is opposed to compartment cars, and for this reason prohibits smoking on all except open cars; as women and children, who constitute by far the larger number of passengers, do not like to pass through a crowd of men who are smoking, no smoking is permitted on the platforms of closed cars.

The destination signs used at present are enamelled, white letters on a blue background, slipped into brass sockets attached to the dash. At night oil signal lights are used, designating the different lines and as a precaution against rear-end collisions.

PARKS.

The Indiana Railway Co. has two parks, one at Springbrook and one at Dunlap. The General Power & Quick Transit Co. purchased about 30 acres on the south side of the St. Joseph River, midway between South Bend and Mishawaka, and opened a baseball park in 1896 which has been maintained by the succeeding company. A covered amphitheater seating 1,200 people and some "bleachers" were erected when the ball field was laid out. The Indiana Railway Co. recently purchased more land and now has 82 acres, 38 on the north side and 44 on the south side of the river, lying as shown on the map which also gives the general scheme of walks and buildings that will be followed in improving the newer portions. The original park is the southeastern portion of the property and is already a beautiful resort. The extreme southeastern corner where the ball field and amphitheater are located is level and from 25 to 30 ft. higher than the rest of the tract south of the river. North of the river also there is a rise of 30 ft. from the river bank to the north line of the property. On the lower level in the rear of the amphitheater is an artificial lake about 500 ft. long in which have been planted many varieties of water lilies. A bandstand is on an island in the lake.

The river is about 300 ft. wide at the narrowest point shown on the map of the park, and a bridge will be built at the place indicated. A spur track for waiting cars has just been completed; this extends along the east line of the south side park to the proposed site of the theater pavilion. On the north side a loop will be built as indicated, thus giving, when the bridge is built, access to the entire park from both lines of the road.

At Dunlap the park is an oak grove of some 10 acres and a cleared field adjacent laid out for a baseball diamond. A theater which will be described later was built in the grove, but no seats are provided at the ball field. This property lies about 200 yd. from the railway line and is held under lease.

This season the company wished to try the experiment of giving vaudeville performances at its parks, but hesitated to spend any considerable sum until satisfied that the venture would be financially successful. Estimates showed that a suitable theater and pavilion would cost about \$10,000, which was considered too much for a doubtful experiment. The solution adopted was extremely novel and has admirably served its purpose in demonstrating that a theater will pay.

Having the covered baseball amphitheater at Springbrook Park, with a level field in front, a covered stage was built and mounted on wheels so that it could be moved in front of the seats for the performance and drawn to one side during ball games. This movable theater is 20 x 30 ft. with an arched stage opening of 20 ft. The platform on which it is built consists of four longitudinal timbers 6 x 8 in., two placed flush with the sides and two 10 in. inside; the end sills are also 8 x 10 in. and bolted to the longitudinal sills with half-lap joints. Under each pair of longitudinal sills are three wheels 30 in. diameter and 8 in. face made of 2-in. oak planks sawed out and spiked together. The axles are 1½-in. square iron with the ends turned down for journals. The bearings are castings bolted directly to the under sides of the sills. The platform is braced diagonally by two 2 x 10 in. x 14 ft. joists between the inside sills at each end. Joists are laid on the sills and covered with matched pine flooring, except in the center of the stage where maple is used to make a better dancing floor. The walls are of lap siding on a framing of 2 x 4-in. studding, and the building is covered by a hip roof. The stage is 40 in. above the ground. There are the usual curtain and wings. At the rear are two dressing rooms, one in each corner, 4 x 8 ft. The entire cost of the building, including the scenery, was \$250. It was completed in less than a week.

The stage is moved into position by a team of horses hitched to a rope which is rove through a block attached to the building and the other end fastened to a stake; the block is on a wire cable

fastened to hook at the corner of the building. Planks are laid on the ground to form a better track for the wheels.

The Dunlap theater is similar in construction save that it is mounted on posts instead of wheels, and that larger dressing rooms are provided. The stage is 18 x 30 ft. with an opening 20 ft. wide. The dressing rooms are in a lean to at the rear 8 x 30 ft. Twenty



VIEW IN SPRINGBROOK PARK.

incandescent lamps are arranged over the arch of the stage opening, as is also the case at the Springbrook theater, and a plank with other lamps attached placed in front for footlights.

The piano, constituting the orchestra at this theater, is placed on a platform in front of the building, and when not in use is boxed in and locked; the top of the box is covered with tin to make it water-tight. The cost of the Dunlap building was about the same as that at Springbrook, \$250. Benches with seats for 700 people are placed under the trees. This park is also popular with picnic parties.

A charge of 5 cents is made for admission to Springbrook Park, (reserved seats 5 cents extra) but at Dunlap the park is free to all passengers because of a higher fare, park tickets being issued as patrons leave the cars.

Citizens of South Bend, Elkhart, and Goshen have recently organized a country club and have a tract of 110 acres, lying between the railway and the river, where a club house has been opened. Golf, tennis, and boating are popular with the members, and considerable new traffic over the railway has developed in consequence. Station No. 4 on the interurban line, which is opposite the club house, has been renamed "Somielgo," which some of the local philologists say is a Shawnee word meaning "Beautiful Links."

TICKETS AND RATES OF FARE.

The local fare in South Bend (including the two lines to Mishawaka), Elkhart, and Goshen is straight 5 cents. Books of 40 tickets good on the local lines are sold for the accommodation of patrons, but no reduction in price is made for these; they are mostly bought by merchants who have occasion to send their employes on errands.

The tickets other than those just mentioned are:

1. Conductors' Interurban Cash Fare Slip. This is the type patented by the National Ticket Co. of Cleveland. In Fig. A we

reproduce the conductor's stub side of one of these slips to show the rates of fare for single trips.

2. Conductors' Interurban Cash Fare Slip for children. The stub side of this ticket is shown in Fig. B, and gives the rate of fare for children.

SOUTH BEND	MISHAWAKA	TWIN BRANCH	OSCEOLA	WHITAKER	ELKHART	YELLOW CREEK	DUNLAP	KEELY	
5									MISHAWAKA
10	5								TWIN BRANCH
15	10	5							OSCEOLA
20	15	10	5						WHITAKER
25	20	15	10	5					ELKHART
30	25	20	15	10	5				YELLOW CREEK
35	30	25	20	15	10	5			DUNLAP
35	30	25	20	20	10	5	5		KEELY
40	35	30	25	20	15	10	10	5	GOSHEN

Conductor's Stub.

SINGLE TRIP. **M** 7701

FIG. A.

SOUTH BEND	MISHAWAKA	TWIN BRANCH	OSCEOLA	WHITAKER	ELKHART	YELLOW CREEK	DUNLAP	KEELY	
5									MISHAWAKA
5	5								TWIN BRANCH
10	5	5							OSCEOLA
10	5	5	5						WHITAKER
15	10	10	5	5					ELKHART
15	10	10	5	5	5				YELLOW CREEK
20	15	15	10	10	5	5			DUNLAP
20	15	15	10	10	5	5	5		KEELY
20	20	15	15	10	10	5	5	5	GOSHEN

Conductor's Stub.

REDUCED RATE FOR CHILDREN
Between the Ages of 5 and 12

3401

FIG. B.

SOUTH BEND	MISHAWAKA	TWIN BRANCH	OSCEOLA	WHITAKER	ELKHART	YELLOW CREEK	DUNLAP	KEELY	
10									MISHAWAKA
15	10								TWIN BRANCH
25	15	10							OSCEOLA
35	25	15	10						WHITAKER
40	35	25	15	10					ELKHART
45	40	35	25	15	10				YELLOW CREEK
55	45	40	35	25	15	10			DUNLAP
55	45	40	35	35	15	10	10		KEELY
65	55	45	40	35	25	15	15	10	GOSHEN

ROUND TRIP RATES

FIG. C.

3. Single Tickets. The company maintains six stations for the sale of interurban tickets, located at South Bend, Mishawaka, Osceola, Elkhart, Dunlap, and Goshen. No reduction in price is made in these tickets. The style of this ticket is shown in Fig. D; the original is 1 1/4 x 2 1/4 in.

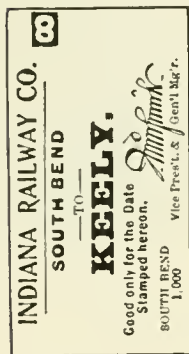


FIG. D.



FIG. E.

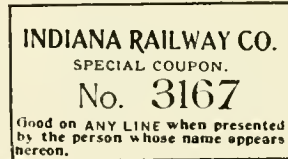


FIG. F.

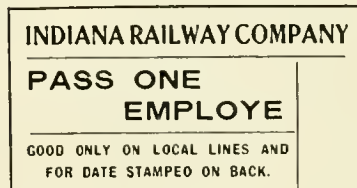


FIG. G.

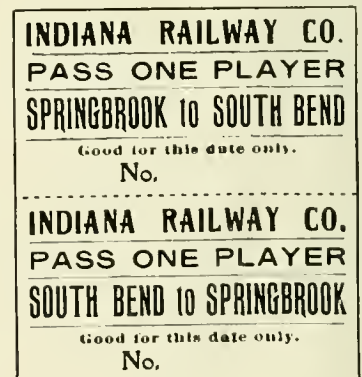


FIG. H.

4. Return Tickets. Round trip tickets are sold at slightly reduced rates. One of these forms, 2 1/4 x 2 1/2 in., is shown in Fig. E. A schedule of the round trip rates is given in Fig. C. These tickets are good only for the date stamped on the back.

5. Personal Complimentary Tickets. These are issued in books

DAY	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MON	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TUE	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
WED	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14
THUR	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
FRI	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13
SAT	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
SUN	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12

INDIANA RAILWAY COMPANY
TRANSFER TICKET
Good only on Line designated, and 15 minutes after time punched. Subject to the Rules of the Company.
033201
Feb. 28, 1900

FIG. I.

of 50 for special reasons, and are of several forms, good on some one local line, on the interurban line, or on all lines like that shown in Fig. F. The name of the person to whom one of these books is issued is written, or stamped, on the back of each ticket.

Where it is desired to extend the courtesies of the road to one who will have use for a few tickets only, the same form is used, the words "Pass One" being stamped on the back. The original is 1 1/4 x 3/8 in.

6. Employes Tickets. Employes are carried on their badges when

going to or returning from work. At other times there may be issued to them a ticket such as shown in Fig. G. These tickets are good only for the date stamped on the back. Local tickets are printed in black and interurban tickets in red ink.

7. Players' Tickets. These are for the transportation of the

atrical performers and ball players between South Bend and the two parks. This ticket is shown in Fig. H.

Transfers are issued on the local lines in all three cities, but not between local and interurban cars. One of the transfer slips is reproduced in Fig. I; the original is 2 x 4 1/4 in. The slips for the five South Bend lines are each of a different color; Michigan St., red; Washington St., yellow; South Side, apple green; North Side, mandarin; Chapin St., blue.

On local lines children under six years of age are carried free when with adults.

The company lets cars to parties desiring them, and is now arranging one of the interurban cars for such special service; the principal changes consist in removing the fixed seats and substituting wicker chairs and building two ice boxes at one end, so that refreshments may be conveniently carried. The rates for special cars are given in the accompanying table.

Within a few weeks a car for light freight and express will be put in service on the interurban line. The management has not yet decided whether a flat or a graduated tariff will be charged.

ACCOUNTS AND FORMS.

The issuing of tickets to conductors and station agents is under the direction of the assistant superintendent, Mr. C. M. Cubbison, who audits the conductor's returns and from his books prepares the statements of receipts for the manager. These reports are

for the name of the article, the box number, the stock ledger folio, the name of the vender, the year, and for each of the twelve months; each item has two lines allotted to it, giving space for two years. This book shows the number and cost of each article by months.

The stock ledger has two accounts to the page with vertical columns for each month of the year. The horizontal lines are numbered 1 to 31 and the number of the articles expended is entered on the proper day and month. Below the table are footing lines for the number "On Hand," "Received," "Received by Transfer," "Total," "Delivered," "On Hand."

The articles expended are reported to the office on blanks such as shown reduced in Form 4; this form is 4½ x 8½ in. As supplies are issued by the storekeeper, he enters them on this blank and at the close of the day the foreman receipts for them by signing the blank which is then returned to the office.

Supplies are ordered on requisition blanks addressed to the superintendent and signed by the foreman. The superintendent then draws a requisition, giving names of makers and a description of the material required, with shipping directions; he keeps a memorandum on the stub of the requisition book. This requisition having been approved by the manager an order is made, a carbon copy being kept; when the order is drawn the auditor makes a pencil memorandum of what it is for that is of assistance in distributing the items.

Vouchers are made for all bills over \$5, and payments made by checks signed by the manager and the secretary. For bills under \$5 the cashier keeps a petit cash book, drawing a voucher once a month or as often as may be convenient. The pay rolls are made on blanks which are copies of the time books of the various foremen and timekeepers. The time of the trainmen is made up from their slips, turned in each day.

Supplies used during the month are passed through the books on a "Credit Voucher" for the total of the daily requisitions made on Form 4. These requisitions and a type-written summary of the several items are attached to the voucher. Each voucher has a "distribution ruling" on the back to show the portion of the total to be charged to each account. The accounts are designated by a number and letter or by two letters, thus:

- A. Cost of Road. Subdivided A to N.
- B. Equipment. Subdivided O to Y.
- C. General Expenses. Subdivided 1 to 15.
- D. Transportation. Subdivided 20 to 45.
- E. Maintenance of Track and Buildings. Subdivided 50 to 54.
- F. Maintenance of Equipment. Subdivided 60 to 68.
- G. Storeroom. Subdivided 75 to 76.

The vouchers are all entered in an "Accounts Payable Distribution Book," which is wide enough, with a short leaf interleaved, to give a vertical column for each account. Each horizontal line is for one voucher, the number, date and total being entered and the total distributed properly.

There are 50 lines to the page and about three pages of this book are filled each month.

The cash book is ruled with columns for: Sundries (including park and advertising receipts). Earnings (with separate columns for each of the local car lines, interurban cash and ticket sales, chartered cars, local ticket sales, and freight and express). Accounts Payable. Pay Roll.

Mr. Arthur Kennedy, president of the Indiana Railway Co., is one of the pioneers of the electric railway business. He was organizer and secretary of the company that built the Observatory Hill Line on the Bentley-Knight trolley and conduit system in Allegheny City in 1887-88—the first conduit road and one of the very earliest trolley roads in the country. He was president of the Cream City Railway Co., of Milwaukee, in 1890, when that property was controlled by a Pittsburg syndicate. He was also for several years a director of the Federal Street & Pleasant Valley Passenger Railway Co., of Pittsburg and Allegheny, until it was sold to the United Traction Co., and of other local roads in and about Pittsburg. In 1895 Mr. Kennedy with Mr. Francis J. Torrance of Pittsburg secured control of the Washington (Pa.) Electric Street Ry. and the road was rebuilt and put on a paying basis. Mr. Torrance is now president and Mr. Kennedy secretary of this road. In 1896 he organized the New Castle Traction Co., which took over, rebuilt and extended the property of the New Castle Electric Street Railway Co. of New Castle, Pa., and served as vice-president and director. He was also president of the electric light company of

that place. When he became interested in the Indiana Railway property he took with him to South Bend Messrs. William and Mark Cummins, who had been connected with his Pennsylvania roads. Mr. Kennedy's home is in Allegheny City, but he spends a considerable portion of his time in South Bend.

Mr. J. McM. Smith, vice-president and general manager of the Indiana Railway Co., is a railway man of long and varied experience. At the age of ten he entered the railway field as telegraph operator



ARTHUR KENNEDY.



J. McM. SMITH.

with a construction train on the south end of the Chicago & Alton Ry. His youth, together with his expert work, attracted the attention of his superiors, W. C. Van Horne, Marion Hughitt and J. C. McMullin, who advanced him rapidly through their various departments. Five years later Mr. Smith resigned his position with the Alton road to accept a responsible office with the Pullman Co. in Chicago, where he remained many years, the last twelve of which he served as private secretary to George M. Pullman. Observing the rapid advance in the application of electricity to traction Mr. Smith decided to enter that field, which he did twelve years ago by purchasing the entire capital stock of the South Bend & Mishawaka Railway Co. The history of his work with this company is the story of nearly every street railway in the country during that period—the struggle to keep alive—and it was due to his pluck and energy that the old broken-down tracks and equipment were kept running and the franchises kept intact for the foundation for the present excellent street railway system.

NEW CARS FOR PITTSBURG.

The Consolidated Traction Co., of Pittsburg, last month awarded a contract for 50 new winter cars to the American Car Co., of St. Louis. These are to be delivered by Oct. 1, 1900. In general appearance the new cars will closely resemble those now in use in Pittsburg, but a number of changes suggested by experience will be made in fittings and appointments.

They will have rattan seats which are thought to be more comfortable and cleanly than the upholstered seats at present in use. Another innovation will be a corrugated steel step designed to prevent passengers from slipping in wet or icy weather. The cars will have headlights on the dash instead of on the hood, as the latter practice has not proven satisfactory. Wagenhals headlights will be used and the cars will be fitted with Van Dorn couplers and electric heaters.

Mr. W. K. Schoepf, general manager of the Consolidated company, states that he will also make some changes in the signs designating the routes. He is convinced the present small sign on the front of each car is not comprehensive enough for strangers, and he will therefore place large signs along the sides of the roofs, naming the principal streets over which the car runs.

Compressed air blowers are to be put up at the car barns and each car will be cleaned out by compressed air every night.

To reduce the chances of collision between street cars and fire apparatus the Commissioners of the District of Columbia propose to have the street cars stop before crossing certain streets that are used for the fire runs. The matter has been taken up with the railway companies, and an agreement as to stops which will be agreeable to all parties will doubtless be reached.

Electrolysis of Underground Metal Structures.

BY DABNEY H. MAURY.

(What follows is an abstract of a paper read at the meeting of the American Water Works Association at Richmond, Va., May, 1900. Mr. Maury is a consulting engineer and engineer for the Peoria Water Works Co., Peoria, Ill. For the illustrations accompanying the paper we are indebted to the Engineering News.—Ed.)

Reports of electrolytic injury to water and gas pipes are rapidly accumulating from cities all over the United States, where the single trolley system has been in use for any considerable length of time, and the subject is one of serious moment to every corporation or municipality, owning underground metal structures of any sort.

It is the purpose of the writer, after illustrating a few of the many instances of electrolytic injury which have come under his notice, to discuss the electrical resistance of the joints of cast-iron mains, and to point out the important bearing which this joint resistance has upon all the various remedies for electrolysis heretofore suggested, and to show, from actual cases, the results

instance, on streets in which the trolleys were laid on or toward the south side of the railway tracks, 96 per cent of the recorded breaks occurred in service pipes supplying the houses on the north side of the street and in pipes passing under tracks.

In investigating the cause of the destruction of our pipes, the query early suggested itself as to whether chemical action pure and simple could have caused the injury. To make clear the claim that the damage was done by the electric current, it seemed to the writer that some evidence should be found of redeposition of the metal supposed to have been removed from the pipes by the current. Our search for this additional evidence was soon rewarded, for early in March, 1893, we observed in the excavation made to renew a broken service pipe, that the lead taken away from the pipe was deposited in the form of glistening particles, or thin metallic coatings, on soil, sand and gravel, all through the adjacent earth, but above the pipe and in the direction leading from it up to the rails—the pipe at this point being shown by voltmeter tests



FIG. 1.



FIG. 2.

which must certainly follow, if cast-iron mains are used to convey electric currents.

The writer has been, since March, 1893, engineer and superintendent for the plant now owned and operated by the Peoria Water Works Co. Early in 1893, the water company's street foreman, Mr. W. B. Norris, reported to the writer that extra strong lead service pipes laid under the street railway tracks were bursting with a frequency that was remarkable, and that the appearance of the burst pipes was unusual, and different from that of any pipes the foreman had yet seen. Electrolysis, as occurring in water and gas pipes was, at that time, almost unknown, and very little had been published, even in engineering papers, regarding it. The writer at once suspected, however, the cause of the breaks, and the foreman was instructed to give him prompt notice of every such break, so that he could personally inspect the pipe and note the circumstance attending its rupture.

To keep better track of the injury printed tags were prepared, on which the

to be electrically positive to the rails. In one excavation, where there was a well-defined wet streak along a fault in a clayey soil, the lead compound, afterwards identified by chemical analysis as sulphide, was observed along this wet streak as far as the sides of the excavation, or more than 6 ft. from the pipe, the streak leading diagonally up from the pipe to the rails. A similar redeposition of the metal was observed in the case of wrought-iron gas service pipes, and of cast-iron gas and water mains, the joints of the latter being surrounded in nearly every case by soil stained with oxide of iron, while immediately in front of the ring of lead in the joint would be found a bluish metallic discoloration showing the redeposition of the lead. The writer sent samples of the soil thus impregnated with lead and iron compounds to Messrs. Stone & Webster, electrical engineers and experts, of Boston, and to Engineering News, and to Fire and Water. The letters accompanying the samples, which were published in Engineering News, Mar. 22, 1894, and in Fire and Water of about the same date, were, it is believed, the first published

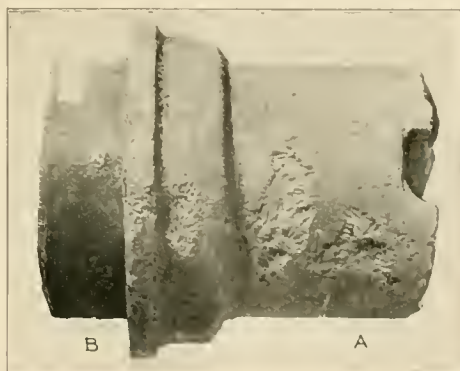


FIG. 3.

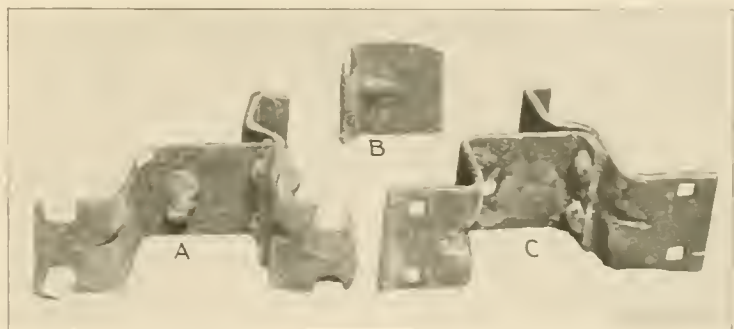


FIG. 4.

attendant circumstances were noted whenever a pipe burst; the tags were signed by the superintendent, the foreman and the men assisting in the work of repairing the pipe. A sample of the pipe was saved for reference and the tag was attached thereto. Although a number of breaks occurred before these records were begun, and in spite of the fact that some intelligent laborers in search of lead for making joints in water mains appropriated and melted down a good many of our carefully preserved samples, records are still on file of 116 electrolytic breaks.

The bursting of service pipes continued with increased frequency, nearly always occurring on those pipes which passed under the railway tracks; for

notes of such redeposition of the metals removed from underground pipes by the return street railway currents.

On Mar. 30, 1894, the water company's steel stand-pipe on the West Bluff burst, killing one person and injuring 15 others, one of whom died later from his injuries. Upon examining the wreck of the stand-pipe, the writer at once noticed a peculiar pitting of the inside of the vertical sheets, and the appearance of these pits was so different from that caused by any ordinary oxidation that he was soon almost positive that they were due to electrolytic action. A similar stand-pipe on the East Bluff was drained, and was found to be similarly pitted. The whole inner surface of the vertical shell appeared to be thickly

covered with blisters resembling in outward appearance the tubercles sometimes found inside of old cast iron mains. This blistered covering, which was almost as thin as paper, was composed entirely of oxide of iron, and on brushing it away with the finger tips, the black paint with which the stand-pipe had been originally coated would be found beneath it. The black paint was oftentimes almost unbroken, or, at least, very slightly cracked. When the paint was brushed off, the pit would be disclosed, considerably smaller in area than the surface covered by the blister. The surface of the metal in the pit was perfectly bright and clean and its fiber was clearly discernible. Many of these pits were more than 1/8 in. in depth. They were slightly more numerous in the West Bluff pipe than in the East Bluff stand-pipe, and were in both generally larger and deeper on the lower courses of the vertical shell.

Fig. 1 is from a photograph of the wrecked stand-pipe, the upturned corner of the torn sheet near the center of the picture showing the pitted appearance of the surface, the blisters having been, of course, shaken off by the fall of the metal and the metal itself having become somewhat oxidized before the photograph was taken. The two largest blotches are streaks of mud. Fig. 8 is from a photograph of a small sample of steel from the stand-pipe and shows the pitting in the sheets around the edges of the rivet heads.

It seemed advisable to secure a thorough expert examination with a view to determining the cause, nature and extent of the observed pittings on the stand-pipes, and injuries to the piping system. Messrs. Stone & Webster, of Boston, were selected to make this examination. The work, in which the writer, from time to time, assisted, covered seven weeks on the ground, and the reports submitted by Messrs. Stone & Webster fully confirmed the suspicions that the pitting was caused by electrolysis and established the fact that the entire piping system of the water company would be endangered by a continuance of the existing electrical conditions. The West Bluff stand-pipe was distant about 60 ft. from the street railway line on Bourland St. The East Bluff stand-pipe was about 700 ft. distant from the railway line on Knoxville Ave. Both stand-pipes were more than a mile from the power station, and were negative to the rails. The electrical examination relative to the stand-pipes was conducted mainly at the East Bluff stand pipe, which was still in service. A flow of a part of the current from the railway line was clearly traced through the earth to the anchor bolts which held the stand-pipe to its foundation, as shown in Fig. 5, up these bolts and into the steel of the shell, and through the shell and from its inner surface to the projecting section of the 16-in. flanged cast-iron pipe which served as both inlet and outlet, and which connected the stand-pipe to the water mains. The current was then traced along this pipe and along the mains to the power station. The deflections of the voltmeter needle were clearly traced to the railway current, being especially influenced by the one or two cars on the line beyond the stand-pipe on Knoxville Ave., and when the cars stopped running at night, the movement of the needle ceased. Where the current left the inner surface of the shell to pass through the water to the inlet pipe it made the pits already described.

Fig. 2 is from a photograph showing the interior surfaces of three sections of this inlet pipe, marked A, B and C, respectively, the positions occupied by these sections originally being shown by the letters A, B and C in Fig. 5. An examination of the photograph shows the strongly marked and numerous pits which were found inside the sections A and B, while the inner surface of the section C was found to be practically as smooth and perfect as though new. When the condition of the inside of these three sections of pipe was first noted, it seemed hard to understand why A and B should be pitted, while C was unaffected. A closer examination, however, showed that in the flanged joints between the bottom sheet of the stand-pipe and A and B, respectively, corrugated copper gaskets were used, while the pipe B was separated from the pipe C by a thick rubber gasket; and that under the nuts and heads of the bolts holding the flanges together, there were grummets or wrappings of cotton wick soaked in tallow. The result of this arrangement was, that the current which entered A, after passing through the water from the inner side of the shell of the stand-pipe, and which was trying to return along the inlet pipe and water mains to the power station, encountered, at the joint between B and C, the rubber gasket and the grummets. The effect of the gasket and grummets was to practically insulate the section C from the sections A and B, and as none of these pipes were in contact with the ground, the current was compelled to leave the pipes A and B and travel through the water or along the slimy coating of oxide on the inside of the pipes around the joint between B and C, in order to continue on its journey. As the current was not leaving C, this pipe was not injured, but the current, in leaving the inner surfaces of A and B did pit them as shown in the photograph.

These stand-pipes and the inlet pipes were negative to the rails, and are striking examples of electrolytic pitting under such conditions.

Early in 1898, Prof. D. C. Jackson, of the University of Wisconsin, and Messrs. Stone & Webster were requested to supplement the investigations already made by the latter, by another examination of the system, with a view to ascertaining whether the electrical conditions reported in 1894 still existed. The result of all these examinations and of those made, from time to time, by the writer, showed that the differences of potential between mains and rails had increased rather than diminished, while the number of breaks in the service pipes, and the number and extent of pittings in the mains, were very much greater than had before been observed.

With a view to further proving that the injury done to the cast-iron

mains and service pipes was caused by the electric current, samples of the graphitic substance dug out from the pits in the mains, and of the scale or incrustation adhering to the mains over the pits, and of the soils at various

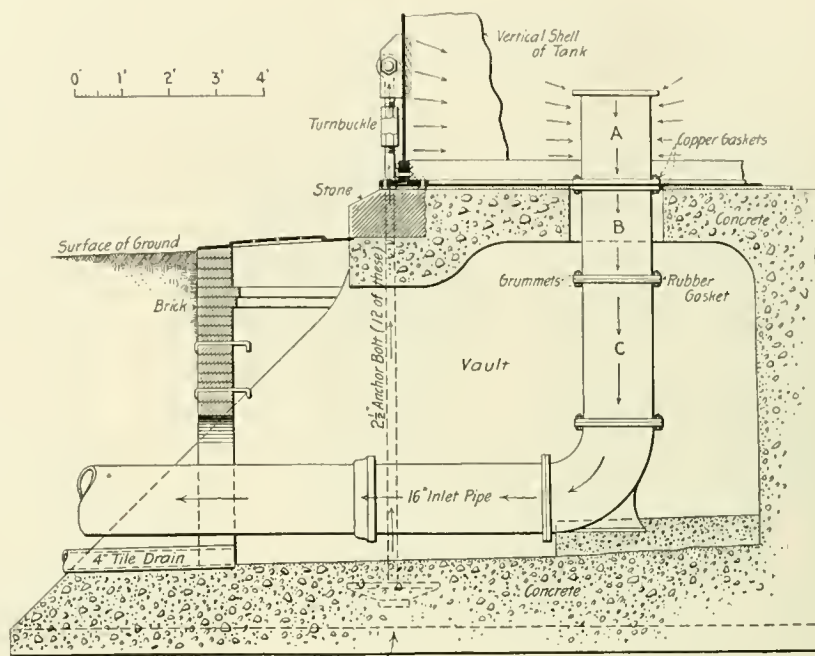


FIG. 5.

distances from the mains, and similar samples taken from the neighborhood of the lead service pipes, were sent to the University of Illinois, where they were analyzed by Prof. Arthur D. Palmer. Samples of ordinary soils, unimpregnated by the metallic compounds from the pipes, were also analyzed. These analyses showed that there was nothing in the soil which, except for the action induced by the electric current, could injure the pipes, while all of the conditions, as found by chemical analysis of all the samples submitted to Professor Palmer, were exactly such as would be caused by the presence of the currents complained of.

In 1899, a series of tests were made by Mr. A. A. Knudson, electrical engineer, of New York, in conjunction with the writer, at the site of the fallen West Bluff stand pipe, in order to still further prove that when that stand-pipe was in service, there was an actual flow of current in the manner already shown by the previous tests at the East Bluff stand-pipe, by Messrs. Stone & Webster. The anchor bolts were still in the foundations, but the shell of the stand pipe, as well as the 16-in. inlet pipe leading thereto, had been removed. It was necessary, therefore, in order to reproduce, to some extent, the actual electrical conditions that had previously existed, to connect a wire from the ends of the anchor bolts to the 16-in. water main in front of the stand-pipe.

By connecting in a voltmeter on this wire the variations of potential between

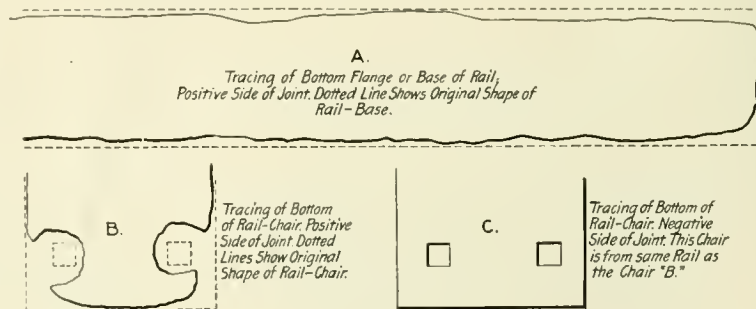


FIG. 6.

anchor bolts and the water main were observed, and by replacing the voltmeter by an ammeter, the actual flow of current was measured. This current was clearly and positively identified as caused by the street railways, and the result of these tests fully confirmed the statement in the reports of Messrs. Stone & Webster, that the pits in the shell of the stand pipes had been caused by the street railway current.

The joints of cast-iron water mains often offer, as already stated, considerable resistance to the passage of the electric current, and the reason for this resistance is apparent, when the construction of these joints is studied. Cast-iron water pipes are coated inside and outside with a preparation of coal tar that is an insulating material. In making a lead joint, the spigot end of one pipe is inserted in the bell end of another pipe and pressed home until it touches the shoulder in the bell. The spigot pipe is centered carefully, so that the annular space designed to hold the yarn and lead may be of equal width all around. The yarn is then rammed in home against the shoulder and holds

the spigot in the center of the bell. There can thus be no actual contact between the two pipes, except where the very end of the spigot abuts against the shoulder of the bell. As both spigot end and shoulder are simply rough castings and are not turned, it follows that they are rarely in mechanical contact at more than two points, and on curves they can only touch at one point. In fact, it is frequently true that after the spigot pipe is once shoved home against the shoulder of the bell, and then released, it works away in the subsequent handling any yarning and oftentimes is not in contact with the bell at all. Even if the two pipes were in actual mechanical contact, the electrical contact would be poor, by reason of the two intervening coatings of tar or asphalt. In that portion of the joint occupied by the yarn, there is no contact between the two pipes, and they are at this point fairly well insulated by the yarn itself, as well as by the two coatings. The rest of the joint is filled with lead, which is a conductor of electricity, but in between the ring of lead and the bell outside of the lead and between the lead and the spigot on the

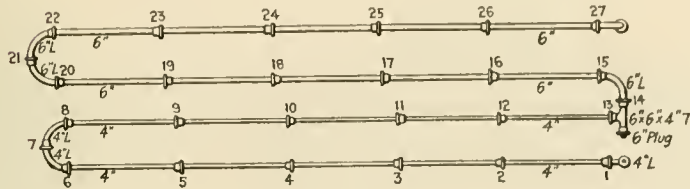


FIG. 7.

inside, are the two tar coatings which materially interfere with the electrical contact between the two pipes.

As it had been stated that the tar coating is completely consumed and burnt out by the heat of the molten lead when a joint is poured, the writer caused a joint to be poured and calked in the usual manner, and then had the bell sawed into three pieces, so that it could be taken off the spigot. It is needless to tell men who have had experience in laying and taking up water mains that the inner surface of the bell showed that the coating was entirely unimpaired by the heat.

Measurements were made by the writer in 1898 to determine the amount of resistance offered by the joints in cast-iron water pipes, and also to ascertain whether the pipes themselves showed any pitting as a result of this resistance.

A large number of these examinations were made during 1898 and 1899, and in every case the pipe which was of the higher potential was found pitted near the joint, while the pipe of the lower potential, or that into which the current was flowing from the other pipe, showed much less electrolytic injury.



FIG. 8.

To further test the joint resistance and to determine, if possible, the influence of different methods of calking as affecting this resistance, the writer, in conjunction with Professor Jackson, caused a line of 6 and 4-in. pipe to be laid and supported on wooden blocks, so as to insulate it from the ground, as shown in Fig. 7. There were 27 joints in all. The pipe was new and had not been previously used. The calker was instructed to drive up the lead hard in one-third of the joints and to calk these joints in every way in the best possible manner, just as though the pipe were expected to stand the heavy pressure of the Peoria Water Works Co's. system. Another third of the joints was calked not quite so hard, while the remainder were purposely only lightly driven up, the work being done as though carelessly, or by a bungler. A current of known strength was passed through the pipes, and the drop of potential around the joints was measured at points 1 ft. apart, and was compared with the drop of potential in length of 1 ft. of continuous pipe. These measurements were made at different times; first by Professor Jackson and the writer; then by the writer alone, and later by Mr. Knudson and the writer. The resistance of the joint was found, as shown by the table, to be from a few times to several thousand times that of the same length of con-

Results of Tests of Electrolysis on Experimental Line of Cast-iron Pipe Under Various Conditions.

No. of joint.	Calking.	Current in amperes.	Drop of potential around joints in volts.*		
			Pipe dry	Pipe full of water.— Clear.	Pipe full of water.— Muddy.
1	Good	10	.0056	.0091	.0087
2	"	"	.0039	.0069	.0048
3	"	"	.0046	.0066	.0059
4	"	"	.0095	.0134	.0122
5	"	"	.0042	.0070	.0058
6	Medium	"	.0080	.0140	.0124
7	Good	"	.0124	Off scale, hard, 1	Off scale, hard, 1
8	Medium	"	.0034	.0050	.0044
9	"	"	.0069	.0145	.0153
10	Poor	"	.0022	.0038	.0033
11	"	"	.0016	.0028	.0022
12	"	"	.0041	.0063	.0049
13	Medium	"	Off scale, hard, 2	Off scale, hard, 2	Off scale, hard, 2
14	Good	"	.0108	.0143	.0099
15	"	"	.0084	.0118	.0098
16	"	"	.0026	.0031	.0022
17	"	"	.0006	.0006	.0004
18	"	"	.0021	.0026	.0023
19	Medium	"	.0007	.0009	.0006
20	"	"	.0017	.0020	.0013
21	"	"	.0057	.0055	.0046
22	"	"	.0054	.0058	.0049
23	"	"	.0011	.0013	.0012
24	Poor	"	.0142	.0125	.0115
25	"	"	Off scale, hard, 5	Off scale, hard, 5	Off scale, hard, 5
26	"	"	Off scale, hard, 7	.0093	.0089
27	Medium	"	.0016	.0010	.0007

*Nine inches between points of contact. Voltmeter showed: 10.042, 70.50, 30.52, 40.270, 50.370, 60.315, 70.040.

tinuous pipe, and this joint resistance was in no way affected by the manner in which the lead was driven up in the joint, some of the joints on which the best calking was done showing the highest resistance. The usual depth of lead in a joint in a cast-iron pipe is about 2 1/2 in., but assuming the length of the joint at 4 in., the joints in this line offered 89.2 per cent of the total resistance of the whole line, or on the average the resistance of a joint was 227 times the resistance of 4 in. of plain pipe. In making this calculation due allowance has been made for the fact that the points of measurement around the joint were 1 ft. and not 4 in. apart.

These observations, taken over a period of about eleven months, also showed that the resistance of the joints increased rapidly with age.

In Kansas City, Prof. Lucien L. Blake, of the University of Kansas, has recently made a number of tests of the joint resistance in cast-iron mains. He found the joint resistance in three lengths of 6-in. pipe to be about 96 per cent of the total resistance of the pipe and joints together; the joint resistance in the 58 joints of 687 ft. of 6-in. pipe which has been 13 years in service, was found to be 96.2 per cent of the entire resistance of the line; the joint resistance of 38 joints in 399 ft. of 20-in. pipe was 88.2 per cent of the total resistance of the line, and the joint resistance in 400 ft. of 30-in. pipe was found to be 96.7 per cent of the total resistance of the entire line.

Mr. Knudson found in Albany a pipe joint which showed a resistance 1,000 times greater than the resistance of an equal length of the plain pipe.

The injury caused by resistance at the joints is not so rapid at any one spot as the injury where the current leaves the pipe for the rails in the positive area, only because all of the current carried by the pipe does not flow around the joint. But one ampere of current, leaving the pipe for the powerhouse in the positive area, pits the pipe but once at that point; while one ampere of current flowing along the pipe and around joints in either the positive or negative district, pits each length of pipe near every joint, where it leaves it to flow around the joint; so that the total injury caused by this ampere is cumulative, and may be, in the aggregate hundreds of times as great as the damage caused by the same ampere of current where it permanently leaves the pipe.

The effect of the current on the rail joints of a single trolley system is similar to that on the joints in the water mains. Within the past three years the writer has examined many hundreds of rail joints, and it was always easy to tell from the appearance of the rail ends, and of the chairs, when the rails were laid on chairs, which way the current was flowing. The end of that rail which was next to the power station would show little or no injury, while the end of the other rail, or that having the higher potential, was invariably pitted. Fig. 6 is reproduced from tracing from the bottom flange or base of such a rail end (and also from two rail chairs), the solid line showing the shape when the tracing was made, while the dotted line shows the original shape of the rail when it was new and before it had been eaten away by the current. Fig. 6 also shows the bottom portions of two rail chairs. The chair B was taken from the side of the joint away from the power station. The dotted lines show its original shape. The chair C came from the other end of the same rail, on the negative side of the joint, and shows no perceptible injury.

Fig. 4 shows two rail chairs and a fragment of a third chair secured by Mr. Knudson and the writer. The chair, A, was a sample of a large number of similar chairs on the high potential side of the joint, and its thin and wasted appearance is plainly shown. The fragment, B, was broken by hand from another similar chair. The chair at C was from the same piece of roadbed, and is a fair sample of a number of chairs observed near the low potential side of the joint. This chair, as the view shows, is almost as good as new.

The soil around the outside of a water main offering an easier path for a current than the water or slime on the inside, outside pittings are more numerous and generally deeper, and they are much more easily observed. The pits on the outside may be caused either by current which leaves one length of pipe to go around a joint into the next length of pipe, or by current permanently leaving the main for some other conductor of lower potential, such as rails, or wires leading to the dynamo; but the inside pits cannot be caused by anything except resistance in the line of pipes itself at the joints,

as nothing else could make the current leave the metal of the pipe and travel through the water.

Opportunities for observing these pits have heretofore been rare, as the action is naturally slower inside the pipe than outside, and as it is necessary for some one familiar with the effect of electrolysis to be present and actually examine the pipe at the time when it is removed in order that the pits may be identified.

The pittings in the 16-in. inlet pipe to the West Bluff stand pipe, observed in March, 1894, and inside pittings found by the writer in a 30-in. cast iron main in 1896, are believed to be the earliest examples of this injury noted, but numerous instances have since been reported.

Figure 3 shows a joint of a 12-in. cast iron main on which the current was flowing from A to B. The very serious outside pittings, nearly $\frac{1}{2}$ in. in depth, are plainly shown on the pipe A, while the pipe B, on the other side of the joint, was, near the joint, almost unjured. The surface of the lead in this joint was deeply pitted in places and so much of the metal had been removed that the marks of the calking tool all around the joint were entirely obliterated. The pipe A was also pitted in a number of places on the inside, while no pits were found on the inner surface of the pipe B near this joint.

Mr. A. A. Knudson found deep outside and inside pittings in Albany, in 1890, as shown in the view, Fig. 9.

Professor Blake, from recent examinations in Kansas City, writes as follows:

"A 12 in pipe running at right angles to an electric railway, and which was negative to the rails, was found to be carrying a current of varying strength and delivering it into a 36-in. main some 750 ft. distant.

"Electrolytic pittings were found on many sections near the joints, only on the positive side, where the current was shunted around the joints. Some of the pittings were $\frac{1}{2}$ in. deep. The interior of the pipe could not be examined.

"Again, a length of 6-in. cast-iron main was taken up in another part of the city and internal electrolytic effects were apparent near the joint. A chemical analysis of the material dug from the pits gave 22.3 per cent graphite, 49.7 per cent iron.

"A second length was removed and broken into, and a fresh fracture revealed the internal electrolysis, by the discoloration of the iron where the pitting was taking place, and which was already $\frac{1}{4}$ in. deep, beginning from the inside. A number of similar cases were discovered, and are convincing proof that cast iron mains cannot convey currents without electrolytic damage, when those mains form part of the return circuits of electric railways."

Within the past few months the writer had occasion to remove from the ground a 16-in. cast iron main. This main was negative to the rails and was nearly two miles from the power station. It lay at right angles to the tracks, and the portion removed was distant, at its nearest point, about 150 ft. from the rails, and at its further end, 570 ft. from the rails, there being 420 ft. of pipe removed. Measurements with voltmeter and ammeter showed a current flowing along this pipe from the rails towards the wet soil of the river bank, in which the further end of the pipe was buried. Every length of pipe showed electrolytic injury. In one pipe the bead in the spigot end had been eaten off for two-thirds of the circumference of the pipe, and in one place the entire thickness of the pipe was eaten out for nearly an inch in depth from the end. There were both outside and inside joint pittings, always on the positive side of the joint, and no pits at all could be found anywhere else on this pipe.

In a recent paper, Professor Blake states that observations and experiments prove that the effects of electrolysis upon water pipes are not limited to the so-called "danger areas," or districts in which the pipes are electrically positive to the rails. He goes on to say:

"Resistance at the joints in cast-iron pipe is sufficient at most joints to shunt a portion of any current allowed in these mains, around the joints through the soil outside or water inside, or through both. Then on the positive side of joints, the effects of electrolysis, both external and internal, are to be apprehended."

Professor Blake then gives in detail the tests previously referred to as made by him to determine the joint resistance, and closes by giving the forcible and convincing examples already quoted of the disastrous results of allowing cast-iron mains to convey electric currents.

It must be clear to any one who has seen the evidence of injury caused by the return currents, and who has studied the effects on the water mains at the joints, or at any other point where the current, once on the pipe, must leave it, that the owners of such pipes can do nothing to prevent the injury.

Street railway companies have frequently recommended that the pipes themselves be connected by wires to the negative bus bar of the generator, or to the rails at various points, or to overhead or underground return feeder wires thus diminishing the resistance of the pipe system as a conductor, and lowering the potential of the pipes usually in what has been termed the "danger district" or the region where the pipes are shown by voltmeter to be positive to the rails. But all such methods contemplate using the pipes to convey the electric current, and they all invite more current to the pipes at some part of the system.

It would undoubtedly be a fine thing for the railway companies to have the conductivity of the pipes on which they already rely largely for the return of their current still further increased. It would mean smaller coal bills in the power station and less outlay for construction and maintenance of their own return circuit. It would, also, apparently lessen the rapidity of injury to the pipes in the "danger district," and, by stopping temporarily the number of actual breaks at the points where they have been occurring with greatest frequency, it would stave off the day of reckoning with the pipe owners. But the general pipe system would be carrying much more current, and, as the pitting goes on, at or near the joints, wherever a main is carrying current, either in the positive or negative district, it would mean that, while the injury in the "danger district" would not be so rapid, the whole system would be much more generally attacked, and that by the time a bursting pipe at length called attention to the injury at some point remote from the power station, the entire pipe system would have been seriously injured. Equally impracticable and misleading are the suggestions for maintaining the pipe system at equal potential throughout, and for "insulating sections" or "insulating joints,"

some of which have been patented. The idea of these sections or joints, as advanced by their advocates, is to break up the metallic continuity of the pipe line and reduce its conductivity, and thus prevent its serving as a path which the return current would naturally choose. The effect of thus dividing a pipe system into a small number of sections would hardly be worth considering, as the ground itself is a good conductor, and the current would leave one section only to go to another, passing through the earth around the insulating joint just as it does around the lead joint in a cast iron main. To entirely destroy the conductivity of the pipe line, it would be practically necessary to make it up entirely of insulating sections, which, as non-metallic substances are not generally recognized as good material for underground water pipes, and for other equally obvious reasons, would be absurd.

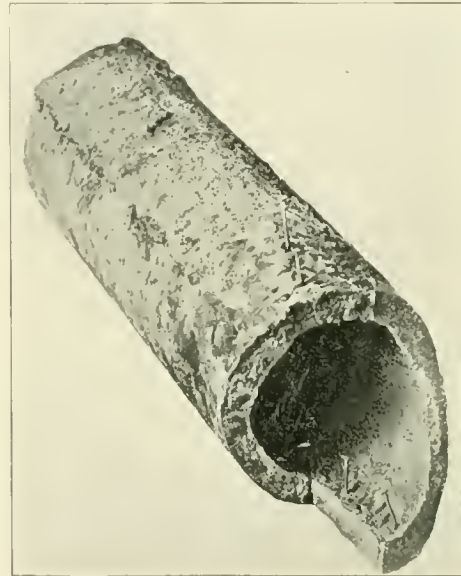


FIG. 9.

The conductivity of the tracks may be, of course, increased by the use of heavier rails, heavier bond wires and improved methods of bonding, or by the introduction of welded joints, or by making practically continuous rails; but the continuous rail itself is at best but a palliative of the electrolytic injury. The rails are not insulated from the ground, and the pipes would still carry, and be affected by a large portion of the current, as is clearly shown by numerous electrical surveys and reports of serious damage in cities where the best tracks known to modern science are in use.

In conclusion, the author recommends the double trolley system, overhead, as at Cincinnati, or conduit, as in Washington and New York, as the only perfect method of keeping currents out of the ground and preventing electrolysis.

NEW YORK FRANCHISE TAX CASE.

The New York Supreme Court has granted a writ of certiorari, returnable in October, directing the Municipal Board of Taxes and Assessments to send up the record in the case of the assessment of the Metropolitan Street Railway Co., of New York, for 1900. The company's paid-up stock in January last, was \$44,928,900. The first assessment of the company was \$4,022,800 on realty and \$45,000,000 on personality; this was on application reduced to \$4,017,800 on realty and \$10,621,789 on personality. The company claims that its indebtedness was \$38,983,234, that its stocks in other companies, amounting to \$14,542,172, were subject to taxation elsewhere, and that these items should be deducted in making the assessment.

The Railway Equipment & Finance Co., of Indianapolis, has been incorporated with \$30,000 capital, to promote, construct and finance railroads, public works and private enterprises. Directors, John C. Shoemaker, William Carter, M. E. Frazier and John E. McGettigan, of Indianapolis.

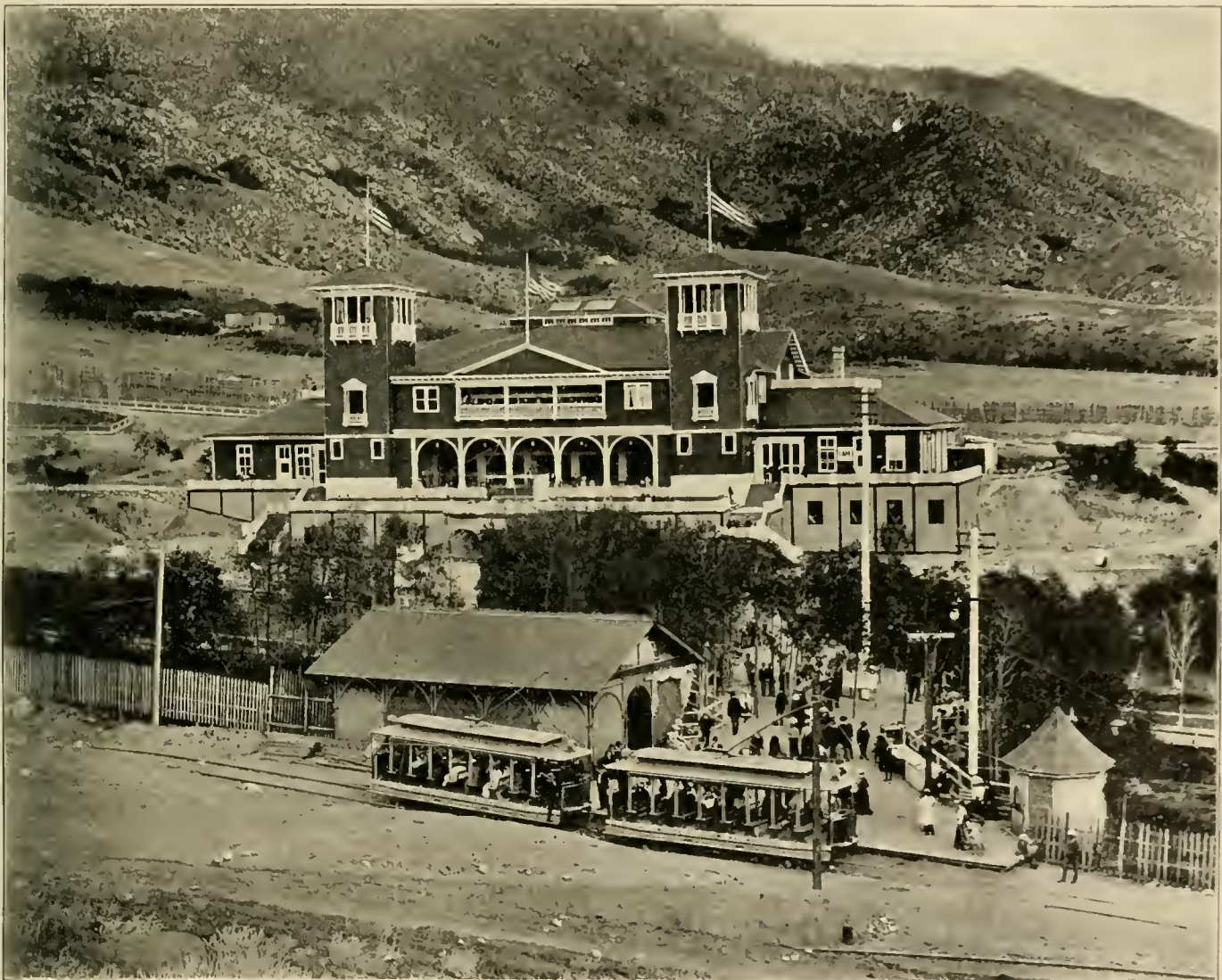
The Illinois Appellate Court holds that a city is liable for personal injuries caused by dangerous appliances used by a street railway company that has been given permission to operate an electric line in the streets. The plaintiff had sued the city of Decatur, Ill., the City Electric Railway Co. and two telephone companies for damages for injuries received by coming in contact with a broken telephone wire that fell across a trolley wire and became charged with current from the latter.

NO SIGNS ON LINE POLES.

Officials of the Union Traction Co., of Pittsburg, have serious objections to the disfigurement of the line poles by bills and other advertising matter, not only on the score of appearances but because the paper and metal signs make the poles dangerous for the linemen. A year ago the company spent \$600 in removing the matter that had been affixed to its poles. Recently the superintendent of the company saw men at work pasting bills on the poles and secured the arrest of five of them on the charge of trespass; three pleaded guilty and were fined \$1 and costs, the other two cases being dropped on a promise that the parties would not again offend.

PARK AND CASINO NEAR BUTTE, MONT.

The Butte (Mont.) Electric Railway Co. for the past few months has been developing an up-to-date pleasure resort known as Columbia Gardens, located three miles from Butte. The place was originally a beer garden owned by private parties who charged an entrance fee into the grounds, but Mr. J. R. Wharton, manager of the Butte street railway system, to whom we are indebted for the accompanying views, conceived the idea of making the place into a public park, and he immediately started to put his scheme into execution. His company purchased the property and during 1899 and the spring of 1900 expended \$48,000 in adorning the grounds, erecting new buildings, remodeling the old ones, setting



COLUMBIA GARDENS, BUTTE ELECTRIC RAILWAY CO., BUTTE, MONT.

STEAM ROADS OF THE UNITED STATES.

The report of the Interstate Commerce Commission on the statistics of Railways of the United States for the year ending June 30, 1899, states that on that date there were in the United States 189,294.66 miles of single track, 11,540.54 miles of second track, 1,047.37 miles of third track, 790.27 miles of fourth track, 49,685.64 miles of yard track and sidings, making a total of 252,364.48 miles. There were 36,703 locomotives and 1,375,916 cars of all classes. The number of employes was 928,924, an average of 495 employes per 100 miles of line. The amount of capital stock and funded debt outstanding June 30, 1899, was \$11,033,954.898 or \$60,556 per mile of line. The number of passengers carried during the year was 523,176,508.

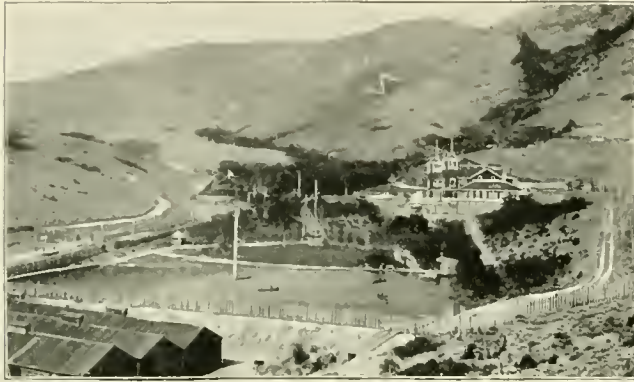
out trees, constructing hot-houses and making flower gardens. The grounds comprise about 40 acres. Five miles of water pipe, a complete fire system, and sewers have been laid out, an electric light plant installed and numerous arc lamps placed in the park and on the buildings, the brilliant illuminations at night being one of the special features of the resort.

The main building or casino, which is shown in one of the illustrations, contains the restaurant, ice cream parlors, dance hall, which is very popular, and other attractions. In addition to the casino there is a moving picture building, a King Solomon's maze, a show building, shooting gallery, Japanese pagodas, merry-go-round and games and swings for the children.

Last year a lake was constructed at considerable expense, and as there is no body of water near Butte, this feature became at

once very popular. This year the lake has been doubled in size. A number of row boats are for hire, the proceeds from this source forming a considerable revenue.

In addition to the amusement attractions it is the intention to have at the park a fine botanical garden and zoological collection which will be free to the public. Over 80,000 plants have been taken from hot-houses and placed in various beds, and many rare trees line the paths and walks. The zoo contains a bear, lynx, porcupine, alligators, coyotes, rabbits and an aviary with doves, peacocks, eagles, swans, ducks, etc. Both these collections will be enlarged from time to time.



GENERAL VIEW OF COLUMBIA GARDENS.

Mr. J. R. Wharton, under whose management the work of beautifying Columbia Gardens has been carried on, went to Butte in 1882 from Greensboro, N. C. Until 1888 he filled the position of teller at Clark's bank, and then was made superintendent of the Silver Bow Water Co. In 1890, when the water plant was sold out, he became manager of the Butte Electric Light Co. When the two electric light companies were consolidated and sold to their present owners in October, 1891, Mr. Wharton became manager of the street railway company, in which position he is meeting with continued success.

THE DEPARTMENT OF BLANKS AND FORMS.

Secretary Brockway of the Accountants' Association, under date of July 16th, sent out the following letter relative to the association's collection of printed forms:

To the Members—The value of the department of blanks and forms can be greatly enhanced from year to year by the addition of the new forms issued by each company, and the refiling of those blanks re-issued. Therefore, it is hoped and anticipated that every member will co-operate with the secretary in the effort to make the department a continual advantage of membership in the association and keep it sensitive to the changes of their blanks and forms.

As the rubber stamp comes naturally within the meaning and intention of this collection of forms, a separate book is to be devoted to rubber stamp impressions, and there is no doubt that it will not be the least interesting of the whole. It is preferred that the impression be made upon white paper 4 x 6 in.; each impression should be on a separate slip of paper. Print on one side only.

Electric lighting in many instances is managed in the offices of street railway companies. Electric lighting blanks are, therefore, of interest to those companies, and if your company has this adjunct, please include the blanks in your package.

Experience has shown the need of the following suggestions, and they are given with the hope that they will be heeded in forwarding your package:

1. Do not fold the blanks, rolling is preferred.
2. Write in ink the name of your company upon all blanks where it does not appear.
3. The term "blanks and forms" covers everything printed in use by your company, books, circulars, rubber stamps, tickets, transfers, statements and reports.
4. Please send at least two copies of all forms, except of rubber stamp impressions.

5. Address your package to W. B. Brockway, Secretary, Post-office Box 630, New Orleans, La., and advise by letter of its forwarding.

It is appreciated that you will be put to some trouble to comply with this request, but it is believed that you will do it willingly, for you understand the importance of the collection.

The companies that complied with the request made by Circular No. 6, Nov. 15, 1898, will consider this request to apply to their issue and re-issue since that date. But the companies which have joined since then will please include their entire issue at the present time.

Yours truly,
W. B. BROCKWAY,
Secretary.

C. N. DUFFY,
President.

WHAT ELECTRIC INTERURBANS DO FOR A TOWN.

A citizen of Grand Rapids, Mich., who had been visiting in Detroit long enough to observe the working of the interurban electric lines entering that city writes as follows to one of his local papers:

"If the Grand Rapids aldermen could be here in Detroit a few days and see the crowds that the interurban car lines drop right in the center of the city, it might open their eyes a little. One line—the Ann Arbor—brings in an average of nearly 2,000 people a day, and there are seven lines.

"For three years interurban companies have been begging for franchises into Grand Rapids, and our brilliant board of aldermen, judging the world to be flat because it was flat as far as they could see, have refused them any kind of a franchise that they could take east and borrow money on. In the meantime other cities have gotten their interurban lines running and are getting the good of them, while Grand Rapids hasn't even scored yet. Worse yet, hasn't even entered for the race. Doesn't even know there is going to be a race. And that, too, for heavy stakes. We need funerals and fool-killers in Grand Rapids. Pompous 'have-beens' walk around the streets and solemnly announce that interurban lines will never pay. The belt line will never pay. A deep waterway to Lake Michigan will never pay, and such other cheerful croakings to help the town along. A frog pond on Campau Sq. would boom Grand Rapids more than this gang.

"Grand Rapids is unfortunate in depending so largely on the manufacture of furniture. Too many of our eggs are in one basket. We should make it up by everlasting push and hustle. We should have had completed and running for two years past electric lines to Holland, Grand Haven, Muskegon and Belding. Four lines besides the belt line, and every one of them should be allowed to run without right to Campau Sq. It might disturb the frog pond, but it would show in the census report of Grand Rapids for 1910. And as goes the census, so goes the real estate market, so go the bank clearings, so goes general business, so goes prosperity."

CONSOLIDATED TRACTION, PITTSBURG.

The Consolidated Traction Co., of Pittsburg, makes the following operating report:

COMPARATIVE STATEMENT.	For the Month Ended June 30th.		For the Three Months of Fiscal Year.	
	1900.	1899.	1900.	1899.
Gross Earnings from Operations	\$747,989 69	\$217,656 86	\$731,048 14	\$637,947 66
Operating Expenses	114,470 73	123,613 83	352,500 53	359,463 19
Net Earnings from Operations	\$133,518 96	\$ 94,043 03	\$378,547 61	\$278,484 47
Other Income:				
Earned Dividends on Stocks of other Companies Owned	26,834 97	16,834 95	80,504 87	80,504 85
Sales, Advertising Space, Discounts, etc.	895 72	590 71	3,763 78	1,785 09
Rentals of Buildings and Real Estate	512 45		1,093 35	472 07
Other Miscellaneous Income	328 50		738 50	
Total Net Earnings and other Income	\$162,090 60	\$121,469 69	\$485,138 11	\$379,247 48
Deductions from Income:				
Taxes	15,147 16	14,112 44	46,147 16	43,737 34
Rentals of Leased Lines	45,025 00	45,025 00	137,275 00	137,275 00
Tenement Expenses	167 55		709 73	
Total Deductions	\$ 60,339 71	\$ 60,337 44	\$184,131 89	\$181,012 34
Total Income	\$101,750 89	\$ 61,132 25	\$300,996 22	\$198,235 14
Interest on Funded Debt	26,475 53	26,580 00	79,671 07	79,740 00
Dividends on Preferred Stock	66,000 00	48,322 75	180,000 00	144,898 25
Fixed Charges	\$ 92,475 53	\$ 74,902 75	\$259,671 07	\$224,638 25
Net Income—Surplus	\$ 9,275 36	\$ 14,375 06	\$ 30,835 15	\$ 30,835 15
Deficit		\$ 13,740 50		\$ 35,383 11

Electrical Measuring Instruments.

By J. FRANKLIN STEVENS.

Mr. Stevens is president of the Keystone Electrical Instrument Co., of Philadelphia, and this paper was read at a stated meeting of the Franklin Institute.

PART I.—The author touches briefly on the history of the subject and the success with which instrument makers have met the demands for new types of instruments. Next the instruments needed in making ordinary electrical measurements are enumerated, and the requirements of a practical and satisfactory instrument for measuring voltage, current or power defined. The different types of instruments in common use are then classified and their respective advantages, disadvantages and limitations for various classes of work discussed. The six types of instruments considered are: Hot-wire, Electro-static, Tangent galvanometer, Dynamometer, D'Arsonval galvanometer, Electro-magnetic.

PART II.—After completing the discussion of the characteristics and limitations of the different types, the questions of specifications and installation are taken up. The importance of selecting a manufacturer who has learned the "trick" of making an instrument properly, is dwelt upon and suggestions are made as to the way of avoiding the troubles that arise between the maker and the purchaser and his engineer because the instruments are carelessly or ignorantly handled by the switchboard contractor. The permissible errors in instruments, the definitions of the ohm, ampere and volt, and remarks on testing and calibrating follow next, and the conclusion deals with special forms of indicating instruments.

PART II.

Further than this, the D'Arsonval instrument, which gives deflections directly proportionate to the current flow, lends itself readily to a large variety of measurements, such as determining resistances and measuring the drop of potential from which resistances and grounds may be readily computed. It is, however, a type of instrument which should be handled with great care, as rough handling or the presence of powerful external fields will permanently destroy the accuracy of its indications. Further, since it depends primarily for its continued accuracy on the maintenance of a field of uniform strength, as supplied by its permanent magnet field, instruments of this type should be frequently checked to ascertain whether the permanent magnets have maintained their initial strength.

A great deal might be said on the subject of the last type under consideration, namely, the electro-magnetic system, for there are probably more variations in practical construction contained in this type than in all the other types put together; some are good, many very bad. It is, however, unfair to adopt the policy of certain engineers, who unqualifiedly condemn every electro-magnetic instrument, solely and entirely on the grounds that they contain a moving mass of iron, which, in their opinion, must render the instrument subject to errors of lag and hysteresis. My practical experience with this type of instrument, covering a great many years, has taught me that it is perfectly possible to so construct an electro-magnetic instrument containing a mass of moving iron that errors of lag and hysteresis, if they are present, are so small as to be negligible. In order to achieve this result it is necessary, first, to proportion every part of the instrument with reference to all other parts; to carefully shield the instrument from the influence of external fields, and this by means of a shield that will not introduce errors due to its own retentivity. The iron employed should be very small and very light, and should be selected, after careful test, for purity and absence of retentivity. It should then be formed up with care, and so treated that oxidation is practically impossible. The field due to the actuating solenoid should likewise be carefully studied, and should be designed so that the moving iron will at no time be completely saturated, and yet of sufficient strength, in conjunction with the shield employed, as not to permit the indications of the instrument to be seriously influenced by external fields. In no case should two masses of iron be employed, as is common in some types of instruments, which depend on the repulsion of a moving vane by a fixed vane of similar polarity, both being energized by the actuating solenoid. It is almost impossible to free double vane instruments from errors of lag or hysteresis, and there is a further tendency for the pointer to stand off zero, due to the residual magnetism mutually induced in the two vanes.

The fact that the instruments constructed on the electro-magnetic principle contain no material subject to change or deterioration, coupled with the fact that they can be built solidly and substantially, and controlled by gravity in place of a spring or springs, renders them exceedingly reliable in practice. If their calibration is correct when first installed, there is no reason why the calibration should change with time.

In the above brief description of the most common types of indicating instruments, it may be noted that there is no one type which is universal, that is adapted for both switchboard and portable use for either direct or alternating current measurements. While we can very readily dispense with the hot-wire and electro-static instruments, the other four types are essential for some class of measurement, and for any particular line of measurement the most suitable system should be selected. It is possible that some day a uni-

versal system may be found, but, until that time, the user must select from existing types the one which in principle seems most applicable, not only to the character of electrical energy to be measured, but, also to the conditions under which measurement must be made.

There is no one line connected with the electrical industry in which so much attention must be paid to details as in the manufacture of electrical indicating instruments. A very prominent engineer remarked to me recently that he had examined the construction and operation of a great many different types of indicating instruments, and, while a number of them bore evidence of similarity in design and construction, yet, in some cases, the manufacturer seemed to have acquired the "trick" of proportioning, manufacturing and calibrating, while others utterly lacked the "trick." As a matter of fact, it is not altogether a case of acquiring the proper "trick," but is a case of studying the theory and design of instruments for a number of years, backed by a large and varied experimental experience, which marks today the difference between the successful and unsuccessful instruments in the various types commercially exploited. Account must be taken of the most petty details of construction, the most careful and skilled labor must be employed in each department, and every particle of material entering into the instrument must be carefully selected and tested with reference to its particular function.

Personally, I have seen the experiment tried of taking a finished and efficient instrument and placing it in the hands of a careful and skilled mechanic for duplication; every wire and every part would be, apparently, an absolute copy of the original, and yet the results obtained would be totally different. It follows, therefore, that it is always wise in placing orders for electrical instruments to select a house who have publicly demonstrated the fact that they have learned the necessary "trick" or "tricks" of their profession.

In no line does reputation count for more than in the manufacture of indicating instruments, nor is there any line in which I have been brought in contact where it takes so long a time to establish a reputation. Further than this, there is no line in which a greater amount of patience is required by the manufacturer. The average purchaser is totally ignorant of the laws or principles embodied in the instrument he is using, and, without regard to the fact that he may have selected the wrong type for the particular class of measurement he wishes to make, unhesitatingly blames the manufacturer for not having known what he wanted and for not having supplied him with the proper type of instrument by pure intuition.

Another obstacle which is commonly met by instrument manufacturers is the fact that for the average installation he is required to furnish instruments delivered to the switchboard contractor, who may or may not handle the instrument properly. It is true that most instruments are sealed, yet it is perfectly possible to utterly ruin the calibration of almost any type of instrument by improper handling without destroying the seal or opening the case. For instance, if a D'Arsonval instrument is laid upon the frame of an actively excited dynamo or motor, its entire calibration will be almost instantly changed, and yet no external evidence is presented to show exactly what has happened. Rough handling and an occasional fall, or improper packing for delivery to the plant, may further operate to destroy the accuracy of the calibrated instrument; yet the manufacturer is expected to provide instruments which will stand such usage and which, after they have been installed, may be subject to the influence of such strong external fields or such high external temperature as to make their correct indications impossible; and, after all of this, must have his instruments accepted or

rejected by the consulting or supervising engineer, who, on the day of the test, carefully checks them with his personal portable instruments, which are usually kept in almost ideal condition and seldom or never leave his immediate possession. Some day I trust these conditions may be modified to the extent that the engineer in charge will test and check the instruments, if he doubts the accuracy of the maker's calibration, before the instruments are shipped; or else issue instructions that the switchboard shall be drilled from template and the instruments set in place by the engineer's own assistants. In several cases I have succeeded in having the latter course adopted, with the result of mutual satisfaction on part of the owner, engineer and ourselves.

If arrangements could be made to have all instruments installed under the supervision of the engineer in charge, it would then be quite sufficient to have the specifications state the limit of error allowed in the indications of the voltmeters and ammeters; and this information, coupled with a specification covering the style of case, character of scale, range and class of measurement to be made, would enable the manufacturer to make an intelligent tender for the instruments required in any installation.

While a high degree of accuracy is desirable in all indicating instruments, it is particularly important that the voltmeter should be right within at least 1 per cent, since a variation of 1 per cent in voltage means a corresponding variation in the candle-power of every incandescent lamp which may be in circuit. It is quite well known that the candle-power of any incandescent lamp varies directly with the voltage, the variation being approximately 1 candle-power for every volt increase or decrease from the normal voltage of the system.

Further than this, a variation of 1 per cent from normal voltage on a system carrying incandescent lamps means a variation of about 16 per cent in the life factor of the lamp and about 3 per cent in the watt consumption per candle-power. Errors in the indications of ammeters do not produce such serious results, yet it is desirable that they should be accurate in order to obviate the danger of overload on circuit, translating device, or generator; and in the case of test instruments, as high a degree of accuracy should be demanded as is required in the voltmeter.

While on the subject of accuracy of indications, I would like to impress upon you the fact that, while we have three electrical units in common use, namely, the volt, ohm and ampere, the ohm and ampere are the only two fundamental units, the volt being a derived unit. The absolute ohm may be quite readily obtained, and, as you probably know, is defined by law as the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross-sectional area, and of the length of 106.3 centimeters. The ampere is likewise defined by law as the practical equivalent of the unvarying current, which, when passed through a solution of nitrate of silver in water in accordance with standard specifications, deposits silver at the rate of .00118 gram per second. The volt is defined as the electro-motive force necessary to send 1 ampere through 1 ohm. This, as you will note, gives us fundamental values for the ohm and ampere and defines the volt as a derived unit, and I am laying stress on the matter for the reason that the average electrical writer defines the volt as a fundamental unit equivalent to 1000-1434 of the potential at the terminals of a standard Clark cell, and then defines the ampere as that current which 1 volt will cause to flow through a resistance of 1 ohm. As a matter of fact, the Clark cell is a secondary standard, exceedingly useful in practice, but not designed for use as a fundamental standard, due to the fact that Clark cells will vary among themselves and will give a gradually decreasing voltage at their terminals after they have been in service any length of time. It is, further, impossible to take 1 ampere from a single Clark cell without permanently ruining it; and, as a matter of fact, the potential of a Clark cell is only correct when the cell is used on open circuit.

It has been rather difficult for me to understand why the absolute ampere has been so little used or so seldom referred to, when it is a unit more readily verified than is possible with the volt. It is true that the fundamental method of determining the ampere is rather slow and tedious, but it is extremely easy to obtain the absolute ampere in c. g. s. units, by the use of the tangent galvanometer. Defined in c. g. s. units, the ampere is such a current that, passed through a conducting wire bent into a circle of the radius of 1 centimeter, will attract a unit magnetic pole held at its center

with a force of one dyne; and this method applied to the tangent galvanometer gives the very simple formula of current equals galvanometer constant into the tangent of the angle of deflection of the polarized needle, the galvanometer constant being readily determined from its dimensions and the number of turns of wire, in connection with a determination of the value of the horizontal component of the earth's magnetism. Having once determined the absolute c. g. s. value of the ampere, we know that the practical ampere is 1-10 the value of the c. g. s. unit. Having obtained the absolute standards of current, expressed in amperes, and resistance, expressed in ohms, the standard volt is readily determined from the relations given in Ohm's law. With the primary units once determined, all others, such as the farad or coulomb, can be readily obtained.

To obtain absolutely correct standards of voltage and current for alternating current calibration, it is only necessary to calibrate a dynamometer voltmeter and a dynamometer ammeter in true volts and amperes, as determined by fundamental standards; then, as a dynamometer measures directly the square root of the mean square, it will indicate correctly the virtual voltage or current in an alternating circuit. In calculating resistance in alternating current instruments, it is necessary to modify Ohm's law to the extent of substituting impedance for resistance. Since impedance is the vector sum of the ohmic and inductive resistances, it is readily obtained by triangulation when the two resistances are known, or when one is known and the angle of lag can be ascertained.

While the design, workmanship and material entering into the construction of an instrument are of vital and fundamental importance, the actual calibration is equally important. Assuming the manufacturer has reliable standards of voltage, current and resistance, trained observers are necessary who should be instructed not only to properly mark the scale, but to check it; and should also be instructed to carefully test the instrument for errors due to reversal, to lag or hysteresis, and for errors introduced by the presence of external fields, or by the variations of internal or external temperature. Certain definite limits must be set for errors allowed, and no instrument permitted to go out until it has fully come up to the standard so set. In the company with which I am associated, we not only make all of these tests and check readings, but, likewise, provide an additional check on the calibration by plotting the calibration curve at the time the scale is made by the draughtsman, and if errors or irregularities are observed in the curve showing a departure from the standard curve applicable to the type of instrument under construction, the instrument is promptly returned to the calibrating room to have its readings checked, or to hunt for and remove the defect which caused the irregularity. It is a known fact that for every type of system there is a characteristic scale, following a more or less complex law, and any variation of the calibration from the normal indicates immediately that there is something wrong, either in the construction of the instrument or of some of the elements entering into it; or else it was inaccurately calibrated. I, personally, attribute a great deal of our commercial success to this intermediate checking in the drawing-room, and you can put it down as a settled fact that any manufacturer who produces instruments of any particular type the scales of which for corresponding ranges vary greatly from one another has not yet mastered the proper design or construction of his instrument.

It would be impossible to detail the many different kinds of measurements which can be made with the proper type of voltmeter, ammeter and wattmeter. In general, however, the possession of these three instruments enables one to measure not only voltage, current and power, but, likewise, capacity, inductance and resistance; and from these various measurements may be obtained data covering the performances of almost any type of generating or translating device.

There are many special forms of indicating instruments designed to indicate directly some of the various measurements most frequently employed, two of which, at least, are so universally used at the present time that they deserve, at least, passing mention. One is a voltmeter designed for use on constant current arc light circuits, capable of indicating directly the total electro-motive force of the dynamo, and so connected by means of self-contained switches that not only can the total voltage of the dynamo or circuit be read, but, likewise, the presence of a ground indicated and its actual value in volts directly determined. This involves an arrangement of connections so that the voltmeter can be connected

directly across the terminals of the circuit and then connected successively from the plus and minus side of line to ground. From the three readings thus obtained the number of lamps burning can be directly ascertained, the presence of the ground shown and the ground itself can be absolutely located by a very simple calculation. By employing, in addition to this, the known resistance of the instrument, the actual resistance of the ground in ohms may be obtained, thus defining its character.

An instrument of this character was brought out by my company some few years ago, and has met with almost universal favor, due largely to the growing tendency to measure resistances under full working potential. Such an instrument will show grounds which would not be shown by the ordinary galvanometer and bridge method of testing, and further enables the switchboard attendant to locate grounds while the line is in operative condition.

Another instrument which, for a time, fell into disuse, but which today is being used more extensively than ever, is the differential voltmeter, designed primarily to show the difference in potential between the bus bars and any dynamo which has to be connected to the bus bars in parallel with dynamos already operating. It is rather a curious fact that the average dynamo tender places implicit confidence in the indications of his differential voltmeter. The mere fact that he can see the pointer come back to zero when the free dynamo is being brought up to voltage, and the knowledge that when the pointer does stand at zero he can throw the free dynamo into circuit without danger of trouble, impresses him with the idea that the instrument is essentially reliable and accurate, and he is ready to condemn any or all of his regular switchboard voltmeters which fail to agree with it in indication. This tendency has led my company to devote special attention to the calibration of differential voltmeters and to furnish them with a full scale which indicates the exact voltage of the bus bars, in place of furnishing instruments which give full scale deflections for 10 per cent or 20 per cent of the normal voltage.

In closing, I would say that I know of no subject connected with electrical engineering which promises such rich rewards for investigation as the subject of electrical measuring instruments, and if my hasty and very general review of the subject will influence any one to pursue the subject thoroughly and scientifically, I shall feel more than repaid. I have confined practically my entire time and attention to this line for a number of years and find the subject grows more interesting the further I investigate it, and I hope the time is not far distant when the literature on this subject will be as complete and as comprehensive as that now available in allied branches of electrical engineering.

THE FUNNY SIDE OF THE TRAMWAY EXHIBIT.

(From Our Own Special Correspondent.)

At the recent International Tramways and Light Railways Exhibition at London some of the exhibitors enjoyed a quiet laugh at the expense of the town councilmen who visited the hall and were betrayed into mistakes because they did not fully appreciate the technical points of the appliances shown.

Mr. Harold P. Brown, of New York, gave away as a souvenir a little leather purse and enclosed therein was what looked like a \$1,000 bank bond, but on examination turned out to be an advertisement for plastic bonds. The chairman of the _____ city council visited Mr. Brown's exhibit and was much interested in the explanation of the bonding process. He had an armful of catalogs and pamphlets that he had previously collected and Mr. Brown, noticing this, remarked that he would give him a little remembrance that he would be likely to retain when the mass of printed matter had been mislaid, and thereupon presented him with a purse which was accepted with many thanks; but when it was opened and the folded bond inside came in view great was the chairman's indignation. "You have fallen very low in my estimation, sir," he exclaimed. "You can not influence my vote by giving me a purse of money, sir; such proceedings may prevail in your land, sir, but not here, sir; I will have nothing more to do with you, sir." And with that he started away. Mr. Brown, however, after considerable talk convinced him that the gift was not a bribe and that the enclosed bond was not negotiable and the chairman departed with the purse and his bond, with the laugh against him.

A very distinguished looking gentleman gazed very wisely at the Ohio Brass Co.'s exhibit of overhead material. The company's representative, Mr. Harwood, approached and inquired if he was interested in the exhibit. "Oh, yes," the gentleman replied. "You see I'm a member of the _____ city council and I'm interested in everything, don't you know?" "Can I give you any information about our goods?" Harwood asked. "Oh, no, thank you, I quite fully comprehend most of them I think, but if it would not be troubling you too much, could you kindly tell me what they are for?" was the reply.

The Doulton Co., Ltd., of London, showed a line of clay conduit material for underground wires, and in the center of the exhibit was displayed a section as it would appear under the street with the manhole built up to it. A deputation halted in front and examined this section most carefully. Finally one of them ventured to remark that he thought "if the bottom of the manhole were raised up even with the little conduit chambers that the sewage would flow easier and not collect in the bottom of the pit."

The question of how to keep a seat dry in rainy weather and still have it out in the open on the top of a tram car seems to have stirred up the inventive genius of Great Britain. Fully 50 seats were shown, and they were certainly most wonderful to behold. Each seat was accompanied by its inventor in a more or less state of enthusiastic frenzy who spent his time raining on his invention with a large-sized sprinkling can and insisting that no dampness occurred. Some of the seats were arranged to fly upside down when not in use and others had covers that closed by their own weight, giving them the appearance of small roll-top desks. Full instructions were printed on each seat telling the passenger how to sit down.

One exhibit showed a device with a seat portion very much like a row of knife blades on edge, the object being to do away with exposed surfaces, while another perspiring inventor claimed that the proper seat to use in wet weather is one made of woven wire stretched over an ordinary seat. Your representative tried this for a moment and the underneath part of his clothing was crimped most beautifully for several hours by the wire imprint. Most of the seats shown would have to be operated by an expert, and if the many conditions were not exactly fulfilled they "wouldn't go."

ELECTRIC TOWING IN OHIO.

Mr. T. N. Fordyce, of Detroit, writes us that he has closed contracts with the State Board of Public Works of Ohio, giving him permission to build an electric railway along the tow-path of the Miami & Erie Canal, on which will be operated heavy motor cars for the purpose of towing canal boats. He adds that recent experiments in which he has been interested have demonstrated that an electric locomotive running on the canal bank will tow 500 tons of freight at the same cost that 50 to 60 tons can be pulled by mule power.

OBSERVATION CAR AT DETROIT.

A special parlor car making regular trips around the city at stated intervals will hereafter form part of the regular service furnished by the Detroit Citizens' Street Railway Co., the idea being to provide a pleasant way for strangers to see the principal points of interest in the town. On each trip the car passes through the wholesale and retail districts as well as the finest residence portions of the city, affording a magnificent view of the Detroit River, Belle Isle Park and Water Works Park, the round trip taking about two hours, for which 25 cents is charged. A competent attendant is always in charge to explain the different features along the route. The car leaves the heart of the city at 9 a. m., 11 a. m., 1 p. m., 3 p. m. and 5 p. m.

Pocatello, Idaho, has an electric line. There are 2 1/4 miles of track and the equipment comprises three old horse cars that have been fitted with motors.

Dispatches state that the long legal contest waged by the city of Madison, Wis., to compel the street railway company to tear up a portion of its tracks, is to be settled by the city's lending the company \$10,000 to lay new pavement, which is an admirable method of settling disputes of this kind.

AUXILIARY WATER-DRIVEN PLANT OF THE ISLE OF MAN TRAMWAYS.

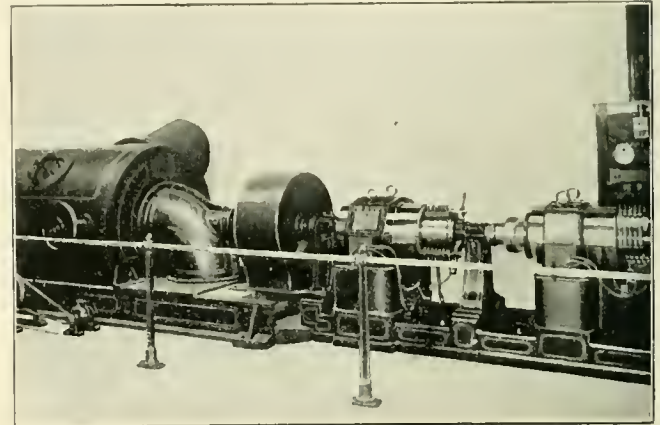
In the "Review" for February there were a number of views along the line of the Isle of Man Tramways, with an account of the method in use for carrying heavy freight. The following description and illustrations, taken from the London Electrician, of a novel water-power plant, recently completed by this company, will be of interest. The line, which derives the greater part of its traffic from summer tourists, during five months in the year is operated from several steam power stations, but to carry the load in the winter, when the road is dependent on the local passenger and freight traffic, which is comparatively light, a water power plant has been erected at a point on the Laxey River, seven miles from Douglas, and 11 miles from Ramsey, the terminal stations. From this power house, for the seven months of light load, current will be distributed over the system in both directions and the steam plants will be shut down. As all the coal used by the company has to be brought from South Wales, the financial saving will be considerable.

The water is taken after it leaves the washing floors of the Great Laxey lead mines, and the tail race discharges direct into Laxey harbor, the total fall being 41 ft., which, after deducting pipe losses, etc., allows a working fall of 38 ft. As part of the water is used for ore-washing purposes at the Snaefell and Great Laxey mines, it contains an immense quantity of sand, and special precautions had to be taken to prevent this from reaching the turbines.

The head work consists of a concrete weir 40 ft. long by 4 ft. 6 in. high, built across the river. At one end of the weir are two masonry archways, 5 ft. wide by 5 ft. high, each fitted with a sluice gate and the necessary gear for raising and lowering the gates. The two gates are separated from the river by means of an iron grating 55 ft. long by 5 ft. 6 in. high. During floods a large amount of debris is washed down the river, and the grating protects the gates from being blocked. Inside the gratings is a large settling tank for the sand, the tank being emptied by opening the gate nearest the weir, which is used as a by-pass for flushing purposes. The other gate is at the commencement of the head race, which consists of 826 ft.

a 12-in. flushing valve. At the end of the second section of race is a masonry head box 8 ft. by 11 ft. by 7 ft. 9 in. deep, from which the water is conveyed to the turbines through 820 ft. of steel pipe 3 ft. in diameter. The head box has also been built to act as a settling tank, thus preventing any sand from entering the pipes. The pipe line is made of 1/8-in. steel plates and is in 15-ft. sections with double-riveted seams; it is carried several feet above the ground on masonry piers.

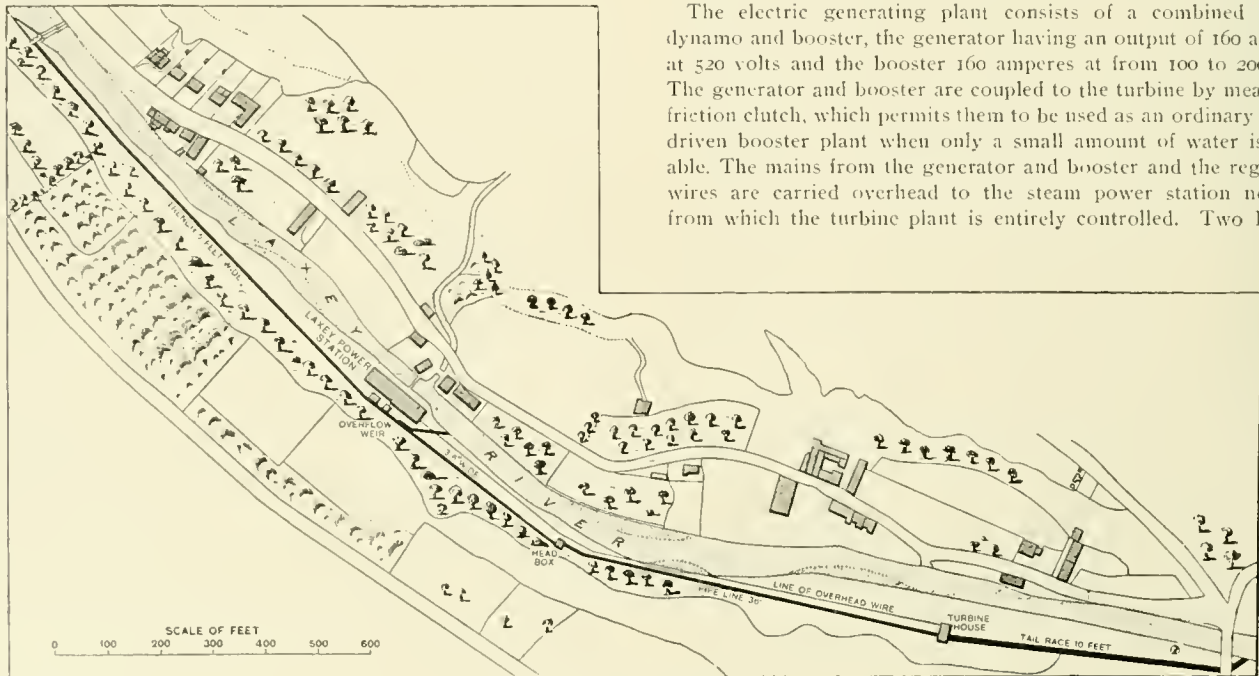
The turbine house is 1,100 ft away from one of the company's steam power stations, and is a stone building 30 ft. long by 15 ft. wide by 12 ft. high. The fall from the level of the weir to the center of the turbine is 26 ft., the remaining 15-ft. fall being obtained by means of draft tubes. The turbines are of the Victor horizontal type, and consist of two independent 12-in. turbines in one casing



TURBINE, MOTOR AND BOOSTER.

with the shafts direct coupled; so that when the water is low one turbine will be used, thus enabling the plant to be worked at its best efficiency. The turbines will develop 140 h. p. at a speed of 720 r. p. m.

The electric generating plant consists of a combined bipolar dynamo and booster, the generator having an output of 160 amperes at 520 volts and the booster 160 amperes at from 100 to 200 volts. The generator and booster are coupled to the turbine by means of a friction clutch, which permits them to be used as an ordinary motor-driven booster plant when only a small amount of water is available. The mains from the generator and booster and the regulating wires are carried overhead to the steam power station near by, from which the turbine plant is entirely controlled. Two Lundell



HEAD AND TAIL RACES.

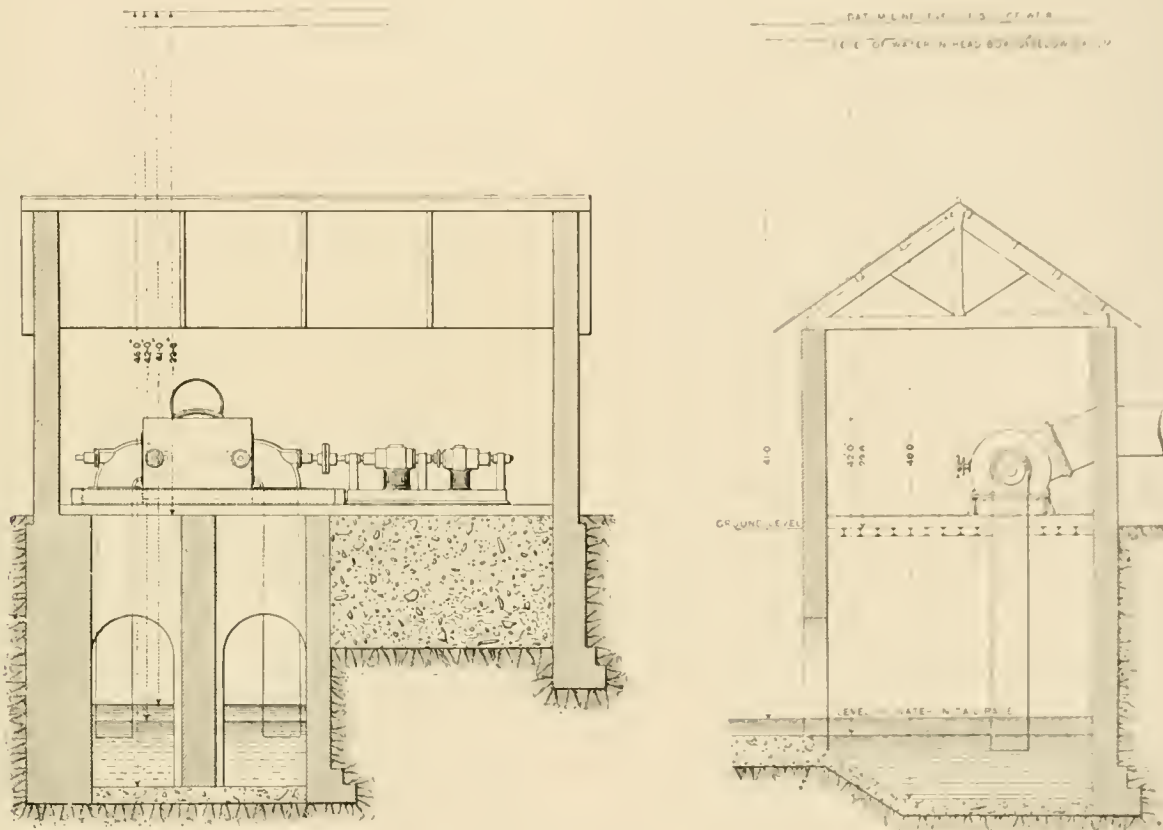
of trench 5 ft. wide, followed by 474 ft. of trench 3 ft. 6 in. wide, the depth in both sections being 4 ft. 6 in. The first portion was made larger in sectional area, to allow the water to travel slowly and permit any sand which might have passed through the first settling tank to settle to the bottom. At the end of the larger section of the race another settling tank has been formed by dropping the bottom of the trench 6 in. for a distance of 50 ft., and providing it with

1/4-h. p. motors, driven from a small storage battery, are used for opening and closing the turbine regulators. The switch panels for the generator and booster are on the main switchboard in the steam station. They comprise one generator panel, together with automatic switch, ammeter, voltmeter, positive and negative switches, shunt regulating switch, starting switch, and resistances for regulating the generator as a motor when it drives the booster during

periods of low water, and a recording wattmeter. The booster panel contains switches for controlling a motor-driven booster in the steam station, and also the switches for controlling the turbine booster—viz., positive and negative switches, voltmeter, ammeter, shunt regulating switch, recording wattmeter, and change-over switches to connect either the turbine-booster or motor-booster to any of three feeders. Adjoining the generator panel is a small panel for controlling in either direction the two 1/4-h. p. motors for regulating the turbines. A small pipe has been carried from the head race, and is attached to a gage glass fixed in a prominent position near the switchboard, so that the attendant can see the height of the water in the head race.

AMERICAN STREET RAILWAYS AS SEEN BY AN ENGLISHMAN.

A subject much discussed in both the technical and non technical press of England during the last year is that of American engineering competition, and one of the late articles appearing in the special correspondence of the London Times deals with the means of transit for passengers as a factor of America's success in manufacturing. On this side of the Atlantic the trolley car is so familiar that many patrons give it little thought, forgetting the conditions that obtained before electric traction was developed as it is today. Seen through English eyes the situation is thus de-



SECTIONS OF TURBINE HOUSE, ISLE OF MAN.

The turbine plant is worked in connection with three battery sub-stations, each containing 250 cells of the Chloride "R" type, one at Laxey, at the foot of the Snaefell mountain railway, and the other two about five miles on each side, all three stations being worked in parallel. When the cars are taking current the turbine generator is assisting the batteries, but when the cars are descending the grades or standing, the generator is charging the batteries. During the night when the cars are not running, the booster is connected in series with the generator, and the batteries are in turn charged at a heavy rate and at a high voltage through underground feeders. This enables a full load to be maintained continuously on the turbines. This is said to be the first street railway plant in the United Kingdom where storage battery sub-stations have been installed.

This auxiliary water-driven station was the idea of Alexander Bruce, the chairman of the company, but the plant was designed and built under the supervision of J. Shaw, the general manager and engineer. The turbines and pipes were supplied by F. Nell, of Queen Victoria Street, London, and the generator and booster by the Electric Construction Co., of Wolverhampton.

The Bulletin of the International Railway Congress states the best wood known for use as ties is quebracho, which is found in great quantities on the level prairies of Argentina, S. A. It weighs from 77 to 87 lb. per cu. ft., has a tensile strength of 17,000 lb. per sq. in. In transverse tests the stress in the outer fiber at breaking point was about 22,000 lb. per sq. in.

scribed: "In the more settled states wherever a town of any size is approached there are the electric railways radiating for miles out into the surrounding district. They run along the main streets of the cities and out into the country, over roads hardly formed, across fields, upon narrow ledges scarped out of precipitous hillsides (as at Pittsburg), up banks so steep as to be inaccessible to horse traction, and over slender viaducts and river bridges. Inside the cities the cars go everywhere. If a man wants to settle some business a mile or two away he finds out by telephone whether the person is at home and then steps outside. When once in the car he knows it will keep going at a good speed, and he will cover the mile out and the mile back in ten minutes or so."

The writer compares this with an extreme case of seven minutes which he required to go a quarter of a mile in a London omnibus.

Some of the interesting points of American practice noted are the following: The subway in Boston where the narrow, crowded streets present a parallel of the conditions in London. The success of the New York, New Haven & Hartford in operating an electrical suburban service and a main line steam service over the same track, as is done on some of its branches. Concerning this last it is said, not without exaggeration, perhaps: "To a cautious Englishman one of the most striking of the drawbacks is that the naked conductor is laid at the ground level and the tension of current is high. Now American railways are hardly fenced at all, and grade crossings are frequent. It is a little unsettling to see children playing on the side of the track and also using it as a

thoroughfare to and from school, after the manner of American children all over the Union. But the Americans hold the view that if a man has not sense enough to keep clear of a third rail, the United States has no use for him. Our Board of Trade principles are not popular there."

The effect of well-meant but hampering legislation in restricting the development of electric lines in England is mentioned and deplored.

AN AUTOMATIC BLOCK SIGNAL SYSTEM.

We are indebted to Mr. C. F. Bancroft, electrical engineer of the Massachusetts Electrical Cos., for data concerning the automatic block signal system invented by him and Mr. P. F. Sullivan. The system was installed on the Lowell (Mass.) & Suburban Street Ry. in February, 1898, and its successful operation led to equipping the Lowell & Nashua line about a year later.

It is designed for a single track road with turnouts, and the principle of its operation will be understood from the description. The trolley wires on the tangent portions of all the turnouts are insulated from the other portions of the overhead line and supplied with current from feeder lines; in each connection from the feeders to the insulated sections at the turnouts is an electrically operated switch the movements of which are controlled by the cars on the line. The effect of a car passing a turnout is to render dead the turnout section just passed by it, to render dead the section at the next turnout ahead that must be used by an oncoming car, and to make alive the section at the turnout next preceding the one just passed. This will appear from tracing out the connections in Fig. 3 and the details will be more fully described later.

One of the turnout contacts by means of which current to operate the switches is obtained, is shown in Fig. 1. Two span wire hangers are placed a short distance apart and connected by a copper strip or light angle bar over the top. When the trolley wheel of a car passes underneath it slightly deflects the trolley wire and makes electrical connection with the overhead bar, and thus permits a current to flow to the automatic switches controlling the insulated turnout sections.

Fig. 2 shows one of the automatic switches and its box. The switch lever is moved by one of a pair of solenoids; each of these

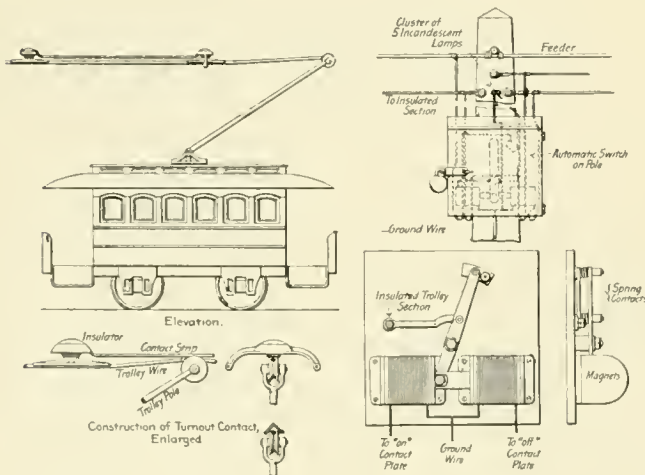


FIG. 1.

FIG. 2.

coils has a resistance of about 1,500 ohms, so that with the ordinary line potential of 500 volts the current flow is about 1-3 amperes. The switches are in weather-proof boxes, mounted on the line poles, and are connected with the proper contact plates by ordinary No. 8 B. & S. bare iron wire. Three wires run from turnout to turnout, and if deemed desirable a three-wire insulated cable could be used. The ground wire of the automatic switches is connected to the rail return, or a return wire may be used.

In order to avoid the inconvenience of running onto a dead section at night and cutting off the lights in the car, a cluster of five incandescent lamps is connected to each insulated section so that the motorman at night can tell whether the section is alive or dead, and if dead he holds his car on the curve of the turnout till the signal light shows the insulated section ahead of him is free.

The equipment of contact plates and switches and the wiring system are shown diagrammatically in Fig. 3. The heavy lines indicate the feeders from the power house and the track return. The medium weight lines are the trolley wires and the light lines the wires of the signal system. The sections of trolley wire between turnouts are connected to the feeders, and insulated from the two sections over the tangents of the turnouts as indicated by the openings.

At each of the three turnouts I, II and III are two automatic switches, one marked U for the out or up-bound side of the turnout and one marked D for the in or down-bound side of the turnout. Each of the U switches has two solenoids on one end, and one on the other, while the D switches have one only on each. There are five contact plates at each turnout, two, marked A and B, for the up-bound cars and three, marked 1, 2 and 3, for the down-bound cars.

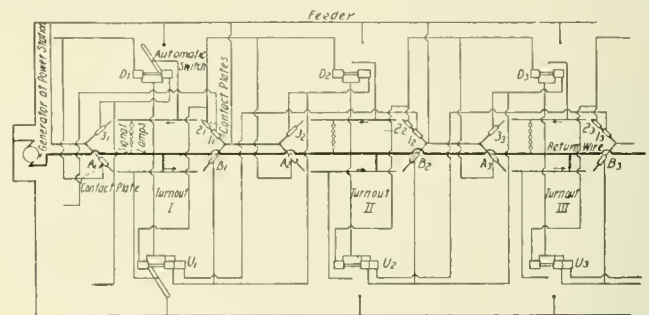


FIG. 3.

Now consider a car approaching turnout II, from I. The up-bound section at I is dead and prevents a car from following, and the down-bound section at II is dead and prevents another car from entering the section from II. As the car strikes contact A₂ at II it closes the circuit through the left-hand solenoid at D₂ throwing in the switch at that point, and also, by a branch wire, closes the circuit through the left-hand solenoid at U₁, throwing in that switch, and releasing both the following car held at I and the opposing car held at II.

Now let the car pass over the insulated section, supposing it to be alive; on reaching the contact B₂ the current is closed through the switches at U₂ and D₃ opening them both.

Next take the case of a down-bound car approaching II from III. In this case the switches at U₂ and D₃ will be open. On reaching the contact 1₂ current is sent through a solenoid at U₁ opening that switch. The car then proceeds to contact 2₂ and the necessary connections are made to close the switches at D₃ and U₃. Passing the insulated section it strikes the contact at 3₂ and opens the switch at D₂, and also that at U₁ in case the latter should have been closed, as for instance by a car passing contact 2₁ after the car at 1₂ had opened it.

It will be apparent from a study of the wiring in Fig. 3 that an up-bound car does not cut out the down-bound section of the next turnout until it is leaving its own turnout, but that a down-bound car cuts out the up-bound section of its next turnout before entering the insulated section of the turnout where it then is. This takes care of the possibility of up and down-bound cars striking the corresponding contact plates at the same instant, as the up-bound car will have to halt because of the power having been cut off of the insulated section by the down-bound car at the next turnout ahead.

The cost of this system is given as \$200 per turnout, when they are about a mile apart; the automatic switches cost \$25 each.

The Chicago City Council has under consideration an ordinance requiring street cars in this city to be equipped with effective brakes, although most of them are now fitted with as good braking devices as can be obtained for cars of their size.

All the employes of the Butte (Mont.) Consolidated Railway Co. took supper at one of the best restaurants in town one evening last month at the company's expense. The men had been kept unusually busy all day owing to ball games at one of the suburbs.

THE EVOLUTION OF CITY STREETS.

BY WILLISTON FISH.

Mr. Fish is a native of Ohio and was graduated from the West Point Military Academy in 1891. He served as an officer of the 4th artillery until 1897 when he resigned to go with the Crane Elevator Co., of Chicago. In 1899 he went with the South Chicago City Railway Co., in which his father-in-law, Mr. D. F. Cameron, was interested, and remained there until September, 1899, when he became secretary to Mr. Spalding, then president of the Chicago Union Traction Co., and is still with that company.

In this paper the author first mentions the growth and development of animals and of cities, and then shows the importance of roads to communities of men. The history of roads and streets is briefly taken up and their growth traced, particular stress being laid on the specialization of city streets by assigning separate portions of them to different uses. The advantages of further differentiation with the object of securing better street car service are pointed out and some suggestions made as to the course future developments will probably take. It is then shown that elevated and underground roads are of but limited application, and that the solution of urban transportation problems is easy if the surface street railways are permitted to develop along the lines suggested.

All things change, and as long as the sun shines warm all things will tend towards perfection. It is the purpose to here consider somewhat the history of roads in general, and of city streets in particular, and to point out certain simple but important changes that seem to be at hand in the methods of using them.

Fortunately for man in his capacity of student natural phenomena are governed by a few fixed laws, and a study of one branch of science leads to knowledge of others. In considering streets, so close an analogy may be drawn between the evolution of animals and that of cities that the writer may be pardoned for dwelling upon it. Thus, as everyone knows, plants and animals are communities of cells, and the same laws which govern their growth and development are concerned in the growth and development of communities of men. People in an early time lived scattered through wide spaces, each individual depending upon himself for support, like the one-celled animals. Camps, villages and cities were formed by a process analogous to the process of formation of many-celled animals.

The first man from observing the one-celled and the many-celled animals might have foretold that some time, if the world lasted, there would be vast cities; and an examination of the system on which a large aggregation of cells is formed would have shown him many things about the organization of cities. For instance, it would have shown him that certain individuals would be selected as the governing body, like the cells of the brain; that other individuals would be detailed to bring in food, others to prepare it for use, others to distribute it. He might have foretold that cities would, if necessary, have walls and soldiers for external defense, and police for internal protection. And the cities would have streets for bringing in supplies of food and fuel and air, and for distributing them. And further he might have known that in the beginning all of these things would be imperfect—sufficient at the time, but insufficient for the future.

The first man of course did not foresee these changes which were radical, comprehensive and far in the future, but it should not now be an over-difficult thing for us to predict the changes that a few years will bring about in the use of streets. We know more about streets than the ancient man knew about zoology. He thought a clam was a clam and a deer was a deer, and that that was all there was to it. Sometimes, it is true, we appear to suppose that a boulevard is a boulevard, and an inextricable confusion a business street; and that that is all there is to it. But we know something about the history, and therefore about the composition of things; the ancient man did not. When a reasonable length of right line is given it is easy to extend it with accuracy, and say where it will run. The early man had no part of the right line given except the point at which he lived. In determining the future of city streets we have given to work from, much of the history of cities, a little of the history of roads and a great deal of the history of the evolution of animals and plants.

All the books treating of roads that the writer has seen, begin learnedly with a profusion of detailed information about the Roman roads and then abruptly pass over hundreds of years to the roads of France. One writer taking a condor flight over those dark centuries, notes the one luminous point that Cordova was not paved in 850. It probably continued not to be paved, for he speaks of it no more.

The reason of this paucity of information is that until recent times there were few roads worthy of mention. Road making and road using did not progress with the other arts. If men had studied them as long and ambitiously as they have studied war, politics, language and logic, every country would always have had in its roads, monuments to be noted in history with its pantheons, temples, schools, war-gained territories and memorials of kings. That roads have been insignificant is apparent not only from the

silence concerning them but from the crude use made of roads, and from the extravagant fuss made over the Roman roads which were, in fact, no great matter. Until modern times commerce by land was not great, and the use of roads was but trifling.

Beckman says that in the works of Greek and Roman writers he finds more proof of paved highways than of paved streets. That is the way he begins. The paved highways were those Roman roads, and he immediately turns to the roads of France. Paris, he says, was not paved in the twelfth century, but in 1184 a small amount of paving was ordered, and the name of the city was changed from Lutetia to Paris. The authorities of the city did not know much about practical matters, but, with the rich learning of the time, they knew that Lutetia was Latin for filthiness, and so they changed—the name. A little light is thrown upon the condition of the streets of Paris in those times by the following history: In Paris Oct. 3, 1131, there died a prince, the son of Louis the Fat. His death was due to an accident to his coach caused by hogs running in the streets. "An order was issued thereupon that hogs should not be allowed to run in the streets, but this order was opposed by the monks of the abbey of St. Anthony, because, as the monks represented, it was contrary to the respect due their patron to prevent his swine from going where they thought proper, and it was found necessary to grant the clergy an exclusive privilege, and to allow their swine, if they had bells, to wallow in the dirt of the streets without hindrance."

In London in 1090 the church of St. Mary le Bow was blown down, and columns 26 ft. long sunk 22 ft. in the mud. The history unnecessarily adds that the streets were of soft earth. Holborn was paved by royal command in 1417. Smithfield Market in 1614. In the seventeenth century the streets of Berlin were never swept, and swine wallowed in the dirt the whole day. Till 1641 sties were erected in the streets and even under the windows. Laing, in "Notes of a Traveler," says he found Berlin in 1841 very fine and very nasty.

Through all these times the usual roads were simply foot-paths, cattle-paths, and roads practicable for saddle and pack animals only.

Prof. Shaler, in speaking of the evolution of roads, says: "Let us note that the first step which men make above the savage state is closely related to the progress of their desires. When they cease to be content with the simple goods which they may obtain from nature about them, when they seek by trade or war to win profit from their neighbors, then the questions of transportation and of routes to be followed present themselves. If the savage in the first steps of his up-going on the way to civilization is so fortunate as to obtain possession of animals which can be used as beasts of burden the road problem at once opens before him. Beginning with pack transportation following his older trails, he soon learns in a rudimentary way the simple arts of road engineering. The pack-train state of civilization may be said, as far as transportation is concerned, to be the first stage of that development. It was a stage which was long continued even in the oldest settled lands. It is consistent with considerable advance in cultivation but not with high commercial development. More than one-half of the world is still in the pack-train stage. This is true of South America and a considerable part of our own continent. Within twenty years the writer has seen in eastern Kentucky a caravan of small mountain-bulls, each provided with a sawbuck saddle in which were packed the exportable products of the district."

Anyone may deduce the history of the development of cities, in a general way, from his knowledge of former times. The general evolution of many-celled animals has proceeded in a parallel course.

The very lowest organisms have no definite tubes at all. Their

food, fuel and air travel by diffusion or osmosis. That is the way men traveled at first—by diffusion. When they wished to reach a point they simply started towards it, and made their way as best they could—as we do now when we hear a squirrel chattering in the woods. Animals had at first no blood; men, no commerce. Size and activity in animals necessitate blood, and size and activity in nations and cities necessitate commerce. The highest form of life will have the most perfect system of tubes for the circulation of blood, and the highest state of commerce demands the best roads.

It follows from the general likeness between the organizations of animals and cities that cities must have streets ample to bring in and distribute food, fuel and air, and such other things as fit men's evolved needs. They should reach every point, and be of easy passage. In animals arteries must be amply large, or too much labor will devolve upon the system in pumping the blood.



WILLISTON FISH.

Obstructed, difficult streets represent labor thrown away. If the arteries and veins are too small or too difficult of passage, the blood must circulate more slowly, with the result that there is less activity. Animals with poor circulation are generally small and sluggish.

In the general analogy between the evolution of the metazoa and that of cities is included a particular analogy which, in connection with the present subject, deserves especial mention: The analogy between the specialization of tubes and the specialization of roads. Both tubes and roads began as indefinite ways; when definite tubes were first established they were used indiscriminately for all the purposes of tubes; and when definite roads were first established they were used indiscriminately for all the purposes of roads. Just as tubes have been produced or set aside for special uses, we find roads established or set aside for special uses under the same general law, and when in cities the process has not yet been carried as far as conditions now demand we shall expect it to be continued in conformity with the analogy between cities and the metazoa, and with the particular analogy between tubes and streets.

In general roads a striking specialization has already occurred, dividing these roads into wagon roads and steam roads. The steam road offers a special way for heavy, concentrated, permanent traffic requiring long hauls or high speed. The steam cars and the road wagons do not use each other's paths. There is a complete differentiation. Yet, of course, each started from the trail over which all traffic ran in common. It is interesting to note that the necessity for this differentiation and specialization of the steam road from the highway was not at first appreciated, and the charters of the early New England railroads provided that the general public should be permitted to use the tracks for wagon traffic.

City streets also begin with the trail, and, though the specialization of city streets began long ago, it has proceeded slowly and intermittently. It is said that the streets of Herculaneum and Pompeii had raised banks on each side for foot passengers. But sidewalks have been far from common in cities. Laing says of the streets of Berlin in 1841: "They are spacious and long, with broad margins on each side for foot passengers, and a band of plain flag stones on these margins makes them much better to walk on than the streets of most continental cities." Another

specialization in streets has been the setting apart of certain streets for pleasure-driving, and another is the building of elevated roads.

Roads therefore show the following evolution: First, roads or ways were general, and people traveled by diffusion; then there were paths or trails in which all travel proceeded in common. When cities arose, a heterogeneous traffic occupied the whole of their streets from wall to wall. After a time the width of the city street was divided to separate pedestrians from horsemen and vehicles, thus making sidewalks and a roadway. To some extent the law of the road divides this roadway into two parts in which travel moves in opposite directions. Street cars, where used, commonly run upon the middle of the street, but have in fact no separate path. The roadway in streets is practically common ground with little more mark of intelligent division than was shown on the pack trails.

In this roadway space are heavy, slow wagons, light, rapid wagons and carriages, and street cars heavier than the heavy vehicles and more rapid than the light ones, all of them moving over common ground. They get along as best they can. They work their way. They are often blocked, and carriages and cars never attain the speed of which they are capable. In other words, between curb lines travel is still proceeding by osmosis, and we leave our betterment to time as the mollusk did. Of course our cities are wonderful organisms, and their system of distribution affords sustenance to all the individuals, but so is an oyster a wonderful organism, and its system enables it to live without discomfort; but still it is only an oyster. The present system of ways in cities is not sufficient for the better cities of the future.

But suppose that a city is already built with narrow difficult streets. What is it to do? It is to do the best it can, as the animals do that have radical faults of construction. When superior animals arise they prey upon the inferior or seize their feeding-grounds, and nature abandons the inferior design. So, well-designed cities seize the commerce of ill-designed ones. Nature is even less sentimental than man, and she also lacks his pride of opinion. She loves only success. An extension of ways where necessary and a specialization of ways are the conditions for the advance of cities as they have been for the higher evolution of animal life.

The middle roadway of streets in the largest cities should be further divided. The nature of the case demands it, and the change is as sure to come as cities are to be larger, stronger and more active. The problem concerns heavy, slow traffic, light, rapid traffic and street car traffic. The two kinds of vehicle traffic should be separated. The ideal solution would be to have streets sufficiently wide to afford separate paths for each kind of traffic. Prof. Shaler says: "On the main line between Boston and Lynn it may be desirable, where possible, to have two different kinds of pavement arranged in strips parallel to each other; that of blocks for heavy-laden vehicles and macadam for lighter transportation. The success of such a method would depend, however, upon the efficiency of regulations which would serve to keep the two classes apart."

Many streets, of course, are not wide enough to afford these separate paths. One such street might be given up to one kind of traffic and a corresponding street to the other kind. In any case where the two ways are established each should be protected from invasion by traffic from the other. Boulevards are already so protected. Self-interest would be sufficient to govern traffic if self-interest were always apparent. Where it is not or where it is lost sight of in the temporary individual interest of teamsters and drivers it should be supplemented by positive regulations.

One positive regulation of traffic that seems highly desirable may be mentioned here, although it falls outside the scheme of this article. Owners or employers of horse or power vehicles sending them upon crowded city streets should be made financially responsible, as by a bond, for damages to property and injuries to persons arising from the negligent construction, maintenance or operation of the vehicles. A right of action against such an owner or employer who is possessed of property subject to execution may be enough to cause him constantly to take every care in hiring servants and maintaining his vehicles in safe condition, but the thousands of wagons upon the streets belonging to irresponsible people who sometimes add to their irresponsibility ignorance and indifference, are an uncurbed danger which a perfect city will not tolerate.

The specialization of the path of electric street cars deserves particular consideration. First, because they are the means of transit of such enormous numbers of people, and, second, because being exceedingly heavy, and capable of high speed, they can not to the general advantage run mingled with other traffic. They need a separate path for reasons similar to and now rapidly approaching in degree those requiring a separate path for steam cars. The weight and speed of street cars cannot be made less. Probably the weight will increase. The speed of the modern electric car is its most valuable quality. That this speed should be utilized instead of being confined is perhaps more apparent if we, for a moment, suppose ourselves still limited to horse cars, with our large cities expanding from a 3, 4, or 5-mile radius to a 6, 10, or 15-mile radius. Beyond the shorter distances horse-car transportation practically can not go. It has an absolute and narrow limit. A strong city striving to expand with such a cinch about it would afford the same spectacle as a vigorous tree trying to grow against an iron band. If such a limit existed now we should consider the discovery of some power capable of breaking through it as of vital importance. Some years ago the cable was seized upon as such a power, and, although enormously expensive, it was installed on many lines. It is no longer equal to the times, the people do not want it, economy of living can not endure it, and the costly machinery of the cable is worth nothing in the market today except as scrap. Fortunately, we now have electricity. It should be allowed to stretch and push out the limits of a large city's growth to the utmost. If allowed to do this freely, it will do it so well that not only will it make possible a vastly greater population, but it will allow this population ample space and air, and save it from living crowded together like the cliff-dwellers in their canons.

It might be claimed that the future specialization of street-car service has already had its beginning in the subways and elevated roads. This is not at all the case. Costly subways and elevated roads—roads whose cost per mile makes the Roman roads seem in the class of corduroy—cannot be used to transport all or any great part of a city's population. The economy of nature will no more permit it than it will permit arteries to run at maximum size from the heart to the extremities: they are not proportioned to the work to be done. Thus, the mileage in Chicago of elevated roads, single track, is about 93. The mileage of surface roads is more than ten times as great. It is to be noted, too, that as city living becomes more hygienic, and the air spaces greater, the elevated roads can not increase in mileage as the surface roads can. The elevated roads have perhaps no further problems to solve except cheap construction and connection with surface lines. The problem affecting a large city's transportation, the city's growth, and the health, vigor and activity of its people, is the problem of the surface roads.

In New York there are a little more, in Chicago a little less than a million passengers daily on the surface lines. It is an enormous army in either case, and its transportation may well occupy the attention of the best generals.

Some part of the street-car streets, say the middle sixteen feet now used, should be given up as fully as possible to street-car service. Extended boulevards from 80 to 200 ft. wide, surrounding and dividing the city, provided with the best pavement, ornamented with trees and flowers, and cared for by gardeners at public cost, are not too much for the little corps who infrequently use them for pleasure. A strip 16 ft. wide on a few streets is not too much to devote to the daily transportation of the rank and file, or rather, of the whole army. That this strip is not too great in proportion to the use is easily seen. The total miles of street-car travel in a large city is more than double the miles of travel on foot; yet the 16-foot strip, considering the limited number of streets occupied by car lines, is but a small fraction of the space given up to sidewalks.

But with a 16-foot strip on the necessary streets given up to street-car transportation, would enough space remain for wagon traffic? There can be no serious question of it. In the first place specialization of parts increases the capacity of the whole. In extreme cases other traffic might be limited to one direction only, as is now done in certain of the narrow streets of Amsterdam where vehicles must make a detour and enter from one direction only. If other wheel traffic yielded the exclusive use of this proposed space it would still enjoy in a city like Chicago, taking all the streets together, more than eleven times as much space for

itself. Suppose that all of Chicago's streets were thrown into one street, 2,600 miles long and 66 ft. wide, and suppose that the street cars were given the exclusive use of a part of this width proportioned to the total space they now occupy in the city streets. The 66 ft. width of this hypothetical street would then be divided as follows:

Sidewalks 28 ft.

Wagon roadway 35 ft.

Car tracks 3 ft.

The question whether street car traffic could be allowed the exclusive use of its present tracks, except at crossings, is thus reduced to an absurdity. The idea, which undoubtedly exists in some places, that this traffic can not be exclusive, arises from the jealous fancy that whatever might be allotted to street cars would be taken from the public. On the contrary, it would be devoted to the use of the whole public.

It seems apparent that the great streams of passenger travel should occupy this 16-ft. strip as exclusively as possible, and that the only question is how exclusive this occupancy may be. Experience will determine this, but the present use of sidewalks furnishes a guide. Wagons cross sidewalks only at cross-streets and alleys. At cross-streets vehicles would have to cross the car tracks, but at other points the necessity of crossing them would rarely occur. No need of longitudinal travel on the tracks would arise except in a few special instances. Our streets are often called "congested." In fact there is plenty of room upon the streets, and the question is how to use it. All through the 24 hours of the day the great extent of streets in the largest cities is practically empty, and yet even in the unused streets, car-passengers are now obliged to divide the way with stray wagons.

Where necessary, on long lines, cars will in the future make a further specialization by cutting out perhaps half of the present stopping points; this will be done by having alternate cars stop at alternate streets only.

When such changes as are here suggested, or better changes, are effected they will make an enormous saving in a city's energy. The daily ride to labor or business that now requires 40 minutes will be cut down to 20 or 25 minutes. On a three-mile ride the average saving will be 10 or 12 minutes. This saving will be a constant one every day in the year. Of course a car sometimes runs over its route without much delay by wagons coming upon its track, but the schedule time has to be arranged for the average delay, and cars can not be allowed to exceed their schedule, or they will become bunched, and the resulting waiting of intending passengers will offset the gain of those carried faster than the average practicable speed.

But beyond this constant saving there will be the irregular saving of time now lost because of wagons stuck or broken down on the tracks. This saving would also be constant to all those persons who must arrive at their place of labor or business at a fixed hour, and who now have to allow in starting out for possible blockades.

A car or a string of cars containing large numbers of people blocked and held by a broken-down coal wagon is now a common daily sight on the streets. The blockade often extends to several lines. It is interesting, though irritating, to estimate the lost time of each passenger at the same value as the teamster's time, and from this to compute the loss which arises from the teamster's carrying a heavier load than would be practicable if he drove on the outer pavement; and, from the average of blockades and delays to further compute the enormous daily tax imposed on street-car riders in order that a comparatively few coal dealers and teaming concerns, hidden away in their offices, may employ fewer teamsters and use fewer horses. Of course the teamsters and the train crews become angry at each other, but in fact they are little concerned in the problem, their "time is going on." But the hundreds of thousands or millions of people who are daily robbed of their time by the usurpation of their streets, are supposed to have no interest and certainly no voice in the matter.

There is no reason why the people of New York and Chicago might not have a street-car service one-half more rapid than they now enjoy. To people who have fixed times for arriving at destinations the changes suggested would work even greater advantage.

The changes suggested may not be the best ones. Even the shortest look into the future is likely to meet with illusions and mirages, but there is no doubt of the ills of our present condi-

tion. Street-car travel is slow, delayed, interiered with, blockaded, and there is no interest so small that it may not add to the obstruction of multitudes. It should be considered, too, that as cities are growing larger and the need of rapid transit is becoming sharper, the wagon traffic is growing too, and under our present protoplasmic system of diffusion, is making transit still slower and more difficult.

Another special use of city streets is worthy of mention. It has been thought that in large cities the tracks of the railways should be used for the transportation of goods. It is so argued by Mr. Dodge, president of the Ohio Highway Commission, and by many others. Where necessary to avoid the rehandling of goods, loaded wagons might be run upon suitable cars and so carried to a point near their destination. The suggestion is made that this work will provide an economic use of tracks and power plants at night when otherwise they would be idle.

Everyone knows how cities flourished and grew great in old times because of their harbors and the adjacent seas. These harbors and seas were simply good, cheap roads. Today inland cities are great because they are cheaply reached by railroads. Cities that have good roads leading to them both by land and by water are doubly served, and when they shall have secured the best internal roads they will have completed one means of material greatness. In 1817 Calhoun said: "The manner in which cheapness and facility of intercourse add to the wealth of nations has been so often and ably discussed by writers on political economy that I presume this House to be perfectly acquainted with the subject. It is sufficient to say that every branch of national industry, agriculture, commerce and manufacture, is stimulated and rendered by it more productive. The result is to diffuse universal opulence."

A WEEDING HOE.

Unless the roadbed for a railway is ballasted with stone or clean gravel, it will require a great deal of work on the part of the

trackmen to keep it clear of weeds and grass, and in a dry season it has been remarked that weeds will grow on the roadbed more rapidly than elsewhere. The reason for this is that the earth about and under the ties is damper than elsewhere. The weed trouble is one which grows worse with each succeeding year because the dust blown into the ballast will in a short time accumulate so as to sustain the weed growth.

The tool most commonly used for removing grass and weeds from the track is a shovel

to which there are several objections. The work is very severe because it must be done in a stooping posture, and the shovel blade is usually dull. On some railroads a specially designed tool is used for this purpose and the accompanying illustration, for which we are indebted to the *Railway and Engineering Review*, shows a hoe devised by Mr. E. C. Blundell, roadmaster of the Chicago, St. Paul, Minneapolis & Omaha Ry. The hoe consists of a rectangular, oil-tempered steel blade, 9 x 5 in., with rounded corners, bolted to a weighted tang which is on a handle 5 ft. long. The blade is polished on both sides and the four cutting edges are beveled from top to bottom.

It is stated that this hoe is found to be much more efficient than a shovel for weed grubbing because a man can do more work in a given time and because the dirt or ballast is not thrown aside but remains in place in the track or on the embankment.

A young woman who jumped from a moving car at New Haven, Conn., remained unconscious for two weeks.



BLUNDELL WEEDING HOE.

GUARD WIRES IN OVERHEAD CONSTRUCTION.

In the United Kingdom the tramway companies are required to make arrangements to prevent telephone and telegraph wires coming in contact with trolley wires, should the former break and fall across the line. The question is of considerable importance and is discussed by Mr. R. C. Quinn, the borough electrical and tramway engineer of Blackpool, in a paper read before the Municipal Electrical Association. He considers the best method is to place the telephone and telegraph wires underground at the crossings; this has the approval of the other electrical companies but the Post Office will not consent to it.

The next best method which is considered "all that is humanly possible to protect overhead telegraph and telephone wires," is the following:

1. The erection of two guard wires 18 in. apart at a minimum height of 2 ft. above the trolley line.
2. The length of the guard wires to be such that should the crossing telegraph or telephone wire break close up to one span insulator, and be blown horizontally in either direction it could not when falling come in contact with an unguarded portion of the line.
3. Each span of guard wires should be separate and distinct from its neighbor, but metallicly looped across.
4. No insulators whatever should be used, but guard wire standards be bolted direct to the bracket arms, or to the span wire as the case may be.
5. The terminal posts of each length of guard wire should be bonded to the tram rails.
6. The trolley line should be divided into sections, and each protected by a maximum current device. These sections should preferably not be of equal length, but proportioned for equal maximum working current.
7. The crossing span of telegraph or telephone wires should be terminated by a disconnecting insulating shackle on each side and the connection across these shackles should be by fusible metal bridge.

Another system of protection somewhat widely used is to fasten to the trolley wire brass clips which support a wooden molding of greater width than the trolley wire. These strips are regarded as more unsighted than guard wires and there has been difficulty in securely fastening them in place; also they do not afford the desired protection since if a telephone wire falls across the wooden strip the trolley wheel or pole will very probably strike it and make the very contact it is desired to avoid.

A third method recommended by the Post Office is to bunch the telegraph wires and then place an insulated cradle or hammock around them at the crossing. This is considered unsightly and inefficient also, since the meshes of the hammock are from 2 to 3 ft. square.

ALLEGED INJURY BY ELECTROLYSIS.

The city of Rockford, Ill., has a bill of \$17.25 against the Rockford Railway, Light & Power Co. for damages to water pipes alleged to have been caused by electrolysis consequent upon defective bonding; the council has directed that suit be brought if necessary to collect the claim. We judge, because of the trifling amount involved, that the matter is being pressed in order to establish a precedent.

CHICAGO GENERAL RY.

The Chicago General Railway Co. held its annual meeting July 20th. The resignation of Mr. Glenn E. Plumb as president and director was accepted and Mr. J. P. Black was chosen president and Mr. W. A. Goodman, director. The general counsel for the company was directed to begin proceedings against the Chicago City Railway Co. and secure a determination of the rights of the latter to occupy its present tracks in Wabash Ave., between 22d St. and Madison St. The General Ry. claims that the franchise for this part of the Chicago City system expired in 1894, and the General Ry. wishes to arrange with the city for an entrance to the downtown district over these tracks.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

DUTY OF CHILDREN TO OBSERVE APPROACHING CARS.

Brady v. Consolidated Traction Co. (N. J.), 45 Atl. Rep. 805. Feb. 26, 1900.

A boy 9½ years of age, playing in a public street, ran across the track of a trolley road, and was struck and injured by a passing car. He testified that he neither saw nor heard the car. There was no obstacle to his seeing the car if he had looked before going on the track. Under these circumstances, the supreme court of New Jersey holds that a verdict in his favor could not be supported.

The plaintiff, the court says, was a foot passenger crossing a street containing a car track. A duty devolved upon him before crossing to use his powers of observation to observe approaching cars, which were within a distance, if run at lawful speed, to put him in danger. Such a duty devolved upon him as an intelligent youth who was sui juris, or possessed of legal capacity to act in his own right in the matter, as he was admitted to be.

The duty of observation required from children, the court goes on to state, may differ in extent and degree from that required from an adult. Judgment which a jury might find lacking in prudence if formed by a person of mature years, might perhaps be found not to be lacking in prudence if formed by a child, but the child is not excused from some duty of observation.

ORDINANCE MAY NOT IMPAIR CONTRACT OBLIGATION IN CONSTRUCTION OF GRANT.

Mercantile Trust & Deposit Co. v. Collins Park & Belt Railroad Co. (U. S. C. C.), 99 Fed. Rep. 812. Feb. 7, 1900.

The United States circuit court, northern district of Georgia, holds that there is no escape from the conclusion that the proposition is established by United States supreme court decisions that an ordinance passed by a municipal corporation in its legislative and governmental capacity, especially with reference to the control of the streets and the granting of rights and privileges therein, is a law of the state, within the meaning of the provision of the constitution of the United States, which prohibits any state from passing a law impairing the obligation of contracts. Nor does it accept of the argument that for a municipal ordinance to be a state law, in this sense, it should be one withdrawing a right, and not one merely construing the effect of a previous grant. If a municipality grants a right in the streets or otherwise, such as that, when accepted and acted upon, a binding contract comes into existence between the grantee and the municipality, and the city, by a limited construction of the effect of the grant, deprives the grantee of a part of the rights obtained thereby, the court says that this would seem to be as much an impairment of its obligation as if the city should by express action withdraw part of the rights so granted.

LIABILITY IN LAYING HOSE ACROSS STREET FROM HYDRANT TO TANK CAR.

North Jersey Street Railway Co. v. Morhart (N. J.), 45 Atl. Rep. 812. Mar. 5, 1900.

Considering that a public street is devoted to the use of passengers on foot or in vehicles, the court of errors and appeals of New Jersey suggests that it is a question whether a street railway company may lawfully obstruct its free use by laying a hose from a hydrant at its side to a tank car on the company's track for the purpose of filling the tank with water to be used in sprinkling the company's tracks. But if a right to place such an obstruction in a public highway exists, which is here assumed, but not decided to be the case, the court holds that it must raise a duty on the company which it owes to all travelers on the highway to give such warning of the obstruction as would be reasonably required to protect the traveler from injury thereby; and whether such warning was in fact given must be a question for the jury. More-

over, evidence that a bicyclist was riding in a bent position at a considerable speed in a public highway, the court holds, in this case, where it affirms a judgment against the company, will not establish negligence contributory to his death, occurring by his being thrown from his wheel by reason of the obstruction of a hose stretched across the highway, if the attitude of the deceased was consistent with such observation as a traveler on the highway is required to make in respect to such obstacles, and the evidence may justify an inference that the obstacle might escape the required observation.

CONSOLIDATED COMPANY HOLDS PROPERTY IN OWN RIGHT.

Greene v. Woodland Avenue & West Side Street Railroad Co. (O.), 56 N. E. Rep. 642. Feb. 20, 1900.

A corporation formed by the consolidation of two or more companies, the supreme court of Ohio states, holds its property acquired by such consolidation in its own right, and not in trust for the constituent companies. The liability of the constituent companies attaches to the consolidated company by virtue of the statute, and not by virtue of the law of trusts.

Furthermore, the court holds that section 6478 of the Revised Statutes of Ohio, which provides the manner in which service of summons may be had upon railroad companies, is not applicable to street railroad companies.

PROPER PARTY TO SUE HOLDER OF ASSIGNMENT OF FRANCHISES.

Havana City Railway Co. v. Ceballos (N. Y.), 63 N. Y. Supp. 417. Mar. 9, 1900.

Where a third party is holding for the benefit of a certain-named corporation an assignment of a street railway franchise, the right of action to enforce the agreement under which he is holding same and to compel him to deliver over the assignment, the appellate division, first department, of the supreme court of New York holds, is vested in the corporation, and to enforce such agreement the stockholders are neither necessary nor proper parties, the corporation not having refused to sue. Neither does it consider a trustee for the stockholders a necessary or proper party plaintiff in such a case.

VALIDITY OF EXTENSIONS BEYOND LEASED INTERVENING TRACKS AND TEMPORARY LOCATIONS.

Daniels v. Commonwealth Avenue Street Railway Co. (Mass.), 50 N. E. Rep. 715. Mar. 3, 1900.

There intervened between the end of the old tracks of this street railway company and the beginning of the new tracks of what purported to be an extension, tracks of another company, which this company used under a contract with such other company. This contract was approved by the railroad commissioners, but had not been sanctioned by the board of aldermen. For want of that sanction, it was contended that the company was not using the intervening tracks lawfully, and that therefore the new location was not an extension, and could not be granted.

But, assuming for the purposes of decision that the authority of the aldermen was necessary to the legality of the contract, and had not been given by implication, and assuming, also, without deciding, that there must be some sort of continuity with the existing location of the company's tracks, nevertheless, the supreme judicial court of Massachusetts holds that the location did not fail on this ground. It appears to think it sufficient that the new tracks were connected with the old by a continuous line, all actually in use by the company, and that no one who had anything to say about it made any objection to the use, but rather all seemed to approve of it,—both railway companies, the board of aldermen, and the railroad commissioners. To this, the court adds that it does not conceive that the process of the statute was intended to enable

citizens having no other standing than as members of the public, although, no doubt, having a considerable practical interest, to rip up transactions satisfactory to all who have a voice in the matter, by discovering some technical flaw in the records of past proceedings.

Another objection was that the location was expressly made temporary only, to terminate upon the abolition of a certain grade crossing. The reason for this was that the location through the street in question was a detour, and that as soon as the cars could run straight on this street where the grade crossing then was without crossing the railroad there at grade, they would undoubtedly do so. But it was insisted that there was no power to grant a temporary location. The court answers that it does not see why not, if the street railway company was satisfied. Ordinarily, it may be presumed, a railway company would not accept a location in those terms. If it is willing to do so, probably some necessity exists, such as notoriously has led to such grants in the case of the Boston Subway, and elsewhere. If it is willing to do so, the court goes on to say it does not perceive any reason, the statutes being silent, for holding the grant void, or even voidable, on the protest of citizens to whom the temporary character of the grant is no injury.

EJECTION OF PASSENGER FOR PASSING SUSPICIOUS COIN.

Vassau v. Madison Electric Railway Co. (Wis.), 82 N. W. Rep. 152. Mar. 20, 1900.

A gentleman accompanied by a lady gave a conductor a half dollar, in payment of their fare, receiving back 40 cents in change. Thereafter, believing from its unusual and suspicious appearance that the coin was not genuine, the conductor so informed the passenger, and requested him to take it back, and pay him in other money. This the passenger refused to do, and the conductor took hold of him, and put him off the car. A jury gave him a verdict for \$500 damages. This the trial judge considered excessive, and required a remittitur from of \$250, which, having been made, he entered judgment for the balance. But this judgment has not been allowed to stand. The supreme court of Wisconsin has reversed it, ordering a new trial. It holds particularly, that the evidence did not justify the submission to the jury the question of punitive damages.

The circumstances under which the controversy arose, the court says, were peculiar, and called for mutual forbearance. Confessedly, the piece of money received by the conductor was unusual in its appearance. Such appearance at first excited suspicion on his part, which apparently, after more careful examination, ripened into a conviction, that the half dollar was not genuine, and so, as above stated, he informed the passenger, and asked him to take it back, and give him other money in place of it. If the result had proved the money to be counterfeit, then, the court declares, it would have been the right and duty of the conductor to put the passenger off the car, if he failed to pay his fare in good money. But the result proved that the money was genuine. That being so, the passenger, the court holds, was lawfully entitled to ride to his destination, and hence rightfully entitled to compensatory damages for being thus wrongfully ejected.

The mere fact that the conductor, in good faith, told the passenger that the money was counterfeit, the court holds, was no insult. Few are so fortunate as never to have received a counterfeit coin. It is only the passing of such coin with knowledge of the fact which makes it an offense. So, there being nothing in the evidence to warrant the jury in finding that the passenger was ejected from the car under circumstances of aggravation, insult, or cruelty, or with vindictiveness or malice, the court holds that it was error, as already intimated, to submit to the jury the question of exemplary or punitive damages. In order to recover punitive damages, it further explains, it was necessary not only to prove that the conductor's conduct was such as to subject him to such damages, but that the company either in advance authorized such conduct, or, with knowledge of such conduct, ratified the same.

The passenger testified that the next morning he went to see the superintendent, who asked him his address, and told him that the conductor was one of the oldest conductors on the line, and one of their most faithful men, and that the company would stand by what he did; that the conductor had the power to protect the company's property,—had a perfect right to put him off the car; that the superintendent told him that he would look the matter up, in order

to see whether the money was good or not. In this conversation, in respect to the passenger's having been put off the car, the court finds nothing to warrant the jury in finding that the superintendent authorized or ratified any aggravating, insulting, cruel, vindictive, or malicious conduct on the part of the conductor.

On the question of compensatory damages, the court holds that it was error to refuse to instruct the jury that, "in considering the question whether there was any injury to the feelings of the plaintiff, you have the right to consider his conduct and that of the conductor, and, among other things, whether or not the plaintiff sought to avoid trouble, or whether his conduct was such as tended to provoke and cause trouble unnecessarily."

INJURY BY LURCH OF CAR AT CURVE OF PASSENGER PREPARING TO ALIGHT.

Babcock v. Los Angeles Traction Co. (Cal.), 60 Pac. Rep. 780. Mar. 24, 1900.

There is no rule of law, the supreme court of California asserts, which requires a passenger in a street car to retain his seat or other position until the car has actually stopped. In harmony with this, it holds, in this case, that the trial court was not authorized to withdraw from the jury the determination of the issue of contributory negligence on the part of the passenger injured, because, it says, it could not declare that it was contributory negligence on his part to start to get off from the car before it had come to a full stop. And when he had shown that the company had assumed to carry him as a passenger upon one of its cars, and that while being so carried he had sustained an injury by reason of the manner in which the car was propelled along its track, a prima facie case of negligence, it holds, was established, which, in the absence of any other evidence, entitled him to recover damages.

Moreover, the supreme court holds that the company could not claim that it was negligence on the part of the passenger to stand up while riding, or to ride upon the outer part of the car, after it had assumed to carry him as a passenger, and had not furnished him with any seat upon the inside of the car. On the other hand, it says, it needs no argument to show that it would be negligence for the company to run its car against and around a curve at a speed of 15 or even 10 miles an hour, while passengers were standing upon the open part of the car, without warning or protecting them against the danger of being thrown off. And if the passenger in question had the right to expect that the car would stop on the hither side of the curve, it does not consider that he exposed himself to any unusual risk in moving across the car, before it came to the curve for the purpose of getting off there. Neither does it regard the fact that he had certain packages in his right hand, and attempted to take hold of the rail with his left hand, was necessarily a contributing cause of his injury.

CONTROLLING POWER OF PUBLIC AUTHORITIES OVER CONSTRUCTION OF JOINT BRIDGE.

Wyandotte & Detroit River Railway v. King Bridge Co. (C. C. A.), 100 Fed. Rep. 197. Feb. 12, 1900.

Two townships, lying on opposite sides of a river, and a street railway company, entered into a contract to bridge the river, the expense to be apportioned between them. Then these three parties contracted with a bridge company to construct the bridge. And now the United States circuit court of appeals, sixth circuit, holds that, as the bridge was to be a part of the public highway, notwithstanding that the bridge company agreed to build the substructure and superstructure of the bridge complete in every particular, in accordance with plans and specifications that had been prepared, and under the supervision of a consulting engineer to be jointly employed by the township and street railway company, it was still within the province and duty of the township authorities to locate this part of the highway, and equally the duty of the bridge company to adopt the location pointed out by their agent. Wherefore, it holds that the street railway company will have to pay its proportion of an expense incurred by reason of additional work required on account of such agent, who was an engineer or surveyor employed by the townships to locate the abutments, making a mistake in locating the abutments, and this, notwithstanding that his employment was without the knowledge or consent of the company. Nor does the court consider that the railway company would have any right to charge the bridge company with delay which the testi-

mony might show was caused by the direction and request of the township officers, or by their failure to furnish proper lines for the proper construction of the bridge. In this connection it states that it thinks that the bridge company might well rely upon directions given within the scope of his authority by the engineer, as well as like directions of the members of the township boards acting in good faith in the construction of the work—not to change the terms of the written contract, but as directing matters essential to the construction of the bridge, not specifically covered by the terms of the written agreement.

LIABILITY OF COMPANY FURNISHING ELECTRICITY.

Thomas' Administrator v. Maysville Gas Co. (Ky.), 56 S. W. Rep. Mar. 29, 1900.

This action was brought against the Maysville Street Railway Company and the above named gas company to recover damages for the death of a boy caused by his coming into contact with an improperly insulated, broken guy wire charged with electricity. The trial resulted in a verdict against the street railway company, from which no appeal appears to have been taken. But as to the gas company, which, besides being engaged in the business which its name suggests, supplied the street railway company with electricity to operate its car line, the judge having instructed the jury to find for it, this appeal was prosecuted, that there might be a review of such instruction. So the principal question presented was as to whether the company that furnished the electricity was responsible for the death of the boy, if it was the result of negligence in failing to keep the wires charged by it with electricity properly insulated.

The exact question submitted, the court of appeals of Kentucky says, has not, so far as it is aware, been answered by any court of last resort. That there was a duty imposed by law upon the street railway company to keep its wires properly insulated, so that those whose business or pleasure brought them into dangerous proximity to them might be protected from the deadly current which they conducted, it thinks, cannot be questioned. But did the fact that the gas company supplied the otherwise harmless wires with the force which converted them into a death-dealing agency make it responsible for the injury which resulted in the death of the boy?

The conclusion of the court of appeals is that the gas company was liable. Considering the dangerous character of the force produced by the gas company, it holds that there was a duty imposed on each to see that the wires into which it was sent were properly insulated. The danger was exactly the same whether the wires were owned by one or both of the companies. And the view taken by the court is that, when one through the instrumentality of machinery, can accumulate or produce such a deadly force as electricity, he should be compelled to know that the means of its distribution are in such condition that those whose business or pleasure may bring them into contact with it may do so with safety.

The fact, too, that electricity is unlike any other dangerous matter or force known to science, and that when so supplied it is not delivered to the street railway company and placed in its possession and control, but its control remains, as it were, with the hand controlling the generator, the court holds, distinguishes the case from one of a sale and actual delivery of possession and control of such dangerous substances as powder, dynamite, or nitro-glycerine, or even of electricity in storage batteries.

WHERE A PERSON ATTEMPTS TO DRIVE ACROSS TRACK IN FRONT OF APPROACHING CAR.

Petrie v. Third Avenue Railroad Co. (N. Y.), 63 N. Y. Supp. 315. Jan., 1900.

This was the case of a man in a light delivery wagon who judged that he could cross the track ahead of a cable car, and who made a miscalculation. This leads Mr. Justice Russell to say, at a trial term of the supreme court, in New York county, that the man had the undoubted privilege of crossing the track, if, with ordinary prudence, he could pass the intersecting point before the car reached it. He had no right to assume that the gripman would stop the car, which was conveying passengers, if that gripman also believed that he would cross ahead of the car in sufficient time. He also knew that if the car was so near that no prudent man would suppose he was going to cross ahead of it, the gripman would see no necessity

for stopping to avoid a collision with him. A person crossing a track with a vehicle must take into consideration not only the distance of an approaching car, but also what the controller of that car would have the reasonable right to expect in the way of prudent caution on the part of the driver of the vehicle. He knew that the gripman could not, in the discharge of his duty, stop before every crossing, on the mere guess that a wagon approaching would be placed in a position of danger from lack of prudent driving on the part of the person controlling that vehicle. To this, the judge adds, that he does not see why the gripman was to be judged by any higher rule than the man himself. If the gripman, seeing the situation of the two moving objects approaching the same point, could, as the man did, have judged that the latter might, with proper diligence, easily cross ahead, why was it negligence on his part to make the same mistake that the man did? If, on the other hand, the man was so near that the gripman had the fair right to believe that the horse would be stopped or turned up the avenue, what duty was imposed upon that gripman to guess at the probable action of the man, and stop his car load of passengers, to await the decision on the part of one who might be reasonably supposed not to be willing to place himself in a position of peril? That gripman did not see ahead of him any helpless object, like a child or a broken-down vehicle, upon the track. He beheld emerging from an intersecting street a horse and wagon controlled by an apparently competent person, with no intimation that such person would not exercise his superior power to choose any part of the street way for his wagon and himself which was conducive to safety. So, the court concludes, that from any point of view sustained by any reasonable evidence, there was nothing upon which the jury might rest a verdict that the gripman was negligent, or that the man was free from negligence, in consequence of which it sets aside a verdict for the man, not only as against the weight of evidence, but because there was not a fair case made for the jury to pass upon.

STRENGTH REQUIRED IN GUY WIRES.

Chattanooga Electric Railway Co. v. Mingle (Tenn.), 56 S. W. Rep. 23. Mar. 30, 1900.

A bicyclist, while riding with due care along one of the most used public streets of Chattanooga, suddenly found that he was about to run over a fallen guy wire of the above named electric railway company, and, in endeavoring to avoid it, received a serious injury, to recover damages for which he brought this action. The case discloses that an approaching car in some unexplained way slipped its trolley, which, as it rose, struck this guy wire and broke it. On breaking it fell to the ground immediately in front of the bicyclist. At the time of the accident the wire was carrying at least 500 volts of electricity,—an amount perilous to life or limb of one who came in contact with it.

This being the entire case, upon submitting it in his charge to the jury, the trial judge said that the rule of *res ipsa loquitur*—the matter speaks for itself—applied, and, if they were satisfied the injury to the bicyclist was the proximate result of the fallen wire, then there arose a presumption of negligence on the part of the company, which, unless rebutted, would entitle him to recover damages. The trial resulted in a verdict and judgment thereon for the bicyclist, which latter is affirmed by the supreme court of Tennessee, its finding, it declares, no error in the record.

The supreme court agrees with the counsel for the company that the rule is "that those who go on a highway may well be held to do so subject to their taking upon themselves the risk of injury from inevitable danger, where carelessness cannot be charged upon any one." But it does not consider that the fall of a dangerously charged guy wire is an inevitable danger, although it may be unexpected. Many accidents, it says, occur from defective mechanical contrivances, which, though not anticipated, are by no means inevitable, because they might have been avoided by the exercise of care corresponding with the danger attendant upon the contrivance.

In view of the extreme peril consequent on the displacement and fall of the wires in an electric railway system, it is essential, the court holds, that a high degree of care be exercised, not only in their construction, but in their continued maintenance in a good and safe condition. It is common experience that in propelling a car the trolley will sometimes slip from the wire along which it is passing, and if, in so doing, it comes in contact with a guy wire, it is apparent, it says, that the latter should be of sufficient strength

to withstand the violence of the stroke; and, if it fails to do so, it is not an unreasonable inference, it holds, that there has been negligence in its selection, construction, or supervision. In other words, under these circumstances, no hardship, the court thinks, is imposed upon a company which is using this dangerous agency of electricity along overhead wires, when an accident occurs from a wire which has fallen to the street, or dangerously near it, in requiring the company to repel a presumption of negligence.

MUNICIPAL ACTION NO AUTHORITY FOR CONDEMNATING PRIVATE PROPERTY.

Dewey v. Chicago & Milwaukee Electric Railway Co. (Ill.), 56 N. E. Rep. 804. Feb. 19, 1900. Rehearing denied Apr. 5, 1900.

The supreme court of Illinois says that a street railroad is built to accommodate street travel, and it has no use for private property, except so far as it may need the same for a side track, turnout, or a station, or as an incident to its main line. The necessity for its condemnation of property must be a necessity, which is incidental to the main purpose of the line along the street, accommodating street travel. Street railways are railways on or upon the streets of a city or town. They have no right to diverge from the street, and condemn private property, unless some obstruction or conformation of the surface of the ground makes such divergence necessary, in order to avoid discomfort or danger to the traveling public. A street railway may not, like a steam railway, locate its route in order to reduce time and distance for passengers traveling from town to town across the country. Such location of its route is not for the accommodation of local travel on the highways or streets, and therefore involves a perversion of the character and object of street railways.

If difficulties or obstructions are encountered which render it impracticable to construct a street railway in the street, a necessity, the court goes on to state, may arise within the meaning of the act of March 7, 1899, which will authorize the company to leave the street, and go upon private property, until the difficulty encountered is overcome, when return may be made to the highway or street. So, also, if sufficient land cannot be had in the streets for side tracks, turnouts, and stations, and the same are necessary for a successful operation of the road, the company will have the right, under the law, to resort to private property. In other words, the power conferred by section 2 of the act of March 7, 1899, which is the same as section 2 of the horse and dummy act, is not a general power of condemnation, but is limited to cases where a necessity for resort to private property is shown to exist. Such necessity must appear upon the face of the petition to condemn.

Furthermore, the court holds that the naming of a route for a street railroad under a village ordinance over private property does not create or establish a necessity to follow the line indicated by such ordinance, and that the recital of an ordinance of that character in the petition does not show that private property is necessary for the construction of a railroad, so as to give jurisdiction to the courts to condemn said private property under the horse and dummy act. The authority to condemn comes from the state, and must be derived from the statutes of the state.

Village authorities may refuse to consent to the use of their streets and alleys by a street railway corporation, but their consent or refusal to the use of their streets is the extent of their power. They control the streets, alleys, and public grounds of the village, but they do not control private property. Any attempt on their part, by consenting to a particular location of a street railroad across private property, to cause the street railroad to diverge from the streets, alleys, and public grounds under their control, is void, and confers no right and creates no necessity.

DAMAGES ALLOWED FOR EJECTION OF PASSENGER ON ERRONEOUSLY PUNCHED TRANSFER.

Eddy v. Syracuse Rapid Transit Railway Co. (N. Y.), 63 N. Y. Supp. 645. Mar. 21, 1900.

Street railroad companies, the appellate division, fourth department, of the supreme court of New York, holds should be permitted to make and enforce all reasonable rules, with respect to the use of transfers, that may be necessary to protect them against im-

position and are consistent with the rights of the public. A rule limiting the use of a transfer to the next car, it considers proper, if there be room on such car for the passenger to ride with reasonable comfort and safety. Likewise, it pronounces reasonable a rule with respect to the punching of transfers and which requires conductors to honor transfers when in doubt as to whether the time for using them has expired, but when positive that the transfer has expired, to decline it, if due precautions be taken to insure its observance and application in such a manner as to protect passengers from transfers being erroneously punched.

It being assumed that the defendant company owned or operated the line to which the conductor gave the transfer in question, which was by mistake punched at 2:30 p. m., instead of at 3:40 p. m., the court says that the passenger had a legal right, upon paying his fare, to a transfer that would entitle him to ride on the car from which he was ejected. And to hold that his only remedy, upon being ejected from the car for refusal to pay another fare, was an action for breach of the contract for transportation, it suggests might encourage the employment of negligent or incompetent conductors, to the serious annoyance and inconvenience of the traveling public, and would not afford passengers reasonable protection or security in their rights.

So, if the plaintiff entered the car believing that his transfer was valid, and was not negligent in failing to discover that it had been punched erroneously, the court holds that he was there lawfully, and was entitled to recover compensatory damages, including the indignity, the humiliation, and injury to his feelings caused by the remarks of the conductor, and his wrongful ejection from the car. And in this connection it maintains that, although he left the car by the command of the conductor, who had stopped it for that purpose, without waiting for the application of force, it, nevertheless, constituted an ejection.

But the court does not think that the passenger was entitled to exemplary damages because the conductor remarked, "I presume you picked up the transfer on the street." It would not be just, it holds, to mulct a railroad company in exemplary damages for the first act of misconduct towards passengers by one of its conductors of previously good character and conduct, and whom it had no reason to believe would be guilty of misconduct. Well-considered precedents, it states, preclude the recovery of exemplary damages in such cases, and, while public policy requires that the common carrier shall be held liable in compensatory damages for the willful or malicious wrongful acts of its conductors, no public policy demands the extension of the rule to authorize a recovery for exemplary damages when the employer has not been guilty of negligence in employing or retaining the conductor, and has not ratified his wrongful act.

DUTY OF CONTRACTORS AS TO GUARDING EXCAVATIONS AT NIGHT.

Fox v. William Wharton, Jr., & Co. (N. J.), 45 Atl. Rep. 793. Feb. 26, 1900.

When the work of construction, repair, or alteration of a street railway track in the streets of a city is authorized by law, and excavations are made in such work, which are to be kept open at night, the supreme court of New Jersey holds that the duty is incumbent upon those in performance of the work under a contract with the street railway company to exercise reasonable care to guard such excavations to protect those in the use of the streets from injury from such excavations.

In order to be reasonable, the degree of care must be a high one, because those who are in the use of the street have the right to assume, unless their attention has been attracted to the danger, that the street is free from such excavations.

Such persons as are in the use of the highway or street are bound to the exercise of only ordinary care to avoid injury from such excavations.

The question of whether the defendant, in an action for injuries received by falling or driving into such excavations, has exercised reasonable care in guarding, signaling, screening, or fencing such excavations, when the facts are in dispute, or where inferences may be reasonably drawn either in favor of or against the exercise of such care, is one for the jury, as well as the question of whether the plaintiff under such circumstances is guilty of contributory negligence.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

WET STEAM.

(From an address delivered before the Northwestern Electrical Association by W. H. Edgar.)

Wet steam is produced by two different causes in the boiler— one is priming and the other foaming. Priming is due to the lack of delivery surface or lack of steam space and to the mechanical construction of the steam dome, and especially the connections between the different domes in water tube boilers. But wherever such a mechanical defect might exist, the water might be said to spatter the steam if the boiler water contained salts of soda.

Foaming is caused by saponification, and not, I believe, by mud or dirty water. I think it is due to the soda contained in the water, and, as a rule, wherever river water containing mud is used there is more or less soda in the form not only of a carbonate but of a sulphate. You are probably well acquainted with well waters and the tendency they have to foam after running a week or two. I believe that in 90 cases out of 100 the moisture in your steam is due to saponification or due to the presence of soda.

You might have a great excess of lime and magnesia in solution in your feed-water, but when the water is introduced into the boiler and heated the lime and magnesia are thrown out of solution into suspension, and consequently there is no action whatever in the way of foaming. It does not increase the density of the water; it is not a part of the water; it is not in solution. Soda always remains in solution. Ninety per cent of the waters throughout the country used in the boilers contain considerable lime and also some soda, and nine plants out of 10 are treated in one way or another with some salt of soda, and you get the same action in all such cases that you have with the use of artesian well water and surface well water in certain places where the soil contains sulphate of soda and generally the carbonates.

If you could get absolutely dry steam, you could use a straight mineral cylinder oil without requiring the admixture of any animal oil whatever. The animal oil is necessary only to take care of the water. The condensation washes off the mineral oil, necessitating the compounding with an animal oil to hold it, and give the clinging, adhesive, film-cutting properties of a good cylinder oil.

On one occasion the officers of a certain railroad system had considerable difficulty in getting an oil to meet their requirements. They finally got up to about 35 per cent of tallow in the compounding. They were using soda ash in the boilers, and the more soda ash they used the more moisture they had in their steam, the more they saponified the water and the more moisture was carried over; and with this moisture came soda, and the more soda that came over the more it cut the animal oil, saponifying it, forming soap, and they had considerable difficulty before they found out where the trouble really lay.

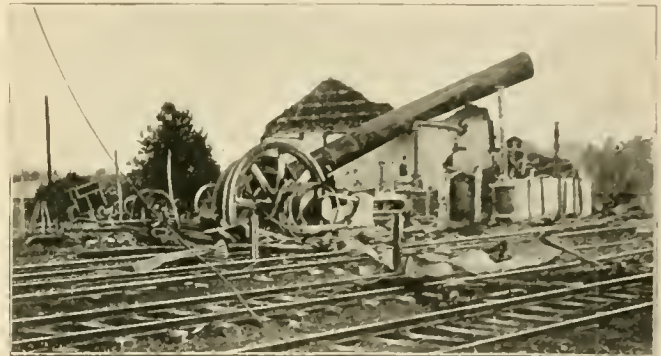
I believe that throughout the country in different plants a great many good cylinder oils have been repeatedly condemned and all due to the well water used, carrying the water a little too high in the boiler or using some preparation of soda, and, of course, the higher you carried the water, and the more you agitated the water, from a sudden opening, I suppose, of the valve in the delivery of steam, the more readily it would foam; and I believe that in all your practice in the engine room, if you would watch your water level and the nature of your water, so as to know the amount of soda it might contain, it would enable you to better take care of the oil question.

A saturated solution of caustic soda would contain 50 per cent of caustic soda; a saturated solution of soda ash would contain 40 per cent soda ash, when it would begin to cake; with salt you would have a 35½ per cent saturated solution before it would

cake. All sodium salts remain in solution until the solution is saturated, and then they cake and always cake at the hottest part of the boilers. It is quite common in Kansas and down in New Orleans and out in the Hawaiian Islands and along the seacoast where they used salty water, to buckle the tubes and bag the sheets, of boilers because of salt.

POWER HOUSE BURNED AT CHATTANOOGA.

Early on the morning of July 23d the power station and car house of the Chattanooga (Tenn.) Rapid Transit Co. were destroyed by fire, the loss being estimated at \$30,000; \$25,000 insurance was carried. The fire was discovered about 4 a. m. by a man outside the building who gave the alarm; the engineer at once started one of



VIEW OF WRECKED POWER HOUSE.

the engines and succeeded in getting current sufficient for running the cars out of the barn. Thus nearly all of the cars were saved. The boilers are reported to have been little injured. Our illustrations show two views of the wreck taken specially for the "Review" on the same day as the fire.



SHOWING CARS DESTROYED.

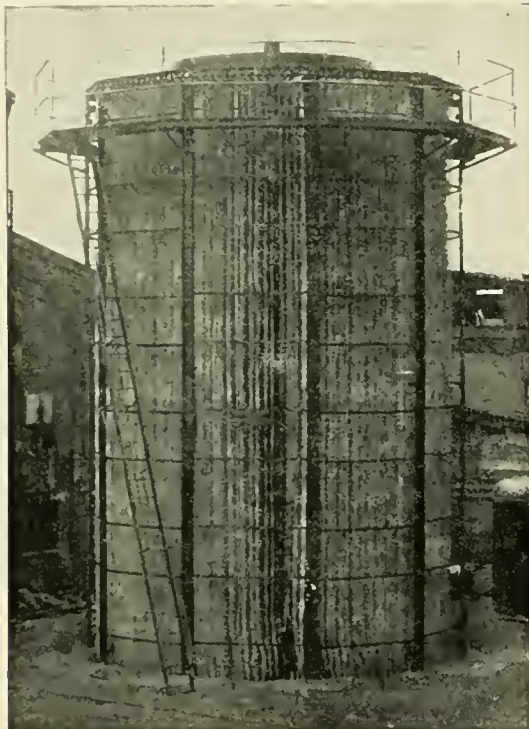
President Divine, of the Rapid Transit company, states that the power house will be rebuilt and put in operation as soon as the necessary new machinery can be secured. He at once made arrangements for using some of the steam dummy engines formerly run on the line and as good a service as possible will be given until the electric line is again in operation. The dummy made its first trip at 4 p. m. the day of the fire.

BARNARD FANLESS SELF COOLING WATER TOWER.

The advantages of running steam engines condensing are well known to the great majority of steam users but the general belief until recently has been that running condensing is impracticable except where plenty of circulating water is available at a low cost. This is not the case at the present time, however, and the owners of steam plants unfavorably situated as regards a supply of condensing water will be interested in the following description of the system of cooling the circulating water that has been devised and patented by the Wheeler Condenser & Engineering Co.

The Wheeler condenser is sufficiently popular to merely mention it in passing as it is to the cooling apparatus that we wish to direct attention.

For a considerable period the Wheeler company has been building and installing, with great success, the Barnard-Wheeler cooling



1,000-H. P. BARNARD FANLESS SELF-COOLING TOWER.

tower of the fan type, but despite the wide use of this admirable device, it has evolved a cooling tower bringing into play all the desirable features of the original tower, but dispensing with the use of the fans for creating a draft, and consequently eliminating a constant source of expense, the power necessary to run the fans.

The Barnard fanless self-cooling water tower is the result of years of study and experiment, the object in view having been to obtain maximum efficiency with minimum cost and space or ground area requirements. All mechanical means to circulate the air for cooling the water have been dispensed with. The water distribution system is unique in that provision has been made to operate parts of the tower where variable loads are encountered, and also what is very essential, that repairs and cleansing do not entail a shut down. A gallery and ladder provide means of inspection at all times. The entire structure is braced against strains, insuring rigidity under all conditions. The average height is about 30 ft. and the weight per square foot of foundation area is very low, thus allowing for roof installations where ground space is not available. The increased pump duty on a roof tower when used in conjunction with a Wheeler surface condenser is that due to the height of the tower only, as the uptake and down columns balance below the tower tank, so long as the tank is not more than 30 ft. above the pumps.

The accompanying illustration shows a tower for a plant of 1,000 h. p. capacity. The hot circulating water, when discharged from the condenser, is pumped up through a central standpipe, from

which it is led to a trough and distribution pipes, which ensure the constant flow of a thin film of water over the meshes of galvanized wire mats. The mats drain into a tank forming the foundation of the tower, and thence the cooled water is returned for another trip to the condenser. The mats are entirely exposed to the atmosphere and are arranged in such a manner that the circulation of air is complete and the consequent evaporation carried far enough to reduce the temperature of the water to a sufficiently low point for good condensing purposes, a common reduction being from say, 135° to between 85° and 90°.

When it is remembered that this result is accomplished by means of natural draft only the importance of this invention and the broad field open to it will be appreciated.

STANDARD DIRECT-CONNECTED UNITS.

At the Cincinnati meeting of the American Society of Mechanical Engineers a preliminary report was made by the committee on the standardizing of engines and dynamos as affecting those parts which are connected, which we abstract below.

The three points taken up first were: The size or capacities of machines which should be standardized; the speeds at which these various sizes of machines should be operated; the diameter of armature bore for each different size machine. The recommendations received from engine builders were reported as being remarkably uniform as regards these three points.

The committee was unanimously of the opinion that in order to secure practical results it should strive not for theoretical perfection but for a result which, while recommending thoroughly good practice, would at the same time coincide as far as possible with the practice of the greatest number of manufacturers. Also, that it was not desirable to have too many standard sizes, involving as such a course would the storage of a large number of patterns and carrying large amounts of stock for both engine and dynamo builders.

The sizes recommended as standard are 25, 35, 50, 75, 100, 150, 200, and 250-kw.

With respect to the matter of speeds for these standard sizes, the principle already stated, of choosing those which so far as possible conform to the practice of existing manufacturers was

STANDARDS PROPOSED FOR DIRECT-CURRENT DIRECT-CONNECTED ENGINES AND DYNAMOS.

Capacity in K.W.	Speeds in Revs. per Minute.	ARMATURE BORE IN INCHES.	
		For Center-crank Engine.	For Side-crank Engine.
25	300 to 325	4	4½
35	285 to 315	4	5½
50	270 to 300	4½	6½
75	250 to 280	5½	7½
100	250 to 275	6	8½
150	200 to 225	7	10
200	175 to 200	8	11
250	150 to 175	9	12

followed. As two of the members of the committee represent two of the largest manufacturers of electrical machinery in the country, it had the benefit of a knowledge of what would suit the builders of generators as well as the builders of engines, and the speeds recommended apply to a very large majority of the engines and generators which have thus far been turned out.

It will be observed in the table of speeds given that the committee has recommended an upper and lower limit for each size of generator and engine. The reason for this is that while the generator builders had already constructed machines for these extreme ranges, some of the engine builders tended rather to the lower and others rather to the upper limit. While in a very few cases some engine builders go slightly outside the limits, yet the limits recommended cover nearly all the data which were collected.

With respect to the subject of armature bores there are two classes of engines, designated commonly as "side crank" and "center crank." In the very small sizes it will probably be found possible to use only a single size of bore, but for the standard sizes recommended engine builders practically insist upon two separate series of dimensions of shaft.

One of the members of the committee made a special investigation of this subject and secured the opinions of a large number of

engine builders with respect to the sizes which would suit them, which enabled the committee to reach a conclusion quite readily.

The tentative recommendations of the committee are given in the table. A number of other matters on which it seems practicable to make an agreement will be taken up later.

WHY SOME MUNICIPAL ELECTRICAL PLANTS DO NOT PAY BETTER.

We take the following extracts from a paper read before the Northwestern Electrical Association at its Waupaca meeting, June 28th, by Prof. George D. Shepardson, of the University of Minnesota. The author has in mind electric-light and power stations, but the same things he finds to be true of them would also apply to municipal railways.

The subject of municipal ownership has been discussed at almost every session of this association, and the general sentiment seems to be that the principal cause of the agitation in favor of municipal ownership is the circulation of incorrect figures as to the real cost of operating existing municipal plants. It is easy to see why the reports of such cost are almost invariably too low. The towns almost never know the real cost of the lights, on account of faulty records. Each town desires to make the best showing possible, for when a low figure is quoted, the general public immediately concludes that it is enterprising, while those who know how such reports are compiled smile at their ignorance of the real cost. The other principal cause is the general belief on the part of the public that the electric companies are making enormous profits, whereas, the painful fact is that probably few of the smaller companies at least are really earning any dividends. In towns of less than 2,000 or 3,000 inhabitants, it is a very difficult matter for an electric-light station to earn respectable dividends unless it is operated in conjunction with some other business, for example, a mill, so that the labor and administrative expenses are reduced to a minimum. Similar conditions hold in many plants in larger towns. The reports of some stations show larger profits than actually exist, which, while flattering to stockholders, are yet deceptive, if not positively harmful. A uniform method of keeping accounts, such as is being urged by the National Electric Light Association, would do much to help station managers discover their own real situation. Did the municipal private plants have correct methods of keeping records, so that it was generally known how much it actually costs to operate municipal plants and how small the net earnings of private plants really are, the agitation would probably die a natural death in a few years. As a matter of fact, the managers of some of the largest central stations advocate the public supervision of their accounts that the actual facts may be in the possession of the people. The ordinary citizen reads the report that the operating expenses of a large plant are only 50 per cent of the gross income, and he believes that the remaining 50 per cent is clear profit, forgetting about the numerous charges which reduce this to 15 or 5 per cent. He also compares the cost of a kilowatt-hour produced at the station with that charged on his bill for service, and then firmly believes that the company is making from 100 to 2,000 per cent clear profit. The public generally have no objection if a reasonable dividend is earned, but there is objection to what are felt to be enormous profits.

The result of the agitation for municipal ownership of electric plants was shown in the statistics for Minnesota; in 1894 the central-station directories showed 10 municipal and 38 private electric lighting plants, while in 1900 there were 53 municipal and 63 company plants.

Of the data on costs it is said: The reports of the low rates with municipal plants are due to several causes, usually to ignorance of the real cost. Expenses that should be charged against the electric plant are often placed against the water-works or against the general fund, and are often ignored until it becomes necessary to pay some bonds. Depreciation is often not considered, and when something finally gives out, a special appropriation is made for renewals and is charged against something other than the operating expenses of the municipal lighting plant. The result is that the rates received for electric lights are often considerably below actual cost to the town, and the saving to the people who take electric lights is made up by increased taxation of the whole people. If the town sells electric light below cost, it

should in all reason furnish kerosene and candles at proportionally low figures. And why not groceries and dry goods likewise?

After a resume of the arguments for and against municipal ownership, there are given some incidents (from personal knowledge and the contributions of friends whose testimony is believed to be reliable) showing why the efficiency in municipal plants is less than called for by the theories of some political economists.

At one place they decided to secure a cheap engineer to design their plant. He specified a 20-h. p. gasoline engine to operate a 600-light dynamo, and, in addition, to drive the pumping machinery for the water-works. The council made a contract for the gasoline engine as specified, including a proviso that if a steam plant was substituted, the gas engine contractor was to receive a commission of 15 per cent of the cost of steam plant. It is reported that this was actually done and paid. Two of the larger towns of the state were contemplating municipal ownership, and each secured the services of an inexperienced young man to prepare plans and specifications for the plants, in one case because he was a friend or relative of one of the committee, in the other case probably because he was cheap. The country is full of half-baked electricians who pose as engineers and as advisers to investors.

There is frequently an attempt to reduce operating expenses too far. At one place the council discharged a good engineer and hired another because he was cheap. Within three days he got his cylinder full of water and broke the girder of the Corliss engine. It is common, even with privately-owned station to attempt economy by hiring cheap firemen, since any one can shovel coal or throw wood. But owners fail to recognize that by paying ten to twenty dollars more for securing a capable fireman they are apt to save his extra wages several times over in reduced fuel bills.

In some cases there is great loss on account of downright dishonesty of the superintendent or the council committee. A city employing an honest superintendent, with liberal pay and some backing in the council, will often prevent small and also large steals which are almost invariably found in municipal departments, such as lamp renewals (on which it is difficult to keep accurate account or check), "rake-offs" on purchases for the plant for which in the end the city pays. One supply company offered a new superintendent as high as 20 per cent on all purchases the year round, as they had always done so. This is substantiated by old bills. Lamps are checked up once a month while burning and one is often asked to go easy in counting, being offered all sorts of bribes from cigars or drinks to considerable sums in cash. I know of officials receiving special concessions in this way amounting to several hundred dollars per year. All this could have been prevented by a proper system of checking, but at best comes down to one man being honest. "Carloads of wood have been sold 'by the car' by former superintendents. An investigation by an alderman indicated that a loss of over \$1,000 per year had been received from that source alone." In another place the city recorder is said to collect the accounts and sometimes sublets the job to his friends who knock down about half and turn the balance over to the recorder, who in turn transmits to the treasurer so much of it as suits his convenience, there being no records and no other system.

The political conditions prevent best results in many plants. Where the employes are appointed by aldermanic influence it is not uncommon for an underling to retort to his superior officer when corrected for some shortcoming, "Oh, well, I have more pull than you have, and what are you going to do about it?" In one town until recently the plant was operated by two parties, an engineer, who took care of the station, and a lineman in charge of outside work. These parties were not on speaking terms, and, of course each attributed all troubles with the lights to the other man's part of the plant. This state of affairs continued for several years, during which time the arc system was in bad condition, the lineman attributing it to the dynamo and the engineer laying it to the lamps. When a change was made, there were two applicants for lineman, one a young man who would have attended to business, the other was a young son of one of the aldermen and with little experience or ability. There were also two applicants for fireman, one a good man and the other a lazy, good-for-nothing fellow who claimed to have considerable influence in the country so that he could turn considerable trade to some of the stores in which the aldermen were interested. By combining forces the poorer

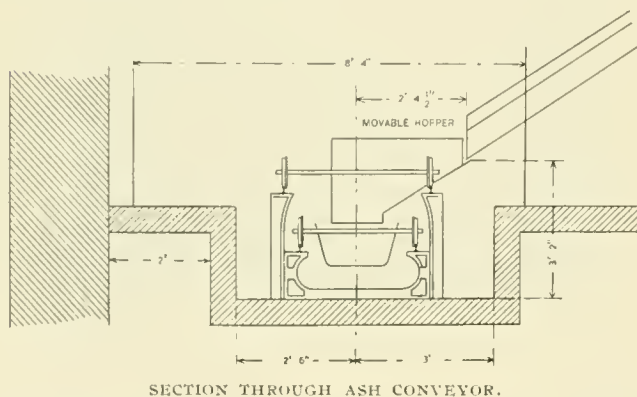
man was appointed in each case. There is a continual struggle between the temperance and the saloon element in most of the towns and when a new election puts the opposition into power, the superintendent is almost sure to lose his place in favor of some friend of the new management.

COAL AND ASH CONVEYOR AT NORTHWESTERN ELEVATED PLANT.

Since the publication of our July issue we have received from the John A. Mead Manufacturing Co., of New York, a description of the coal and ash handling plant it is building for the Northwestern Elevated Railroad Co., of Chicago, giving some of the details which were not apparent from the general drawing on page 370 of the July "Review." As will be seen on reference to that view the coal storage building is 24 x 80 ft., located on the north end of the lot and connected with the boiler-room by an overhead passageway, about 40 ft. above the ground, and by a tunnel. This trestle is about 260 ft. long, and the receiving hoppers are about 50 ft. north of the power station; the ash tanks are just north of the receiving hoppers.

Coal is unloaded from the railroad cars directly into the hoppers and thence passes through the crushers, which are driven by independent electric motors, into the buckets of the horizontal conveyor which takes it through the subway to the storage house and thence up and onto the elevated trestle. The coal is dumped into the storage house or carried on south and deposited in hoppers above the boilers; the dumping is accomplished by means of a movable dump carriage which is operated by a separate chain and wheels, and can be set at any desired point on the upper line.

For loading ashes into the conveyor a special movable hopper traveling over the conveyor buckets on separate tracks in the basement of the boiler-room is stopped under one of the chutes leading down from the ash pit, and the chute opened. By this means ashes are transferred to the conveyor buckets in such manner that



they cannot reach the wearing parts of the conveyor. Once in the conveyor the ashes are carried around and up, and emptied into the ash tanks, from which they can be drawn off into railroad cars or carts. The drawing shows the ash conveyor and movable hopper.

The driving machinery for the conveyor is located on the upper line just opposite the stack; there are two drivers operated by independent electric motors of the iron-clad type, one driver being held in reserve so that in case of accident either to driver or to electric motor, the other driver can immediately be pressed into service.

This is also true of the coal crushers which are duplicates and entirely independent of each other. The length of the conveyor is approximately 1,300 ft.; the buckets and links are of malleable iron, buckets of this material being the only ones that will satisfactorily handle ashes for any length of time. The capacity of the conveyor is from 40 to 50 tons of coal per hour.

It is understood the new Lansing (Mich.), St. Johns & St. Louis Electric Railway Co., formed to build an electric line, has sold out to the Lake Shore & Michigan Southern R. R., which proposes to make the road a steam line.

IRON AND STEEL RAILS IN AMERICA.

Abstract of a paper by Robert W. Hunt, M. Am. Soc. C. E., read before the London meeting of the American Society of Civil Engineers.

The first railroads in America (1829-1833) were laid with strap-rails, $\frac{1}{2}$ in. to $\frac{5}{8}$ in. thick and $2\frac{1}{4}$ in. to $4\frac{1}{2}$ in. wide, on longitudinal stringers. On later work some strap-rails and some fish-bellied, Clarence, H, and U-rails were laid; the sectional rails were all imported until 1844 when some of the U-rails were rolled at Mount Savage, Md. The T-rail was invented by Robert L. Stevens, of Hoboken, N. J., but in Europe is generally known as the "Vignoles" rail, after Charles W. Vignoles, who introduced it there. The first T-rails rolled in America were made at Dauville, Pa., in 1845. These early rails were all short, none over 15 ft. long; the first 30-ft. rails were rolled in 1855 by the Cambria Iron Co., of Johnstown, Pa.

The rolling of iron rails was attended with many difficulties. If the pile of bars was not heated to a sufficiently high degree, the welds would not be perfect; and if heated too highly, the iron would crack in the process of rolling and yield an imperfect product. If the metal was too soft, although the rail might be free from flaws and bad welds, it would wear out rapidly under traffic. Under all circumstances it was important that the rolling process should be completed as quickly as possible, so that the reductions should be made while the iron had lost little of its heat. This, together with some local conditions, led to the invention by John Fritz, Hon. M. Am. Soc. C. E., of the three-high rail train. Three-high sets of rolls had been used for many years in making merchant bars, but it required the application of the "Fritz yielding hanging guides and driven feed rollers" to make them practical for rail rolling. This improvement was put into successful operation at the Cambria mills in 1857. It has ever since remained as the typical American rail mill. Since the introduction of steel rails there have been several two-high reversing mills on the English plan used in America; in fact, two of this kind are now running. But the three-high is the American mill, and has permitted the tremendous production which has been attained in later years.

The early mills required the work of handling the material as it passed through the rolls to be done by manual labor, through the use of tongs and hooks. Probably the rolling of iron piles, with their necessarily peculiar handling, would have indefinitely continued this, but with the use of solid steel blooms, the troubles lessened and made possible the introduction of automatic machinery. The tong and hook system necessitated the employment of 15 to 17 men, and the production of steel rails was limited to not over 250 tons per turn. Automatic machinery revolutionized this, both as to number of men employed and the possibilities of production.

It was the writer's fortune to introduce the first driven rail-mill tables, those in the works of the Albany and Rennselaer Iron & Steel Co., Troy, N. Y., in March, 1884. These were in front of the finishing rolls, and worked so well that an automatic arrangement was soon after placed in front of the roughing rolls. This latter arrangement was more particularly designed by Mr. Max M. Suppes, then the master mechanic of the works, and now the general manager of the Lorain Steel Co., Lorain, Ohio. Naturally, these devices were protected by letters patent. From this start other inventions were made, and many improvements by other American engineers have followed, until the present American rail mill, capable of turning out 50,000 tons of finished rails per month, has been developed.

It was the writer's fortune to become connected with railmaking in 1856, and among his earliest recollections is the statement that the users of rails had in service certain makes which had been and were giving good results impossible to be obtained from any of more recent manufacture. How familiar that statement must sound to many of you, and as of recent date!

Then, as now, the question demanded an answer, and many sought for the solution.

The first iron rails were made from straight pulled bars. These bars were about 1 in. thick and were placed one upon another, until a pile of sufficient weight and height was formed; the pile was then reheated and rolled into rails. And it was to the formation of that pile that inventive genius was applied.

From an investigation of the fracture of some of the rails which had given satisfaction, it was discovered that the pile of bars from

which they had been rolled had been entered into the rolls edgewise, thus bringing the line of welds between the bars in vertical instead of horizontal position. This presented a different structure to the wheel wear, and seemed to be logical. Based on that supposition many rails were so rolled, and the writer believes that the scheme was patented.

Where the rail was rolled with the layer of the pile in a horizontal position, particular attention was given to the character of the top bar, which would, of course, form the wearing surface of the rail. Cold-short or granular iron was used for it, while the remainder, or at least the flange of the rail, was of fibrous iron.

At one time a rail with a puddled-steel head—or rather with the top bar of the pile of puddled steel—found much favor, but, owing to the difficulty of obtaining uniformly good welds, the results were not satisfactory. Some of these so-called steel-headed rails had the top bar of what was known as silicon steel.

Another plan, on which much money was spent, was to hammer a puddled ball, or weld two puddled balls together, under a steam hammer, and draw them into a slab 2 in. to 2½ in. thick, which was used on the top of the rail pile. Under an order from the Pennsylvania Railroad Co., the Cambria Iron Co., in whose employ the writer was then serving, erected a special steam hammer, and made several thousand tons of such rails. Their service was somewhat disappointing, and the practice was abandoned.

At that time, as since, commercial conditions controlled. The railroads had the worn-out rails on their hands, and regardless of whether or not the practice would give satisfactory results, they adopted a system of having the old rails re-rolled into new ones. At first a certain percentage of new iron was specified, but as the necessities for immediate economies increased, that demand was eliminated from the contracts, and the new rails were composed entirely of the old ones. The best practice was to make a pile of old rails, break it down into bars, which were piled upon each other, and then rolled into rails. But presently this was found to be too expensive to successfully meet the cry for cheaper rails, and only the top and bottom of the piles were formed from re-worked iron, the center being composed of from three to six pieces of old rails.

From the many re-workings, the cheapening of the process of manufacture, and the increasing demands of traffic, the wear of the iron rails become more and more unsatisfactory, until it seemed as though, from that cause alone, the limit of railway development had been reached. Such situations frequently occur in earthly affairs; and seldom if ever has the occasion failed to be met by a solution of its difficulties. In this case came the invention of Bessemer.

It is an historical fact that the first rail ever made from Bessemer steel was placed on the Midland Railroad, of England, early in 1857, at a point where iron rails had sometimes to be renewed within three months; and it remained there until June, 1873, some sixteen years, during which time about 1,250,000 trains and any number of detached engines and tenders passed over it.

We all realize that without such an innovation as Bessemer's, the subsequent tremendous expansion in railway development would have been physically impossible.

Railroad managers were timid about using steel rails, and in America many attempts were made to produce a satisfactory rail having an iron base and web, with a steel-capped top. None was satisfactory, and the Bessemer steel rail soon conquered the situation.

The first steel rails made in America were rolled at the works of the North Chicago Rolling Mill Co., May 24, 1865; the first production of American steel rails on a commercial order was at the mill of the Cambria Iron Co., in August, 1867.

For a time after the starting of the Bessemer works of the Pennsylvania Steel Co. the ingots were cast from the top on the then accepted English plan. The late Alexander L. Holley, then in charge of those works devised a means of bottom-casting the ingots, the steel being poured into a central octagonal mold about 14 in. in diameter at the bottom and 10 in. at the top, from the bottom of which the metal flowed through connecting gates into four surrounding molds 8½ in. square. This plan was adopted after consultation with Mr. George Fritz, who had rolls turned to take the 8½-in. ingots. The central or spruce ingots were hammered into blooms. It was found that the small ingots rolled satisfactorily, while, on the contrary, the central ones cracked badly during working.

This led to much discussion and consultation among the operative officers of the Cambria Co. and Mr. Holley, the result of which was that John E. Fry, then superintendent of the Cambria Iron Co.'s iron foundry, suggested the use of a rammed-up center sprue, 4 in. in diameter, connecting through firebrick gates with surrounding ingots; the sprue and gates to be treated as scrap. This plan answered admirably.

While in charge of the experimental Bessemer Works at Wyandotte, Mich., in the interest of the Cambria Iron Co., the writer had developed a manner of bottom casting ingots. Mr. Holley, having protected his plan by a patent, Mr. Fry and the writer united in patenting theirs, and their interests and those of Holley were consolidated. For some years after this, practically all bottom-casting of ingots in America was licensed under these patents. After a time the price of rails became so much reduced that the loss incident to the scrap of the center sprue and bottom gates made in bottom-casting became a serious matter; and while it was and is impossible to cast as sound, and hence as good, ingots from the top, the better plan was abandoned.

The American blooming mill, which soon superseded the steam hammer in rail making, is due to George Fritz, who, in perfecting his plans, had the benefit of the advice of his brother John, then manager of the works at Bethlehem, Pa.

Holley started the innovation by which the production of steel ingots has been increased so greatly. Fritz gave the blooming mill, which would not only take care of all that was sent to it from the converting works, but, like *Oliver Twist*, ask for more; and the late Capt. William R. Jones, Robert Forsyth, M. Am. Soc. C. E., and several others, built rail mills which were not satisfied with the amount of steel sent to them by any blooming mill. This has all been magnificent. It has made possible undreamed of low prices for steel rails. It has helped to build railroads, but has it improved the quality of the rails produced?

Steel rails, when first manufactured, replaced iron rails, which, through their deteriorated quality and the increased duty demanded of them, were giving most unsatisfactory service. Some of the early steel rails failed, but most of them were so much better than the best of their predecessors that such failures did not excite adverse comment. They were of what would now be considered light sections, and thus in their production from the 6 in. x 6 in. or 7 in. x 7 in. blooms from which they had been rolled, had received much work, and at a comparatively low temperature. In the writer's judgment the greatest factors in the production of good rails are covered by the words "work and temperature." All steel men know that work at high heats does not change the grain of steel at all in proportion to work given at lower temperatures.

For years after the introduction of steel rails a 65-lb. per yd. section was considered a heavy one. In fact, in America it was the heaviest used, and much the largest percentage was not over 60-lb. These were rolled from 7 in. by 7 in. blooms. The ingots from which the blooms were made were generally 12 in. x 12 in. After the bloom was formed it was examined carefully after becoming cold, and all cracks and mechanical imperfections were chipped out. Then, after slow heating, with care to avoid too high a temperature, the blooms were rolled into rails by light reductions. While this was being done, if a defect showed itself, the process was stopped until it was chipped out. Now, this slow work at a moderate and steadily decreasing temperature, resulted in a fine grained metal, which, of necessity, no matter what may have been its chemical composition, would give greater resistance to the wear of traffic than could be possible from the coarser grained steel which is in the head of the heavier and more rapidly rolled sections of today.

By waiting long enough, the things of the past always become the best. That is, provided the past is not examined too closely. It must be remembered that the early rails replaced a much inferior article; in fact, created a revolution in railway maintenance of way. Hence, if a few from any cause failed, it excited little comment; they were quietly replaced by others. After a while these failures were forgotten and the whole of existing rails were instanced as an example of what rails should be. Another thing which must not be overlooked is, that the early steel rails had the ultimate stress of traffic applied by slow degrees. In other words, the traffic to which they were subjected when first put in

service was for them light duty. Heavier rolling stock, faster and more frequent trains, came gradually. The old-time rails, which are in these later days so reverently mentioned, had been subjected to a cold rolling process before being given their severest task. Today an 80-lb. is hardly cold before a 175,000-lb. locomotive, hauling 100,000 lb. capacity cars at 35 miles per hour, and limited expresses of heavy Pulmans at 60 miles per hour, are thundering over it.

The details of manufacture of steel rails changed not only in America, but also in England and other countries. This had to be, and it would today be as impossible to return to the earlier methods as to restore the service of stage coaches.

In 1876 the writer chronicled with pride the fact that the North Chicago Bessemer Works had in a single month produced 6,457 gross tons of ingots and that it led the world's record. Today these works have been abandoned, their places having been taken by the present South Chicago plant of the Illinois Steel Co., in which rail mill the largest month's production has been 58,103 gross tons.

While the faster work of modern practice has somewhat altered the character of the steel in rails, it must not be assumed that the product has been increased without any regard to other considerations. This is not true; on the contrary, the outward character or finish of the rails has been improved to a radical extent. While working fast, the improved machinery is also reliable, and the care exercised in keeping true to section, square sawing, accurate drilling and straightening of both line and surface, yield results which it would have been impossible to obtain in the earlier days. In fact, the requirements of the railroads, in consequence of increased weight and speed of traffic, etc., have made it imperative that such finished rails should be given them.

It is not desired to draw any invidious comparisons, but in the writer's judgment, American makers are today not only turning out the most rails, but at the same time the best finished one now produced. Moreover, foreign rails, imported into the United States and Canada during late years, have not worn any better than American rails.

It has been stated that examining into the past sometimes disproves assumptions. So that, while in the earlier days rail steel and rails were made with all the time and care which has been described, all the rails produced were not satisfactory. The experience of the Pennsylvania Railroad was such that its chemist, Dr. Dudley, made an investigation and reached conclusions in favor of chemically softer rails. His results were made public in 1878, but the demand thus created for softer rails did not long continue.

In 1881 the 11 Bessemer mills then making rails answered inquiries of Mr. Holley and stated that there were 188 patterns of rails considered standard, and that 119 patterns of 27 different weights per yard were regularly made. In 1891 the American Society of Civil Engineers appointed a committee to consider rail sections, which made its report in 1893. During 1899 quite 75 per cent of all rails rolled at American mills were of what are commercially known as the American Society sections.

When the Bessemer process was introduced in America imported English pig irons were used, but American irons were experimented with and gradually displaced foreign irons. Geographical and commercial conditions have led to the use of entirely distinct chemical specifications in the eastern and western districts.

The heavier equipments and higher speeds required more rigid road beds, which could only be obtained by heavier sectioned rails. These were gradually adopted. It was naturally expected that as the sections were increased so would be the resulting amount of service yielded by the rails. From the very first, the results obtained were disappointing, and the writer doubts whether we will ever succeed in getting results as satisfactory as those yielded by the lighter sections. As the area of the section is increased, so, of necessity, will the work upon the steel in forming it be decreased, and as the resulting mass is enlarged, so will the amount of heat retained in it at the time of the final reduction through the rolls be increased. In the writer's judgment it will be found that the most satisfactory results will be obtained by so modifying the rolling system that the final pass (or better, passes) shall be given after the temperature of the partially formed rail has been lowered. This is not by any means a new idea, but as yet it has not been carried out in a manner calculated to obtain the best results.

Some years ago Mr. F. A. Delano, now superintendent of motive

power of the Chicago, Burlington & Quincy R. R., in the interest of that company, had some rails rolled at the South Works of the present Illinois Steel Co., then owned by the North Chicago Rolling Mill Co., on such lines and under his personal supervision. Unfortunately, these rails were of a peculiar section, which was not continued, but the writer believes that the wear of the metal itself was encouraging.

The satisfactory wear being given by rails renewed by the "McKenna Process" at the Joliet and Kansas City Mills of the McKenna Steel Working Co., bears very strongly on this point. Mr. McKenna takes rails which have become unfit for further service in main line tracks, from having become rough in surface, through flow of metal, or other causes; or which have become curve-worn on the side of the head; and after carefully removing any fins which have been formed on the upper edges of the heads by metal flow, charges them into a long furnace, and, when heated to not more than 1,500° F., they are drawn from the furnace by a mechanical contrivance which at the same time removes any scale which may have formed on their surface, and slightly upsets or flattens the section. The rail is then passed through a set of forming rolls, from which it is carried forward to another set, in which it is given a finishing pass. The rail is then sawed hot, and cold-straightened and drilled in the usual manner. And while the section has been somewhat reduced, the original finishing sections and heights have been maintained.

Now, the steel has been given finishing work at low temperature, and examination has proven that the grain of the metal in the head of the rails has been "fined." But, more important than all, the wear of the renewed rails is promising to be much more satisfactory than that obtained from new rails of heavier sections. This treatment of rails is no longer in an experimental state, as it is over five years old, and there are nearly 100,000 tons of renewed rails in service on the Chicago, Milwaukee & St. Paul; Atchison, Topeka & Santa Fe; Wabash and other large systems. One chief engineer, on whose road there are many of these rails, says: "No rail ought to be used at all until after it has been renewed."

The writer has gone on record so often, as believing that in the absence of work at low heats, incident to the present method of making heavy-sectioned rails, it is important to increase the carbon with the section to as great an extent as the phosphorus present will permit, without incurring risk from breakage, that it seems unnecessary to repeat the arguments.

At the Atlanta meeting of the American Institute of Mining Engineers, in October, 1895, the writer presented a set of specifications for "Steel Rails of Heavy Sections Manufactured West of the Alleghanies." In accordance with these specifications thousands of tons have been made and used with satisfactory results. During the last two years the western makers have declined to limit the phosphorus to less than 0.10 per cent, but, in fact, have been making steel with a fraction less than that amount—say 0.09 to 0.096 per cent. And he regrets to say that in many cases they insist that the amount of carbon shall be less than that which he has advocated. He believes, however, that gradually, higher carbon will prevail; and certainly has not had any cause to change his mind on the subject. His experience as a steel-rail maker, and as an observer of the wear of steel rails of many sections and diverse chemical composition, leads him to advocate: First, work, after careful heating of the steel, and continued until its temperature has been much reduced. Second, that the carbon percentages shall be increased in proportion to the increase of rail section, the ultimate amount being, of necessity, limited by the contained percentage of phosphorus. In all cases he advocates the use of drop tests, on samples from each heat of steel.

At present many of the American railway engineers use the drop test, but none of them demands the static or tensile tests insisted upon by so many engineers of other countries; nor does the writer think there is any necessity for these latter. The chemical analyses and drop tests are all sufficient.

As a matter of record, the writer gives the chemical formulas contained in his specifications of 1895, in accordance with which, as stated, thousands of tons of rails have been made and have given good results. And while at present the western makers decline to limit their steel to 0.085 per cent phosphorus, the writer certainly sees no reason to decrease the carbon. In other words, so many rails have been made and proven safe with quite as much carbon as given in these specifications, and with 0.10 per cent phos-

phorus, that the writer does not think the former element should be made less, certainly not until the details of manufacture have been changed.

ROBERT W. HUNT'S SPECIFICATIONS.

Sec. 8.—The carbon in the 70-lb. section shall not be below 0.43 per cent nor over 0.51 per cent. In the 75-lb. section, not less than 0.45 per cent nor over 0.53 per cent. In the 80-lb. section, not less than 0.48 per cent nor over 0.56 per cent. In the 90-lb. section, not less than 0.55 per cent nor over 0.63 per cent. In the 100-lb. section, not less than 0.62 per cent nor over 0.70 per cent.

The phosphorus shall not exceed 0.085 per cent.

The silicon shall not be below 0.10 per cent.

The remainder of the chemical composition of the steel to be left to the maker's judgment.

CROWDED CARS IN ST. LOUIS.

The cars of the St. Louis & Suburban Railway Co. during the time that the service on the Transit lines was impaired by reason of the strike, were in a greatly "congested" state. These cars seat 40 persons, but when crowded frequently carried as many as 175 passengers. By courtesy of Mr. George D. Rosenthal, who repre-



A CROWDED CAR ON THE ST. LOUIS & SUBURBAN.

sents the General Electric Co. in St. Louis, we are enabled to publish the accompanying illustration.

At first the passengers on top secured free rides, but later the steps at the front end of the car were removed and outside passengers were required to pay fare to the conductor before climbing up. Notwithstanding the crowding very few accidents were reported.

DISCRIMINATION IN USE OF BRIDGE.

In our June issue we briefly noted that the Supreme Court of Pennsylvania had decided that the city of Pittsburg could exact tolls from a traction company for the use of a bridge owned by a separate company, notwithstanding the fact that the city owned all the stock of the bridge company and had made the bridge free for all other traffic.

The Pittsburg & Birmingham Traction Co. has applied for a writ of quo warranto to compel the Monongahela Bridge Co. to come into court and show why the contract in question should not be revoked.

Mr. J. C. Hubinger owns all the franchises for electric lights, telephones and street railways in Keokuk, Ia.

Because the words "not guilty" appeared in larger type than the remainder of the court's instructions to the jury, in a suit against the Chicago City Ry. to recover for personal injuries, the Appellate Court has ordered a retrial of the case.

BROOKLYN 10-CENT FARE CASE.

In our last issue we noted that the Supreme Court of New York had refused to enjoin the Brooklyn Rapid Transit Co. from charging a 10-cent fare on its Sea Beach line to Coney Island, but the justice said that the attorney general might sue to have the company's charter annulled. The plaintiff in the injunction suit at once acted on the suggestion, and filed a petition with the attorney general.

This suit will probably be dismissed, because of the ruling of the appellate division of the Supreme Court in another case, made July 23d. Arthur Barnett had been ejected because of his refusal to pay the 10-cent fare, and on a suit recovered \$65 damages. On appeal the court held that the provision in the railroad law limiting the maximum fare on a street railway system to 5 cents for a continuous ride did not apply in this case, because the Sea Beach line was a steam railroad, and because it was already built and thus expressly excluded from the operation of the law, which did not apply to any part of roads built and in operation prior to 1884.

STREET RAILWAY FOR KENOSHA, WIS.

The franchise for a street railway granted to Messrs. Haynes and Clausen by the city of Kenosha, Wis., has been acquired by Mr. B. J. Arnold, of Chicago, who has deposited with the city certified checks for sums aggregating \$9,000, and also bonds, one for \$10,000 and one for \$50,000 to comply with the conditions of the ordinance. The bonds were executed by Mr. Z. G. Simmons, of Kenosha, and are admitted by all parties concerned to be perfectly good, though the mayor of Kenosha is at present contending that they should be made by a surety company to conform to the wording of the ordinance. It is believed, however, that the mayor will accept the bonds offered.

If permitted to do so, Mr. Arnold will build the road this year; it will be part of the connecting line between Kenosha and Waukegan, which when completed will give a through line from Evanston to Milwaukee.

RAISE IN WAGES APPRECIATED.

On July 10th, Mr. J. M. Roach, president of the Chicago Union Traction Co., issued a letter to his employes notifying the North Side men of an increase in wages. This letter will be found in full on page 416 of the "Review" for last month.

Shortly after the notice was issued, President Roach was waited upon by a delegation of 17 of the older employes from the North Side lines, who presented him with a roll containing the names of nearly 2,000 conductors and motormen, who wished to express their thanks for the increase and their appreciation of the efforts made to better their condition. Mr. Roach assured the committee that he would never fail to look after the interests of his men, and told them the company would always share with its employes any future profits that might result from their care and faithfulness in the performance of their duties. He further assured them that if at any time they had any suggestions to offer for the betterment of the service, or complaints to make, he would be pleased to hear from them.

ELECTRIC RAILWAYS IN CANADA.

The Canadian Government has issued an interesting report on the street railways of the Dominion, from which it appears there are 632 miles of track operated by electricity. For the year ending Dec. 31, 1899, the number of miles run was 29,646,847, and number of passengers carried, 104,033,659 or 20 times the total population of the country. The paid up capital invested amounted to \$21,700,000.

For the same year the steam roads carried 87,865,468 passengers less, and ran 4,353,988 passenger car-miles less than did the electric lines.

The practice of running trail cars has been discontinued by the Union Railroad Co., of Providence. It has been decided by the management that trailers are responsible for a large proportion of accidents.

HARTFORD STREET RAILWAY BAND.

By the courtesy of Mr. T. C. Davis, who was instrumental in organizing the Hartford Street Railway Band, we are enabled to publish the accompanying engraving and also the constitution, which it is hoped will be of material assistance to others who may contemplate having a similar organization.

CONSTITUTION

The name of this band shall be Street Railway Band, Hartford, Conn. The object of this association is two fold; first, the encouragement of the study of music among its members, and second, to give public and private performances for mutual gain and profit.

I. The officers of the Street Railway Band shall consist of a president, a vice-president, a secretary and a treasurer, each of

for the same, as they deem best for the interests of the organization.

V. If the leader or musical director is a paid man, he shall not be considered an officer, but when on duty or at rehearsals he shall have full command of the band, and his orders must be obeyed to the letter. Should the leader be selected from the ranks of the band, the office must be created an elective one, and added to the list of officers, with the same power as given to the paid leader.

VI. When the band turns out for duty the president shall act as sergeant of the band and assist the leader in maintaining discipline, and in case of the latter's absence, assume the position of director.

VII. The president shall appoint a librarian to take charge of the music, etc., and also appoint such committees as shall be found necessary in the course of events.



STREET RAILWAY BAND, HARTFORD, CONN.

whom shall be elected annually, and also an advisory board of three members, all of whom shall serve for the period of one year.

II. The meetings of this association shall consist of one rehearsal each week and four quarterly meetings, which shall be devoted to the business of the organization. At the quarterly meetings the president shall preside, and in his absence, the vice-president. The weekly meeting shall be under the direction of the leader of the band.

III. The regular quarterly meetings shall be held on the last Sunday of April, July, October and January. The regular weekly rehearsals shall be held on Sunday afternoon. Should necessity arise the president may call a special meeting at any time.

IV. The president shall preside at all meetings of the band, and the vice-president shall do the same in the president's absence. The secretary shall attend to all correspondence of the association, keep a record of the meetings, etc. The treasurer shall keep a correct account of all moneys received and disbursed and shall render a quarterly account of the same; it will also be his duty to make out bills and collect the amounts for services rendered by the band. The advisory board shall formulate plans for the raising of funds by subscriptions, concerts or in any other manner that they may deem advisable, for the maintenance of the band's library, uniforms, instruments, rent of band-room, furnishings, etc. They shall also act as an auditing committee to audit the accounts of the treasurer semi-annually. The advisory board, in conjunction with the president, shall have full power to regulate the price of engagements, and to accept or reject offers

VIII. Every member must consider it his imperative duty to attend all meetings of the organization, and turn out for band engagements when properly notified of the same by the president or secretary. Should he wilfully neglect to attend after due notification, unless excused by the president or leader, he shall be subject to a fine, to be imposed by a majority vote of the organization.

IX. Applicants for membership must signify their intention in



KEY TO GROUP.

writing, and shall be voted on at the next quarterly meeting. A majority vote elects the candidate.

X. Any member may resign from the band by handing in his resignation in writing to the president. In doing so he forfeits all rights or claims upon any band property, and must return all of the same in his possession before his resignation can be accepted.

XI. Each member of this organization must endeavor to uphold its dignity and improve its musical standing, and to that end he should take more than ordinary pride in attending the rehearsals, and to his uniform equipments, instruments and other band properties, and conduct himself with propriety upon all occasions, pay proper respect to the leader and officers, and ever keep in mind that a misdemeanor while in uniform or with the band does not count against the individual, but disgraces the whole organization.

XII. The regular dues of this association shall be 25 cents per week, to be paid to the secretary at each rehearsal. Members shall be fined the sum of 25 cents for non-attendance at rehearsals.

XIII. The use of intoxicating drinks, gambling and any misdemeanor during meetings or band engagements are strictly prohibited, and for such offenses members shall be dealt with as their offense deserves.

XIV. This association being a street railway band, the band must not accept any engagements that may conflict with the work of the members, without first conferring with the proper officer of the street railway company.

XV. A member may be suspended or expelled for offenses committed against the constitution by a two thirds vote, at any quarterly meeting.

The names of the members of the band and its patrons, together with the instruments, are given in the following list: 1. Norman McD. Crawford, general manager. 2. James R. Goodrich, purchasing agent. 3. Frederick W. Miller, assistant superintendent. 4. Isaac J. Reese, foreman steam fitter. 5. Herman Van Ormer, chief engineer at power station. 6. Orrin W. Chaffee, drum major, foreman of line. 7. Thomas C. Davis, bass drum, foreman at Venon St. 8. Alfred M. Mack, clarinet. 9. Eugene W. Brown, cornet. 10. Wm. J. Shultz, alto. 11. Peter Bernhard, alto. 12. Jerome Spanier, cymbals. 13. Wm. A. Doherty, trombone. 14. Fred J. Flint, cornet. 15. Levy V. McGee, trombone. 16. John H. Mills, trombone. 17. Frederick J. Saunders, cornet. 18. John Herzog, alto. 19. Oscar Belden, cornet, and leader. 20. Hubert H. Hibbard, baritone. 21. Jos. H. Dancker, bass. 22. Wm. F. Fischer, bass. 23. Samuel P. Leadyard, cornet. 24. Wm. Hubbard, snare drum. 25. Henry F. Hosmer, first snare drum. 26. Louis A. Dreiu, clarinet. 27. Frank A. Hennessy, clarinet. 28. George F. Goodrich, clarinet. 29. Frank R. Williams, piccolo.

THE ELECTRICAL ENGINEERS ABROAD.

The functions that have been arranged for the American Institute of Electrical Engineers while in Europe have been announced by the secretary, Mr. Ralph W. Pope, as follows: In London the entertainments are by courtesy of the Institution of Electrical Engineers.

Sunday, August 12th.—Trip up the Thames by rail to a convenient point, thence by electric launches, returning by the same route after lunch.

Monday, August 13th.—Dinner in the evening.

Monday and Tuesday.—Visits will be arranged to works and other points of interest in the vicinity of London.

Wednesday, August 15th.—Special train to Paris.

Thursday, August 16th.—Joint meeting, by courtesy of Commissioner Peck, in the U. S. Pavilion.

At the Paris meeting the subject for discussion will be: "The Relative Advantages of Alternate and Continuous Currents for a General Supply of Electricity, Especially with Regard to Other Interests." The particular point which the British Committee wish discussed is: How far will interference with other undertakings, rather than ordinary commercial and industrial conditions, be the factor which will determine whether continuous or alternating current shall be used.

On July 18th, Mr. W. Roger Fronefield was appointed receiver for the Springfield (Pa.) Street Railway Co., a company existing only on paper.

A negro was arrested at Dayton, O., while in the act of throwing a switch with the purpose of wrecking a car on the Cincinnati & Miami Valley Traction Co.

IMPORTANT DECISION ON TRUCKS.

The J. G. Brill Co., of Philadelphia, Pa., announced that on July 9th Judge Shipman, of the United States Circuit Court for the Southern District of New York, rendered a decision holding that letters patent No. 578,208, granted July 5, 1892, to G. Martin Brill for certain improvements in railway trucks, broadly cover any truck having elliptic and helical springs secured to the outer end of the axle box frame for the purpose of overcoming oscillation.

The suit was brought by John A. Brill agent of the Third Avenue Railroad Co., of New York, for alleged infringement, but was defended by the Benn Car Box Co., of Springfield, Mass. The court granted an injunction and ordered an accounting for damages.

RAILWAYS ALONG AN OHIO CANAL.

The berme bank of the Miami & Erie Canal in western Ohio is in great demand as a right of way for railways, and the canal commissioners now have under consideration two applications for a lease of the bank over the whole course of the canal and other applications for portions of the route. The second applicant for the entire route is the Cincinnati, Hamilton & Dayton Traction Co., composed of officials of the C. H. & D. Ry. The other application was filed two months ago by Messrs. I. D. York, H. L. Wilhard, M. L. Sternberger, E. L. Sternberger and J. E. Lewis.

The Miami Valley Railway Co. has applied for a lease of the canal from Troy to Dayton and from Piquette to St. Mary's and for the Sidney feeder.

The Southern Ohio Traction Co., of which Mr. Will Christy is president, has filed an application for the lease of the part lying between lock No. 2, north of Middletown and Franklin.

CROSSING RAILROAD TRACKS IN GEORGIA.

Both the Atlanta Railway & Power Co. and the Atlanta Rapid Transit Co. (successor to the Collins Park & Belt Line road) have been seeking to cross the line of the Southern Ry. in Atlanta, Ga., and the steam road applied for an injunction to prevent the threatened crossings. In denying the petition for an injunction the court said that the operation of a street car line did not impose any new servitude on the street, the trend of legal authorities being that a street car should be placed in the same class with an omnibus or any other vehicle.

Permission was accordingly given the two electric lines to make the crossings desired. The Rapid Transit Co. stated that though not required to do so it would install a manually operated derauling switch which would be normally open and have to be closed by the conductor to permit cars to make the crossing.

CINCINNATI, NEWPORT & COVINGTON.

Mr. J. C. Ernst, president of the Cincinnati, Newport & Covington Railway Co., sends us the following condensed statement for June, 1900:

	June		Six Months	
	1899	1900	1899	1900
Gross receipts	\$73,446.81	\$63,141.35	\$301,381.1	\$255,501.5
Operating expenses	31,240.80	23,064.15	144,734	141,663.1
Net earnings	42,206.01	40,077.20	156,647.1	113,838.4
Tolls, damages, taxes, etc.	12,314.00	11,717.00	74,520.00	75,115.07
Net profit	30,892.01	28,360.20	82,127.1	38,723.37
Ratio of expenses to earnings				
With tolls	72.53	47.1	52.85	57.72
Without tolls	72.25	36.52	47.4	43.4

As a token of appreciation for the efficient work performed by the police at its park on July 4th, the Consolidated Traction Co., of Pittsburg, donated \$200 to the police pension fund.

A salute of 21 guns was one of the features of a celebration held at Fort George, New York City, in honor of the completion of the Third Avenue Railroad Co's. Amsterdam Ave. extension to 144th St.

MECHANICAL DEPARTMENT

COMPETITIVE TESTS OF STREET CAR BRAKES MADE BY THE NEW YORK STATE RAIL- ROAD COMMISSION.

In 1899 the Board of Railroad Commissioners of New York arranged to make some official tests of various brakes for street cars and the report of these tests has recently been issued by the Board in the form of a pamphlet of nearly 200 pages. We give below those portions of the report of Mr. Charles R. Barnes, electrical expert of Board, which describe the apparatus, methods and results; on another page will be found our comments on the results.

ABSTRACT OF REPORT.

The introduction recites the invitation to enter the competitive tests and the responses received, (this invitation was printed in our issue for May, 1899, page 336, together with some criticism of the proposed method of making comparisons between different brakes); next is a description of the apparatus and methods as follows:

The whole subject of these tests received a great deal of consideration at the hands of the Board, it being the desire that when that result was made public no claim of unfair treatment and no suspicion of favoritism could possibly be charged. To attain this end, I, as your official electrical expert, assisted by Mr. W. A. Pierson, electrical engineer of the Metropolitan Street Railway Co., designed and constructed a device that automatically recorded the result of each stop, in the form of curves, which showed the number of feet that car had run after "stop" signal had been given and the time consumed in bringing the car to a standstill. This device was built at the 146th St. car shops of the Metropolitan Street Railway Co., without expense to the public, and consisted of the following:

A pair of wooden wheels of 24 in. diameter (with leather tires to prevent skidding), 2-in. tread and standard gage, were keyed to a 1 1/2 in. axle which rotated in boxes, guided in pedestals, outside of the wheels, screwed to the body of the car; the wheels were held down on the rails by compression springs, thus insuring good traction. On the axle between the two traction wheels was held, by means of set screws, a 20-in. sprocket wheel with 70 teeth, cut for a No. 25 Ewald detachable link chain. This chain ran through the flooring of the car and was kept in tension by two idler pulleys, with tension

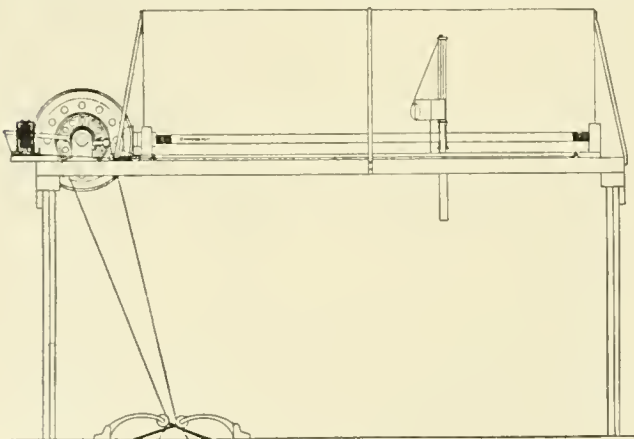


FIG. 2—FRONT VIEW.

springs, to a loose sprocket 6 1/4 in. in diameter, with 22 teeth, running on a 1 1/2-in. diameter countershaft of the instrument proper inside the car. The instrument was mounted on a table, the top board of which was made of three-ply ash, 2 in. thick, 6 ft. long and 18 in. wide, with another board perpendicular to it holding the paper on which the record was made. The countershaft was properly boxed near both ends, with suitable holes, grooves, etc., for lubrication. Keyed to the shaft was a friction wheel, of the cone type, which, when thrown in, engaged the hub of the small sprockets, imparting the motion of the same to the shaft. Fixed to the end of the shaft was a bevel-gear 12 in. pitch diameter, 72 teeth meshing in a smaller 3-in. pitch diameter, 18 teeth, geared at right angles to it, rotating a 1-in. steel rod, cut with a screw-thread between journal boxes near each end, the number of threads on the screw being eight to the inch and the length 4 ft. 4 1/2 in. The friction clutch was thrown in by means of a lever 13 in. long, the clutch being 3 in. from the fulcrum towards the center. At the extreme end was attached, by means of a

screw, a strong tension spring, distending when the clutch was drawn out, and held by a protected catch, the other end of which was the armature of an electro-magnet. When the circuit which included the magnet was closed, the clutch was drawn up, releasing the clutch lever, thus throwing in the clutch, and the motion of the sprocket was imparted to the screw rod through the bevel-gears. Running in guides screwed to the top of the table with a split nut, having a locking device for engaging or disengaging it from the screw, was a carriage, which, when the clutch was thrown in, travelled in the guides until the car stopped. Knowing the ratio between the travel of the carriage and the travel of the traction wheels on the track, the distance required to

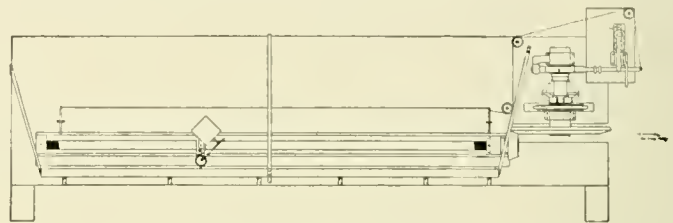


FIG. 1—TOP VIEW.

stop the car was easily computed. Attached to the carriage and at right angles to the screw was a 1-in. round brass tube, slotted on each side, in which was a cylindrical 1 1/2-lb. weight of lead, with pencil attached having compression spring behind it to insure its bearing against the sheet of paper on which the record was taken. On top of the carriage was screwed a clock movement, containing a heavy main spring to secure quick action when movement was released. From the weight carrying the pencil a string was secured, running over the top of the tube on a pulley and down to a sheave held to the movement by a clutch, which could be thrown out to allow the weight to be raised, by winding the string on the sheave. The movement was released at the same time the cone clutch was thrown in, by means of a string attached to the end of the clutch lever, which pulled a lever attached to the board; this, in turn, threw out another lever which was holding the spokes of one of the wheels on the movement, thus allowing it to run, and the weight to descend into the tube at a certain rate. On the axle of the pony wheels of one of the trucks was placed a sheave which operated, within the car, a Boyer speed recorder, with a dial showing the speed of the car, in miles per hour, by means of a revolving hand. On the dial was arranged a movable contact point, which could be set at any desired speed. When the car reached the required speed the dial hand made contact with the movable point and closed the circuit in the electro-magnet, actuating the clutch and movement. When the clutch was thrown in, another circuit was automatically closed, ringing a bell on the platform of the car, and thus signalling the motorman to throw off the power and apply the brakes. To prevent the brake operator, or motorman, from taking up the slack in the brake rigging before the proper signal was given, a bell circuit was placed with the bell on the recording table. As soon as the least movement was given to the handle of the brake, the bell circuit was closed by means of various styles of contact points, and the testing operator was thus warned, by the bell on his table, that there was some premature or improper interference.

METHOD OF CALIBRATING.

The instrument was calibrated on a track about 275 ft. long, in the 146th St. car house of the railway company, great care being taken with the measurements, timing, etc. To get the track travel of the car for 1 in. travel of the testing carriage, the car was run about 200 ft., the points of departure and stopping carefully marked and the distance between them measured, as was also the travel of the carriage. About 18 readings were taken under various conditions, such as running the car slowly and at high speed; also with dry and wet rail. It was found that 1 in. travel of the carriage was equivalent to 47 1/2 in. travel of the car; and, as the maximum travel of the carriage was 51 1/2 in., the maximum length of the stop that could be recorded was 203 1/2 ft.

To get the time constant, the movement was started while the car was in motion, and the time the pencil took to drop a given distance was noted on a stop-watch, reading to fifths of seconds. If the movement ran too slow, the staff was weighted with lead; if it ran too fast, lead was taken off until the necessary speed of drop was acquired. It was thought preferable to weight the staff instead of using a fly, so that a draught of air would have no effect on the results.

The movement was finally arranged to drop the weight 9 in. in 15 seconds, or 3/5 in. in one second, and, as the maximum drop of the weight and pencil was 10 in., the maximum time range was 16 2/3 seconds. The starting of the movement was very quick, as trials were made by timing the first and last half of the drop separately, but no appreciable difference could be detected.

METHOD OF CONDUCTING TEST.

On each car 14 official speed records were taken; 3 at 8 miles per hour, 3 at 12 miles, 3 at 15 miles, 3 at 16 miles, and 2 at 16 miles, with sand.

In setting the instrument, the pencil was drawn up near the top of the paper and the clutch on the movement thrown in and the carriage brought to

the extreme end of the instrument towards the front of the car. The split nut was then locked, the lever put in place to start the movement and the contact point on the speed indicator was set opposite the figure of speed required at which the car was to be stopped. When everything was in order a signal was given to the motorman to start the car. From this time the operator had nothing to do but watch the apparatus, to see that there was no failure of the parts to work properly.

When the predetermined speed was attained, the indicator hand made a contact with the metal stop on the dial of the speed indicator, thus closing the local circuit and setting in motion the recording instrument. This was kept in motion until the car came to a stop and the curve was automatically traced by the pencil on the paper. In addition to this record, the skidding of wheels was noted, a record being made of the number of wheels skidded and the number of feet that they slipped along the rails.

As soon as the record was taken the cone clutch was thrown out, the split nut unlocked, the carriage brought back to its first position, the pencil and everything readjusted, as stated. To avoid any dissatisfaction on the part of a contestant, he was given the option of personally applying the brake or leaving it in charge of the motorman.

Figs. 1, 2, 3, show different views of the apparatus.

Arrangements were made with H. H. Vreeland, president of the Metropolitan Street Railway Co., under which each contestant was allowed to attach his brake equipments to one of the cars of that company. The tests were commenced on Aug. 31, and completed Dec. 2, 1899. During this interval a number of perhaps unavoidable delays occurred. A day for a test would be set and the Board would be present, only to find that some car had not been equipped as promised; thus that day would be lost. Again, when all was ready for the test, rain would prevent it, as tests were held only when the rail was perfectly dry. On several occasions the tests were interrupted by derangement of the braking apparatus, and a delay of two weeks was once caused by the speed indicator becoming disabled.

The tests were held on the Lenox Avenue line, between 135th and 146th Sts. Between these points the track is of 90-lb. girder rail, 2 in. head, double track underground electric construction. The distance, between the streets named, is 2,750 ft., and there is a descending grade northward from 135th St. of 8.8 ft., nearly uniform between the points.

It was the intention to make the tests at initial speeds of 20, 16, 12 and 8 miles per hour, but it was found that the higher speeds could not be attained with the motor equipment used; so the tests were made at 16, 15, 12 and 8 miles per hour. These tests were made without sand; and two additional stops, at 16 miles, were made with sand.

The regular schedule cars were operated on the line during the tests. At 116th St. is a crossover which was used in going from the south to the north bound track. After making the southbound test stops, this crossover enabled the car to return and make the test stops on the northbound track. A flagman was stationed at each intersecting street to prevent accidents. After testing a car it was run into the car barn at 147th St., and over a pit, where the testing apparatus was transferred to another car. On each of these changes four men were employed from two to four hours. Five employes of the company were on each car during the test. The largest number of brakes tested in one day was four.

Sixteen different brakes were tested which may be thus classified:

Air brakes—G. P. Magann Air Brake Co.; Christensen Engineering Co.; Standard Air Brake Co.; John E. Reyburn.

Electric brakes—General Electric Co.; Columbia Electric Light & Brake Co.; Price, Darling & Co.; Electric Selector & Signal Co.

Hand power brakes—Sterling Supply & Manufacturing Co.; M. H. Vogel; Sauvage Street Car Brake Co.

Friction brakes—Peckham Truck Co.; J. G. Brill Co.

Track and wheel brakes—Devlin Street Car Brake Co.; Philip Bach & Bernard Schlegel.

A system of brake levers submitted by the Safety Appliance Co.

The report contains a brief description of the principles of each of these, but does not give any data concerning the brake leverage or braking force available with the apparatus tested.

Then follow 66 plates of diagrams, which it is stated are reduced by measurements and photography from the original recording instrument curves. One of these is reproduced herewith and another will be found in connection with our criticisms of the report.

After the curves are 15 tables giving the results, one for each of the 15 brakes enumerated. One of these, Table 10, is reproduced herewith. Next is a general summary, Table 16, which we also reproduce. In tables 17 to 22 are data shown in Table 16, somewhat differently arranged. Table 23, reproduced herewith, was prepared to show the standing of the brakes based on the formula $ws^2 \div d$.

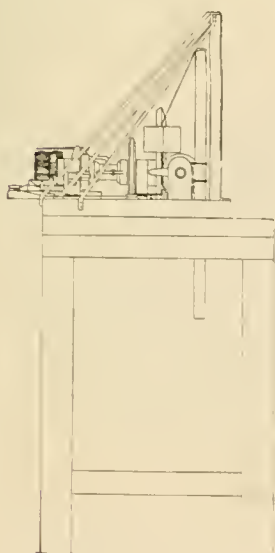


FIG. 3—END VIEW.

TABLE No. 10

Showing result of curves and other information in reference to test of electric brake submitted by the Columbia Car Light and Brake Company, dated October 17, 1899—Car No. 1433

Car No.	Company	Type of Brake	Initial Speed (m.p.h.)	Brake			Distance (ft.)	Time (sec.)	Average Speed (m.p.h.)	Remarks
				Feet	Secs.	Per Cent.				
31	1	0	72	11	6.67	13	11	13.0	End not skid.	
32	2	0	66	11	6.70	13	11	13.0	End not skid.	
33	3	0	60	11	6.70	13	11	13.0	End not skid.	
34	4	0	54	11	6.70	13	11	13.0	End not skid.	
35	5	0	48	11	6.70	13	11	13.0	End not skid.	
36	6	0	42	11	6.70	13	11	13.0	End not skid.	
37	7	0	36	11	6.70	13	11	13.0	End not skid.	
38	8	0	30	11	6.70	13	11	13.0	End not skid.	
39	9	0	24	11	6.70	13	11	13.0	End not skid.	
40	10	0	18	11	6.70	13	11	13.0	End not skid.	
41	11	0	12	11	6.70	13	11	13.0	End not skid.	
42	12	0	6	11	6.70	13	11	13.0	End not skid.	
43	13	0	0	11	6.70	13	11	13.0	End not skid.	
44	14	0	0	11	6.70	13	11	13.0	End not skid.	
45	15	0	0	11	6.70	13	11	13.0	End not skid.	
46	16	0	0	11	6.70	13	11	13.0	End not skid.	
47	17	0	0	11	6.70	13	11	13.0	End not skid.	
48	18	0	0	11	6.70	13	11	13.0	End not skid.	
49	19	0	0	11	6.70	13	11	13.0	End not skid.	
50	20	0	0	11	6.70	13	11	13.0	End not skid.	
51	21	0	0	11	6.70	13	11	13.0	End not skid.	
52	22	0	0	11	6.70	13	11	13.0	End not skid.	
53	23	0	0	11	6.70	13	11	13.0	End not skid.	
54	24	0	0	11	6.70	13	11	13.0	End not skid.	
55	25	0	0	11	6.70	13	11	13.0	End not skid.	
56	26	0	0	11	6.70	13	11	13.0	End not skid.	
57	27	0	0	11	6.70	13	11	13.0	End not skid.	
58	28	0	0	11	6.70	13	11	13.0	End not skid.	
59	29	0	0	11	6.70	13	11	13.0	End not skid.	
60	30	0	0	11	6.70	13	11	13.0	End not skid.	
61	31	0	0	11	6.70	13	11	13.0	End not skid.	
62	32	0	0	11	6.70	13	11	13.0	End not skid.	
63	33	0	0	11	6.70	13	11	13.0	End not skid.	
64	34	0	0	11	6.70	13	11	13.0	End not skid.	
65	35	0	0	11	6.70	13	11	13.0	End not skid.	
66	36	0	0	11	6.70	13	11	13.0	End not skid.	
67	37	0	0	11	6.70	13	11	13.0	End not skid.	
68	38	0	0	11	6.70	13	11	13.0	End not skid.	
69	39	0	0	11	6.70	13	11	13.0	End not skid.	
70	40	0	0	11	6.70	13	11	13.0	End not skid.	
71	41	0	0	11	6.70	13	11	13.0	End not skid.	
72	42	0	0	11	6.70	13	11	13.0	End not skid.	
73	43	0	0	11	6.70	13	11	13.0	End not skid.	
74	44	0	0	11	6.70	13	11	13.0	End not skid.	
75	45	0	0	11	6.70	13	11	13.0	End not skid.	
76	46	0	0	11	6.70	13	11	13.0	End not skid.	
77	47	0	0	11	6.70	13	11	13.0	End not skid.	
78	48	0	0	11	6.70	13	11	13.0	End not skid.	
79	49	0	0	11	6.70	13	11	13.0	End not skid.	
80	50	0	0	11	6.70	13	11	13.0	End not skid.	
81	51	0	0	11	6.70	13	11	13.0	End not skid.	
82	52	0	0	11	6.70	13	11	13.0	End not skid.	
83	53	0	0	11	6.70	13	11	13.0	End not skid.	
84	54	0	0	11	6.70	13	11	13.0	End not skid.	
85	55	0	0	11	6.70	13	11	13.0	End not skid.	
86	56	0	0	11	6.70	13	11	13.0	End not skid.	
87	57	0	0	11	6.70	13	11	13.0	End not skid.	
88	58	0	0	11	6.70	13	11	13.0	End not skid.	
89	59	0	0	11	6.70	13	11	13.0	End not skid.	
90	60	0	0	11	6.70	13	11	13.0	End not skid.	
91	61	0	0	11	6.70	13	11	13.0	End not skid.	
92	62	0	0	11	6.70	13	11	13.0	End not skid.	
93	63	0	0	11	6.70	13	11	13.0	End not skid.	
94	64	0	0	11	6.70	13	11	13.0	End not skid.	
95	65	0	0	11	6.70	13	11	13.0	End not skid.	
96	66	0	0	11	6.70	13	11	13.0	End not skid.	
97	67	0	0	11	6.70	13	11	13.0	End not skid.	
98	68	0	0	11	6.70	13	11	13.0	End not skid.	
99	69	0	0	11	6.70	13	11	13.0	End not skid.	
100	70	0	0	11	6.70	13	11	13.0	End not skid.	

TABLE No. 16

Showing average stops made with all brakes tested at 8, 12, 16 and 20 miles per hour, and at 16 miles per hour with sand

NAME OF BRAKE	8 Miles Per Hour		12 Miles Per Hour		16 Miles Per Hour		20 Miles Per Hour	
	Feet	Secs.	Feet	Secs.	Feet	Secs.	Feet	Secs.
Peckham Motor, Truck and Wheel Company	42.41	7.03	59.73	6.44	79.60	6.97	91.23	7.43
Devlin Street Car Brake Company	51.08	7.30	53.92	6.96	52.34	6.68	69.63	6.91
Christensen Air Brake Company	56.96	6.30	60.20	7.06	113.46	6.60	130.75	6.74
Standard Air Brake Company	66.18	6.70	74.06	6.95	66.43	7.22	104.47	6.44
General Electric Company	44.00	6.94	111.99	6.95	114.86	6.32	134.72	6.43
Columbia Car Light and Brake Company	65.66	6.19	99.64	5.68	103.92	7.35	154.98	7.79
Sauvage Street Car Brake Company	46.11	6.50	78.56	6.97	129.14	6.30	130.77	6.50
J. G. Brill Company	35.11	6.16	67.80	6.19	131.94	7.80	106.44	6.99
Safety Appliance Company	40.77	6.16	56.86	6.44	139.80	6.97	165.90	6.97
Vogel Brake Company	50.98	7.68	72.88	7.46	92.11	6.62	123.66	10.48
G. P. Magann Air Brake Company	43.73	6.75	68.90	7.23	91.92	6.13	94.90	6.17
Price, Darling & Company	45.70	7.23	67.00	7.91	73.87	6.58	91.41	6.33
Sterling Supply & Manufacturing Company	41.60	6.89	67.00	7.91	73.87	6.58	91.41	6.33
Electric Selector and Signal Company	54.75	7.71	60.10	7.89	69.58	6.39	79.13	6.33
Bach & Schlegel	56.80	7.17	64.00	6.88	.....	.....	.....	.....

TABLE No. 23

Showing standing of brakes based on the formula and per cent. of rating based on the average stops, also per cent. deducted from this standing for skidding of wheels and the per cent. of rating after making this deduction.

NAME OF COMPANY.	Formula $ws^2 \div d$	Average stop at all speeds, feet.	Percent of rating based on average stop	Percent deduct of skidding of wheels	Percent of rating after deduction.
Electric Selector and Signal Co.	66,197	58.53	100.00	1.7375	98.26
Sterling Supply and Manufacturing Company	58,073	69.16	87.73	.875	86.86
Peckham Motor, Truck and Wheel Company	84,410	66.71	97.30	10.70	86.60
G. P. Magann Air Brake Company	54,853	73.22	82.86	4.00	78.86
Devlin Street Car Brake Company	54,424	79.15	82.21	6.20	76.01
Standard Air Brake Company	49,907	82.92	75.50	5.75	69.74
General Electric Company	45,630	104.45	68.93	.225	68.71
Vogel Brake Company	44,380	88.46	68.92	.575	68.35
Christensen Air Brake Company	44,322	96.67	65.95	2.00	63.95
J. G. Brill Company	44,545	92.08	67.29	4.35	62.94
Safety Appliance Company	38,280	96.10	57.84	1.0625	56.78
Sauvage Brake Company	36,600	107.07	55.29	.6475	54.60
Price, Darling & Company	31,803	45.27	48.04	1.75	47.85
J. G. Reyburn Brake Co.	29,547	80.40	44.63	.25	44.38
Columbia Car, Light and Brake Company	29,325	132.80	44.80	.225	44.09
Bach & Schlegel (no test)	.....	.....	.....	.....	.....

Per cent. deducted for skidding wheels is based on the following values:

Skidding 15 feet or more.	Skidding 10 feet to 15 feet.	Skidding 5 feet to 10 feet.
One large wheel ..... .25	One large wheel... .125	One large wheel ..... .0625
One small wheel ..... .125	One small wheel... .0625	One small wheel ..... .03125
Large and small wheels ..... .45	Large and small wheels ..... .225	Large and small wheels ..... .1125
All wheels 1.00	All wheels ..... .50	All wheels ..... .25

could be furnished for this purpose except in the run from the shop to the car barn. The General Electric Co. labored under the disadvantage of having only two axles equipped with shoes, there being no shoes on the pony wheel axles. Messrs. Bach & Schlegel equipped the car with only four shoes. The construction of their shoe was such, it being a wheel and rail brake, that only the shoes on the forward wheels had any braking effect on the rail. For this reason the car could not be stopped within the limits within which the instrument would record the result. The electric controller of the Price-Darling brake lunched out after the tests at 8 miles per hour were made, so the standing given for this brake is based only upon the test made at that speed. The John F. Reyburn air brake was tested at only 8 and 12 miles per hour. This, how-

Sauvage Street Car Brake Co.
 Standard Air Brake Co.
 Christensen Engineering Co.
 General Electric Co.
 J. E. Reyburn.
 Columbia Car Light & Brake Co.
 Price, Darling & Co.
 Safety Appliance Co.
 Bach & Schlegel.

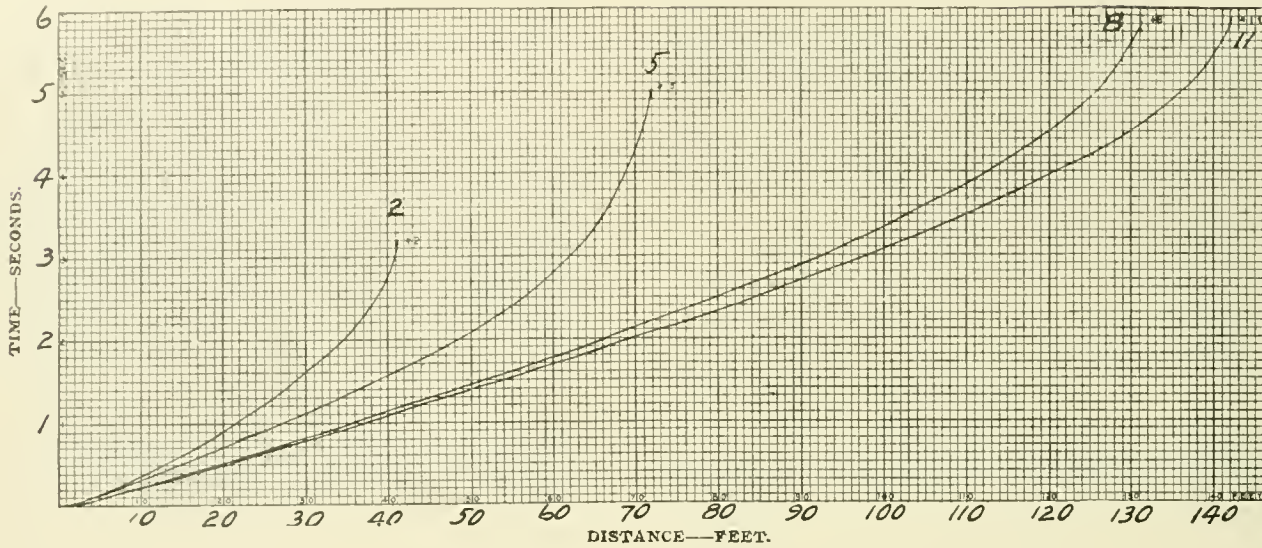


DIAGRAM NO. 43—TESTS OF STREET CAR BRAKES BY N. Y. RAILROAD COMMISSION.

ever, was owing to no defect of the brake. It was found impossible to make the faster speeds with the car equipment; so the standing of this brake is based on stops made at 8 and 12 miles per hour. The Safety Appliance Co. presented a system of levers for street car brakes which, during the test, was applied to the Sterling brake.

The standing of the respective brakes, as shown on the foregoing tables, is only the result obtained by the automatic recording instrument, and the record of skidding of wheels as noted.

To this standing must be added or deducted, as the case may be, points for the possession of, or the lack of, the following qualities: Reliability of system, ease of manipulation, simplicity of system, liability of brakes operating when they should not, safety devices in case of disablement of any part of the braking system, cost of equipment and expense of maintenance.

In addition tests were made, on the same car used for the test of the Sterling brake, with the ordinary spindle hand brake. This showed an average stop of 67.01 ft. for the spindle brake as against 63.79 ft. for the corresponding tests of the Sterling brake. An apparatus was also rigged to determine the maximum force exerted by the motorman in applying the brakes; an 18-in. hand wheel was substituted for the ordinary brake handle which is usually 12 or 14 in. long. This test showed an average stop in 58.73 ft. for the Sterling brake, the average maximum force exerted being 77.68 lb.; for the spindle brake the stop was 56.87 ft. and the average maximum force, 92.5 lb. The largest and smallest values of the maximum force exerted in any one test are given as 85 and 65 lb. for the Sterling and 105 and 85 lb. for the spindle brake.

Tests were made on a wet rail with one car the average stop on the wet rail being 71.73 ft. as against 60 ft. on a dry rail.

The conclusion of the Commissioners from these tests after adding or deducting points of merit or demerit based on the following features:

- Reliability and simplicity of system.
- Liability of brakes to act when they should not.
- Ease of operation by the ordinary motormen.
- Cost of equipment and maintenance.

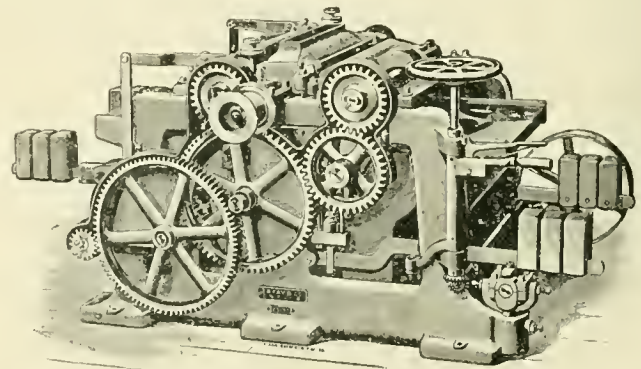
was that the brakes took rank as follows:

- Electric Selector & Signal Co.
- Peckham Truck Co.
- Sterling Electric & Manufacturing Co.
- G. P. Magann Air Brake Co.
- M. H. Vogel
- Deylin Street Car Brake Co.
- J. G. Brill Co.

Its recommendation was that in all but special cases, where the liability to accident is very remote, the ordinary spindle brakes should be replaced by one of first 12 of the brakes mentioned in the preceding list or some other brake which in the judgment of the Board is equally efficient.

IMPROVED SMOOTHING PLANER.

The accompanying illustration shows a new single cylinder cabinet smoothing planer just placed on the market by J. A. Fay & Co., of 557-577 West Front St., Cincinnati. It is known as their No. 19 and embodies some late improvements, the patents bearing date of Dec. 19, 1899, Feb. 6, 1900, and May 8, 1900. The more noticeable mechanical advantages of the design are: The



IMPROVED SMOOTHING PLANER.

feed rolls are center-gearred and hung pivotly; the pressure for each roll is cushioned on a spring, giving a very fine cut, and enabling the operator to plane smooth without wave; the bed raises and lowers on long inclines; the feed is so arranged that with one lever its speed can be increased or reduced, started or stopped, instantly.

The manufacturers will be pleased to furnish any of our readers who may be interested, and will write them, prices and full particulars of this or any other machine for working or cutting wood, and will also forward their new illustrated catalog free.

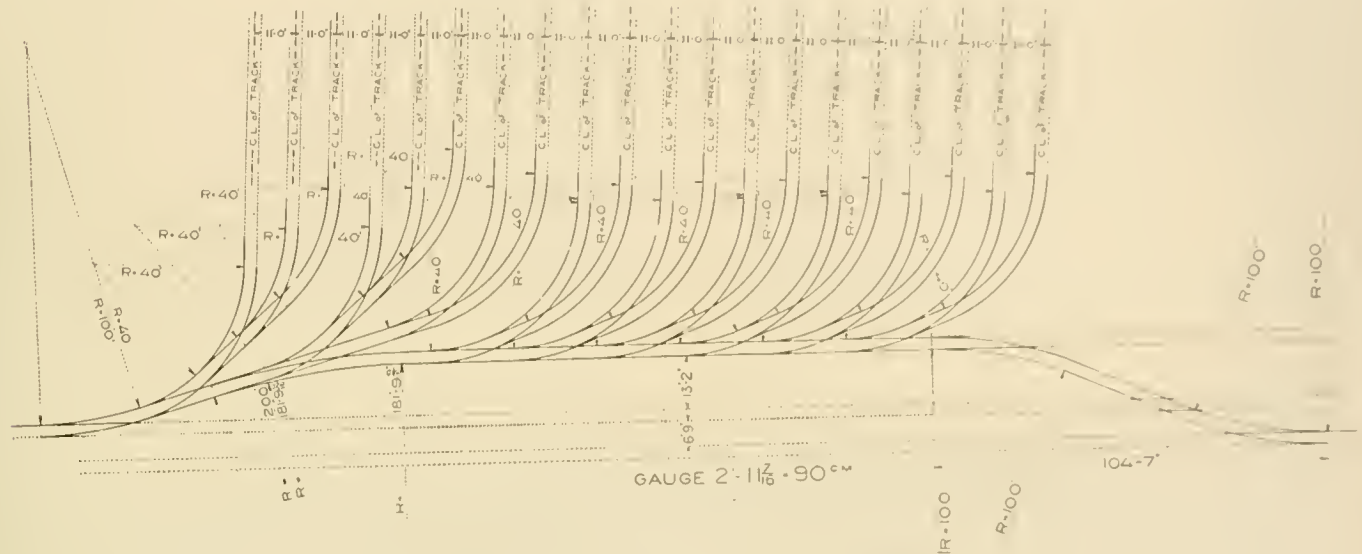
CAR HOUSE LAYOUT AT LISBON, PORTUGAL.

The accompanying illustration shows in outline what is probably the largest piece of special track work ever exported, that was fitted together complete in this country. It is the special work for the entrance tracks of the car house of the Companhia Carris de Ferro de Lisboa, of Lisbon, Portugal, and was made by William Wharton, jr., & Co., of Philadelphia. It is all of 7-in. guard rail section, the style being the well known Wharton manganese steel construction. Contrary to the usual practice of fur-

proper shape, but it is necessary to do this only two or three times, as the shape soon becomes set.

Varnish brushes and brushes used in varnish stain, and all color in varnish require different handling from paint brushes. After dry cleaning them through the hand it is a good idea to pass them back and forth over a sheet of sandpaper, which will pull out all the loose bristles and smooth down the rough end.

Varnish brushes should never be placed in water. They may be washed by working them for a few moments in clean turpentine and swinging dry, and when not needed they should be kept in



CAR HOUSE TRACK LAYOUT AT LISBON, PORTUGAL.

nishing single switches, mates and frogs, and cutting and curving the rails when installed, the entire work was laid out and fitted together at the yards of the Wharton company in Philadelphia. This layout is of special interest as indicating the high opinion in which this construction is held abroad, as well as at home.

As will be seen by reference to the drawing there are 20 tracks of 90 cm. (2 ft. 11 7/16 in.) gage; the minimum radius is 40 ft.

turpentine and varnish, or, better still, in some of the varnish in which they have been used. They should not be kept in turpentine only, as this is apt to roughen the bristles.

When it is desired to change from one color to another, or from one varnish to another, all brushes should be washed in benzine or turpentine and shaken dry, not whipped.

THE CARE OF PAINT BRUSHES.

The good workman is known by his tools in car painting as in all other arts and trades, and the best car painter in the country can not turn out good work with poor brushes, so that it behooves the master painter to bestow as much thought on the selection and care of his brushes as he does on his materials. Twisted bristles and misshaped ends will make the best paint cover poorly and always deface the surface.

The first principle in brush care, says the Hub, is to keep the tool at all times when it is not in use, and especially when it is new, in a cool place, as a high temperature tends to shrink the wood of the handle, thereby causing the bristles of the brush to loosen and drop out.

New brushes require special care for the first two or three days. No new brush should be dipped in the paint and put to work without first being dry cleaned by working back and forth on the hand or a clean board. It should then be placed in water for a few minutes, not long enough to soak or swell it, but only until it is wet through, when it should be swung and shaken dry. It may then be dipped in raw oil or the paint itself and smoothed out carefully. It is better to let it remain over night before using.

Never leave a brush standing on the ends of the bristles when at rest, as this will ruin its shape and shorten its life more rapidly than will constant use. A good brush holder is easily made from a water-tight box or old paint keg, with nails driven in the inside, on which the brushes may be suspended to hang clear of the bottom but with the bristles entirely under water. Before placing in water the brushes may be wiped, but it is better not to remove all the paint.

The chisel-pointed brushes when new may be set at an incline, the handle supported just enough to allow the brush to lie along the point. This prevents the twisting of bristles and gives the

“TAYLOR-WHITE” TOOLS.

For the past two years the Bethlehem Steel Co. has been developing a method for increasing the cutting properties of a special grade of tool steel, and has achieved remarkable results. The company has had many requests for data on the operation of these tools, but until now has preferred not to make them public. July 31st representatives of the technical press were invited to South Bethlehem to see the tools at work, and all who were able to do so gladly availed themselves of the invitation.

Briefly, the Taylor-White process was the result of experiments by Mr. F. W. Taylor and Mr. Maunsel White, engineer of tests, of the Bethlehem Steel Co., and the cost to the company which has acquired the patents, has been over \$100,000. The following statement from it shows that the investment has been more than repaid, however:

“The increase in cutting speed of the various machine tools throughout the machine shop has entirely reversed the inequality of balance existing two years ago, so that the capacity of the forge has had to be largely increased to keep pace with the rapidly growing efficiency of the machine shop. The introduction of this process for the treatment of our tools has enabled us to speed up our main lines of shaft from 90 to 250 revolutions, and further changes in countershafts have been made to speed up individual machines.

“In order that the rate of progress might be observed, records from time to time were made of the average amount of metal cut per hour per tool throughout the shop. The table shows the increase in efficiency made up to January of this year.”

These tools retain a high degree of hardness when heated to a visible red, and it is possible to cut steel after the point of the tool has become red hot, leaving an unusually smooth surface on the work. The practicable cutting speed is from two to four times that for tools of any other steel of which the Bethlehem

company has knowledge. The effect of the process is said to extend to the center of even the largest tools that have been treated,

Average.	1 Oct. 25, '98.	2 May 11, '99.	3. Jan. 15, '00.	Gain in per c't. cut of 3 over 2.	Gain in per c't. cut of 3 over 2.
Cutting speed . . .	8 ft. 11 in.	21 ft. 9 in.	25 ft. 3 in.	16	183
Depth of cut . . .	.25 in.	.278 in.	.30 in.	8	30
Feed . . .	.07 in.	.0657 in.	.087 in.	32	24
Pounds of metal removed per hour. . .	31.18	81.52	137.3	68	340

which were 4 in. square. While all standard brands of self-hardening steel are improved by the Taylor-White process, it is preferred to use a steel of special composition. This steel forges more easily and a process has also been discovered for annealing it so that it can be easily machined to shape.

The price charged for a shop right to use the process is based on the number of machines and their size and character.

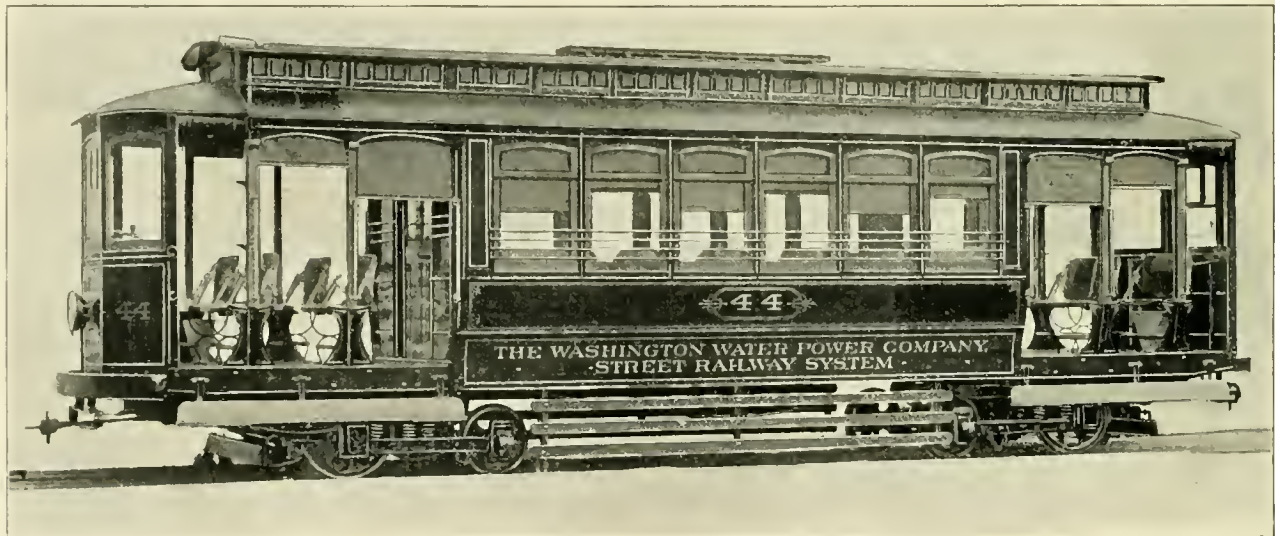
GRAPHITE FACINGS.

A recent publication of the Joseph Dixon Crucible Co. explains the theory of graphite facings for molds. Graphite is one of the forms of carbon and is combustible. When the molten metal is poured into the mold, the air in the mold and the air carried in by

CALIFORNIA CAR WITH NEW DETAILS.

The California car illustrated in the accompanying engraving was built for the street railway system of the Washington Power Co., in Spokane, by the J. G. Brill Co. and is interesting because it embraces several novel and important features. It is the California type pure and simple, mounted on maximum-traction trucks, with 8 ft. 6 in. vestibuled platforms. The first feature of novelty to strike one is the fact that the platform seats, as well as those within the body of the car, are made reversible. The aisle extends from end to end, and is 19 in. wide on the platforms and 18 in. within the body of the car. The sills are plated with iron, thus giving ample strength to carry the long car, which measures 33 ft. 8 in. outside the vestibules. Another feature is found in the panels, which are of metal, held in place by round headed brass screws. This introduction of metal for panels is significant in a car which is going into a well wooded country and into a climate where wood endures in a satisfactory manner. On the platforms the seats are fitted with round-end seat panels, and the curtains, of which there are three on each side of each platform, are arranged to come all the way to the floor, giving a complete enclosure. The dimensions are:

Length over dashers, 33 ft. 8 in.; width at the sills, 6 ft. 10 in.; width over all, 7 ft. 8½ in.; length of closed portion over the corner posts, 16 ft. 8 in.; extreme width of closed portion, 8 ft. 2



IMPROVED CALIFORNIA-TYPE CAR—J. G. BRILL CO.

the stream of melted metal furnish oxygen enough to bring about a certain amount of combustion, forming a gas between the metal and the mold. This gas effectually prevents any adhesion of the metal to the sand. A proper facing must burn to give the desired results, but it must not burn too fast as is the case with the cheaper grades of facing; also the facing must adhere to the sand and not run before the metal. To meet conditions that vary because of the different sands used and the degree of moisture, the Dixon company makes eight different kinds of graphite facings.

KW. H. PER CAR-MILE.

Mr. A. H. Binyon in a paper before the Society of Engineers (England) gives the following figures on power consumption of electric cars weighing about 12 tons for speeds of from 6 to 12 miles per hour, and with stops of 8 to 10 seconds.

Miles per hour.	No. of stops per mile.	KW. H. per car-mile.
6	6 to 14	.7 to 1.08
7	6 to 13	.65 to 1.43
8	5 to 11	.75 to 1.75
9	4 to 9	.73 to 2
10	4 to 8	.82 to 2.2
11	4 to 7	.78 to 2.04
12	3 to 6	.73 to 2.04

in.; gage, 4 ft. 8½ in.; head room inside, 8 ft. 2 in. at center; from bottom of sills to top of trolley board, 9 ft. 2 in.

The maximum-traction trucks have 30-in. and 22-in. wheels, with 2¼-in. treads and ¾-in. flanges. There are two G. E. 52 motors with nose suspension. The space between the trucks on each side of the car is closed by a life guard; the steps are of the standard pattern, folding up when necessary. Each end is fitted with Brill angle iron bumpers, a 12-in. electric headlight with a 32-c. p. lamp and a Brill radial draw bar. There are two sand boxes and two "Dedenda" gongs. The details of finish comprise quartered oak, decorated headlinings, spring cane seats within the the car body, spring roller curtains, window guards and in general a very neat and satisfactory finish. In the open part the seats are spaced 2 ft. 6 in. centers. The trim is solid bronze throughout. The California type modified as shown with the 34-in. seats, which the widths given make it possible to use, is quite satisfactory, there being always ample room for smokers, for those who wish to ride in the open air and for those who desire the protection of a closed compartment.

The Binghamton (N. Y.) Railroad Co. recently purchased the Stow driving grounds, situated in the suburbs of the city, and will turn the property into a public park. The Binghamton Railroad Co. now owns one of the finest systems of pleasure parks to be found in the country.

CHICAGO UNION TRACTION REPORT.

The first annual meeting of the stockholders of the Chicago Union Traction Co. was held on July 24th. Directors for the ensuing year, all re-elected, are: Jesse Spalding, John M. Roach, R. A. C. Smith, Walter H. Wilson, H. B. Hollins, Charles L. Hutchinson, James H. Eckles, C. K. G. Billings, P. A. B. Widener, William Dickinson, John V. Clarke.

Pres. J. M. Roach's report was as follows:

"The business done by your company during the last fiscal year, June 30, 1899, to June 30, 1900, which we have the honor to report, has been excellent, showing a satisfactory increase over business done the preceding year by the leased lines, notwithstanding the trying conditions under which the company has passed during this, the first year of its existence.

"The conditions upon which our earnings are based, since Feb. 1, 1900, have been very unfavorable. Unsatisfactory conditions have existed with the various industries which have not, up to this time, been satisfactorily settled. The weather for the months of April, May and June was anything but good for the railroad business. The Northwestern Elevated road, starting up as it did on May 31, 1900, also had its effect on the income of this company.

"Notwithstanding these unfavorable and embarrassing conditions to the management, our books show that we have earned a dividend on the preferred stock of the company and besides the roadbed and rolling stock are in better condition than ever they have been during the history of these companies.

"There were large amounts of money expended on boulevard crossings, repairing and relettering of cars, overhauling and remodeling 300 summer and winter cars, besides adding 80 new cars to our equipment, with everything incident in the shape of motors, etc. There have been no pains spared in keeping all of the electrical construction first-class and up to date.

"There have been the following amounts spent on the property of the company:

Construction:

Track construction	\$ 74,625.42
Electric-line construction	42,063.13
Real estate	158,922.01

Equipment:

New engines and machinery for power houses..	60,577.13
Additional machinery at shops.....	4,627.49
Cost of new cars.....	88,451.02
Cost of rebuilding and vestibuling old cars.....	26,218.91
Cost of new electrical equipment for cars and plows	78,073.40
Cost of building four new snow plows, wagons, horses and harnesses	10,812.79
Other property accounts	60,838.80
Reconstruction	216,026.26

A total of\$821,236.36

"With the industrial question settled and with reasonably fair weather, which we shall expect, and with the general prosperous outlook for the future, I predict that the stockholders of the Union Traction Co. who continue in the holdings of the company will find it a good, profitable and safe investment.

"It has been, and shall be in the future, our desire to obviate friction and cater to the wants of the public by broad-gage management of its affairs and courteous treatment in the handling of the public.

"I will not attempt in this address to give any financial details of the company, inasmuch as the auditor, Mr. F. E. Smith, has furnished a detailed report under our system of bookkeeping of the entire financial operations of the road. Mr. James H. Eckles, treasurer, will also furnish a short statement showing the reduction of fixed charges in the operation of the road since he became treasurer. For the splendid condition and relations that now exist you are much indebted to our former and distinguished president, Mr. Jesse Spalding, for the manner in which he has handled the property of the company and turned it over to the present officers."

Mr. Eckles reported showing that since he had been treasurer the fixed charges had been reduced \$28,080 per annum by refunding portions of the company's debt.

The income account is as follows:

Earnings.	
Passenger receipts	\$7,468,797.98
Chartered cars	2,122.50
Mail	6,477.58

Gross earnings from operation.....\$7,477,398.06

Expenses.	
Maintenance—Way and structures.....	\$ 193,666.90
Maintenance—Equipment	381,082.87
Transportation	2,619,647.41
General	567,400.18

Total operating expenses.....\$3,761,797.36

Net earnings from operation.....3,715,600.70

Income.	
Advertising	\$ 33,576.95
Rent of land and buildings.....	35,622.14
Rent of tracks and terminals.....	10,000.00
Dividends on stocks owned and leased.....	764,603.49
Interest on deposits.....	17,600.11
Miscellaneous	2,441.13
Premium on bonds sold.....	4,416.83
Total income from other sources.....	868,350.65

Gross income.....\$4,583,951.35

Deductions.	
Taxes accrued	\$ 246,033.88
Interest on loans accrued	41,776.80
Rentals accrued	3,688,451.70
Premiums on bonds purchased.....	3,613.43

Total deductions from income.....\$3,979,875.81

Net income.....604,075.54

Dividends on pref'd stock, 5 per cent.....600,000.00

Surplus as per balance sheet.....\$ 4,075.54....

Compared with the similar items of the old north and west side systems for the year ending June 30, 1899, the passenger receipts for 1900 show an increase of \$423,413; operating expenses an increase of \$249,013; net earnings an increase of \$32,239.

During the year 29,691,850 car-miles were run and 208,490,562 passengers carried of whom 149,521,755 were revenue passengers, 784,660 were carried free and 58,184,147 were transfer passengers.

Data in cents per car-mile, per revenue passenger, and per total passenger are:

	C.-M.	R. P.	T. P.
Gross earnings	25.18	5.00	3.59
Expense—			
Maintenance—Way, structures	0.65	0.13	0.09
Maintenance—Equipment	1.29	0.26	0.18
Transportation	8.82	1.75	1.26
General Expenses	1.91	0.38	0.27
Total operating expenses.....	12.67	2.52	1.80
Net earnings	12.51	2.48	1.78
Income from other sources.....	2.92	0.58	0.42
Gross income	15.43	3.06	2.20
Deductions	13.40	2.66	1.91
Net income	2.03	0.40	0.29
Per cent of expenses to earnings.....	50.31		
Per cent of expenses to gross receipts.....	45.07		
Per cent of deductions to gross receipts.....	47.69		
Per cent of net income to gross receipts.....	7.24		

The balance sheet is as follows:

Assets.	
Cost of stocks and leases.....	\$29,926,000.00
Construction	116,688.55
Real Estate	158,922.01
Equipment	268,760.74
Other property accounts	60,834.80
Reconstruction	216,026.26
Stocks and bonds in treasury.....	382,344.73
Cash on hand and in banks.....	130,034.59
Coupon deposits	143,470.00
Advanced interest, rent, insurance.....	14,296.34
Improvement fund on deposit with Morton Trust Co., New York.....	210,485.62

Account receivable	257,941.86
Material and supplies	106,661.38
Equitable Trust Co., Chicago, trustee under general mortgage	6,750,000.00
Equitable Trust Co., Chicago, trustees under trust agreement	6,500,812.50
Equitable Trust Co., Chicago, trustees under operative agreement	240,187.50
Accrued dividends on stocks owned and leased	146,667.76
Lease account North Chicago Street Railroad Co.	532,314.28
Lease account West Chicago Street Railroad Co.	1,053,380.15
Total	\$47,224,833.07
Liabilities.	
Capital stock—preferred shares	\$12,000,000.00
Capital stock—common shares	20,000,000.00
Contingent liability—guaranty of Chicago Consolidated Traction Co. general mortgage bonds	6,750,000.00
Operating agreement with Chicago Consolidated Traction Co.	6,237,589.85
Bills and accounts payable (including pay rolls)	931,954.45
Employees' deposits	61,588.00
Coupons	164,170.00
Tickets	6,827.50
Accident fund—reserve	35,989.88
Accrued liabilities not yet due:	
Interest	2,737.42
Rent for track and terminals	1,395.83
Rent for leased roads	827,841.31
Dividends	150,000.00
Taxes	50,663.29
Profit and loss—surplus	4,975.54
Total	\$47,224,833.07

A large portion of the item \$567,460 under "general expenses" was spent in the adjustment of pending claims, and the settlement of old suits of long standing and is in the nature of an extraordinary expense, so that the ensuing year may be expected to show a much larger surplus over dividends on preferred stock. The present year's report will be considered very satisfactory when all factors are taken into account.

THE ST. LOUIS SITUATION.

The cars of the St. Louis Transit Co. are operating on the regular schedules, and while for convenience people continue to speak of the strike, it is a misnomer to so call it. The second "strike and boycott" have proved failures from the start.

July 11th the strikers issued a lengthy statement of their troubles, including a denunciation of Mr. Baumhoff. On the following day Mr. Baumhoff published a letter to the public, in which he denied the charges of bad faith on the part of the company in keeping the agreement of July 2d, and gave an account of what had been done towards employing new men. We quote what Mr. Baumhoff had to say concerning the personal attack on him:

"The statement that I made to the employes of the Lindell division prior to March 10, at which time it was supposed that the strike would take place, and the resultant position which the employes of the Lindell division took, are generally conceded to have been instrumental in averting the strike at that time. I have since been informed by a number of the employes of the Lindell division that after the agreement of March 10, the lives of those who refused to join the organization were made miserable by threats that if they did not join they would be forced to leave the service of the company, and many members of the organization joined for no other purpose than the hope of being let alone in the peaceable discharge of their duties.

"The public is aware of the demands made by the organization which brought about the strike of May 8, and those who desire to refresh their memory may do so by looking up any of the daily papers published on May 8 and 9, and for several days prior. Surely, if there existed the slightest grievance or charge of un-

fairness against me, this matter would not only have been embodied in their list of grievances, but I have no doubt would have been magnified to suit the occasion.

"The list of employes on the Lindell division prior to May 8 embraced a larger number who had been in continuous service for upwards of ten, fifteen, twenty and twenty-five years, than in any other street railway system in this or any other city of the country employing a like number of men, which is certainly conclusive evidence that had I been half as bad as pictured in the statement of the strikers, these men would have sought other positions instead of remaining with the company under my supervision the number of years they did, and the men on this division were noted for their good character and deportment. The fact that the Lindell system was prepared to operate its cars for each and every day during the strike, had it been safe to do so, is the best evidence that its employes were satisfied with their treatment and conditions, and many of those who left our employ on the day of the strike have returned to work. Therefore, the imputation that the organization was effected on account of my management brands itself as a falsehood.

"Referring to their statement regarding the agreement of July 2, the last sentence reads: 'A majority of us, however, thought the directors and stockholders controlled the company.' Allow me to suggest to the strikers that had they entertained the same opinion with reference to their exorbitant and unreasonable demands made to this company, which caused the strike of May 8, there would have been no strike, for the demands made clearly indicated that they were not then of the opinion that the directors and stockholders controlled the company."

There has been comparatively little lawlessness, though on July 21st a car was injured by explosives placed on the track, and on July 27th five cars were injured in the same way.

July 17th a committee of citizens formally asked the union and the company to submit their difficulties to arbitration, but nothing has yet come of this.

The attorney general of Missouri has attacked the organization of the St. Louis Transit Co. in two suits. The first was commenced in the Circuit Court July 12th; the plaintiff asks that the compacts between the Southern Electric Railway Co., the United Railways Co. and the St. Louis Transit Co. be annulled, and the deeds of conveyance set aside, on the ground that the act of June 19, 1899, permitting a street railway company to sell or lease its property by a two-thirds vote of the stockholders, is unconstitutional.

July 17th application was made to the Supreme Court for a writ of quo warranto against the St. Louis Transit Co. The claim is made that the company was chartered to "construct, maintain and operate a street railway," whereas it has in fact "bought and leased" instead of "constructing."

CHANGES AT ALBANY, N. Y.

At the annual meeting of the United Traction Co., held last month in Albany, a new office was created, that of second vice-president and general manager, and Mr. John W. McNamara was chosen for first incumbent. Other officers were elected as follows: President, Robert C. Pruyn; first vice-president, F. N. Mann; secretary, Jas. McCredie. Mr. McNamara will continue to act as treasurer in addition to his new duties.

The directors declared a quarterly dividend of 1¼ per cent.

ELECTRIC TRAMWAYS IN VALENCIA.

U. S. Consul Horace Lee Washington, of Valencia, Spain, supplementing his recent report, a digest of which will be found on page 307 of the "Review" for last June, states that negotiations for the transfer of the tram lines in Valencia to Thompson, Houston & Co., of Paris, on a 40-year lease, have been brought to a successful issue. The lessees, in addition to paying a yearly rental, agree to substitute electricity for horse traction. Electrical machinery will probably be supplied by the General Electric Co., of Schenectady, N. Y., and the cars will be constructed in Spain.

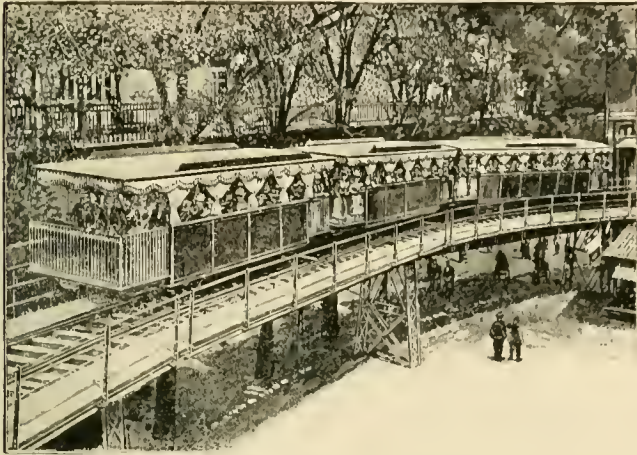
It is announced that the Springfield (O.) Railway Co. will spend \$100,000 in rebuilding track and refitting cars.

NOTES ON THE PARIS EXPOSITION.

The Street Railway Exhibits—Transportation at the Exposition.

The main entrance to the Paris Exposition is at the Place de la Concorde—the very centre of Paris. Owing to this convenient location the question of local transportation to and from the Exposition grounds was probably not seriously considered and the ordinary means of local transportation—the cab and the omnibus—thought sufficient to take care of all who wished to ride. The result is that many who would often like to ride have to walk.

There are several tramways, some operated by electricity, others by steam or compressed air, but a stranger would need a guide



ELECTRIC RAILWAY AT PARIS EXPOSITION.

to find them. Then service is very poor and the capacity is limited, so their principal patronage is derived from the working classes. Furthermore, these lines run through the remote and poorer streets in the outlying portions of the city, generally beyond the legal cab course, or run to suburban points and not through the business districts of the city at all.

Aside from the horse cars, the principal trams are operated by steam, used in several forms, the Serpollet system, the "fireless" system and the regular locomotive. The latter is in general use and in reality this tram service is a railway train of an engine and several double-decked cars running through the streets. The "fireless" locomotives have a reservoir that is charged with water at a very high temperature and pressure and contains a sufficient store of energy to last for a run of five or six miles when the water is drawn from the engine and a new supply pumped in. This arrangement does away with smoke and fumes, but the amount of steam emitted is almost as objectionable. As before stated the cab or the bus is the principal means of transportation. At the omnibus stations you are given a ticket bearing a number which indicates the order of precedence and crowds at these stations extend into the hundreds awaiting their respective numbers to be called before they can enter a bus. The cab drivers are very insolent and will refuse to carry you if your journey is of any distance. In the evening hours when the crowds are returning home from the Exposition, it is next to impossible to obtain transportation by car, bus or cab. The cars and buses are crowded and tickets are out bearing numbers hundreds ahead of yours. The cabman will say that he is engaged, but if you offer him double rate he will forget his engagement.

The means of transport within the Exposition grounds are limited to the moving sidewalk and the electric railway. These lines run parallel but operate in opposite directions and form two belt lines one within the other.

The moving sidewalk draws a very large patronage, the fare being 50 centimes (10 cents) and permits a continuous ride as long as the passenger pleases. The sidewalk skirts the Champ de Mars, the main avenue of the fair, the Quai d'Orsay and the Esplanade des Invalides. The moving platform is supported on an endless structure covering a distance of about 10,000 ft. There are two parallel lines of platforms running $2\frac{1}{2}$ and 5 miles per hour re-

spectively, each composed of about 420 trucks. Only the alternate platforms are provided with trucks, the intermediate ones being linged to them. The trucks have wheels for carrying the weight and run on rails which are 21 ft. 4 in. above the ground. The driving, however, is done by rollers which are in contact with central longitudinal girders on the under side of the platforms. The driving rollers for both the high and low speed platforms are on one shaft, the different speeds being secured by having the rollers of different diameters. A flexible coupling is placed between the two driving rollers to allow for inequalities.

The motors are about 120 in number and of 5 h. p. each; they are carried on a spring suspension and the driving wheels are held up against the rails with a very uniform pressure so that unnecessary friction is avoided.

The Exposition tramway follows the same route as the moving sidewalk. It operates nine trains of three cars each; four Westinghouse motors of 30 h. p. each are on each car. The current is distributed by means of a third rail. This tramway is doing its work very well. The current for the operation of the tramway and the moving sidewalk is obtained from a central power station at Moulineaux, about four miles from the Exposition, where nine Westinghouse three-phase generators of 800-kw. each are installed. This current is received at the Westinghouse Pavilion in the Exposition grounds at a potential of 5,000 volts and is here lowered to 220, 350, and 550 volts for distribution to the tramway and sidewalk motors.

The street railway and electrical exhibits at the Paris Exposition are not very extensive. The general electric show is very fine, but there are few exhibitors from each country. In street railway material and rolling stock the exhibits were very few indeed and so scattered that they were next to impossible to find.

Perhaps in some lines, such as fabrics, furniture and art materials the exhibits represent the best in the world, but in the lines of mechanical engineering the lack of space prevented anything like an imposing showing. One reason for this is that not enough space was allowed in the main grounds, so an annex was designed at Vincennes some seven miles from the Exposition proper and here buildings were erected to take care of the overflow. Almost the entire American machinery exhibit is here, also the U. S. transportation exhibits, the American Bicycle Co.'s costly building and the Automobile Building. The attendance at Vincennes is almost nothing, as the distance is far and the attractions very few.



EXHIBIT OF AMERICAN STEEL & WIRE CO.

Referring to the extent of the street railway exhibits—I saw but two exhibits of rolling stock, one that of the J. G. Brill Co. at Vincennes and the other was a French tram car in the main transportation building. The following American firms had exhibits at Vincennes: International Pneumatic Railway Co., Rochester, N. Y., pneumatic tools; Gould Coupler Co., New York, couplers; New York Air Brake Co., New York, air brake apparatus; Standard Car Wheel Co., Philadelphia, car wheels; International Brake Shoe

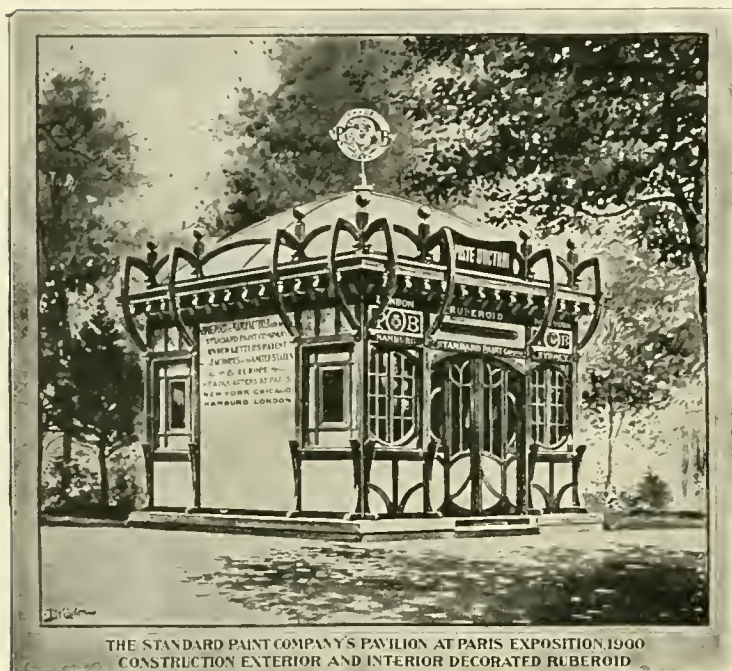
Co., New York, brake shoes, McConway & Torley Manufacturing Co., Pittsburg, couplers; J. G. Brill Co., Philadelphia, convertible cars and trucks. (An extended description of one of the trucks exhibited by the Brill company was published in the Review for June, page 344. This truck was similar to a number furnished to one of the new Paris roads.—Ed.)

The following American concerns have exhibits in the Electrical Building:

John A. Roebings Sons Co., Trenton, N. J., shows a large exhibit of electrical conductors in all sizes and gages, and a section of conduit electric road, such as used by the Metropolitan Street Railway Co., of New York. The track is complete, showing two manholes, the interior cables, racked on the side. Above one of the manholes is placed a stock reel of cable, the outer end is carried down into the manhole, showing the method of feeding into the conduit. It also uses this track to show the Columbia rail bond. In the Mining Building the Roebling company has another exhibit of wire rope and trolley wire.

The Bullock Electric Co., Cincinnati, shows a large exhibit of motors and dynamos.

The Lorain Steel Co., Lorain, O., and Johnstown, Pa., has a



THE STANDARD PAINT COMPANY'S PAVILION AT PARIS EXPOSITION 1900
CONSTRUCTION EXTERIOR AND INTERIOR DECORATED RUBEROID

prominent exhibit of Dupont trucks, motors, controlling boxes and rails.

The General Electric Co., Schenectady, N. Y., has a very prominent space, but shows no manufactured products. It has a large model of its factory which attracts much attention.

The Western Electric Co., Chicago, has a very large and complete exhibit which shows up the company's large and varied line in the most comprehensive manner.

The American Steel & Wire Co.'s principal exhibit is in the Mining Building. It has a very large and costly display; the traction materials include trolley wire and rail bonds.

Other exhibits are: The Crane Co., Chicago, valves; Walworth Manufacturing Co., Boston, valves; Standard Pneumatic Tool Co., Chicago, tools and appliances; Gold Street Car Heating Co., New York, electric heaters, seats and appliances; Albert & J. M. Anderson Manufacturing Co., Boston, switches and overhead material; Crown Woven Wire Brush Co., Salem, Mass., sample board of brushes; Safety Insulated Wire & Cable Co., New York, sample board of cables; Van Wagoner & Williams Co., Cleveland, drop forged commutator segments; Eureka Tempered Copper Co., North East, Pa., dynamo brushes and commutator bars; Pass & Seymour, Syracuse, New York, porcelain electrical specialties; C. J. Topping Co., Philadelphia, arc lamps; Robins Conveying Belt Co., New York, ash and coal conveying apparatus; National U. S. Carbon Co., Cleveland, carbons, batteries, etc.; Weston Electrical

Instrument Co., Newark, N. J., full line of instruments; Sprague Electric Co., New York, interior conduits.

In the Colonial Section is an interesting pavilion which was occupied by the officers of the Paris customs. This was built by the Standard Paint Co., and is inscribed with the American and European trademarks and the names of the various cities where the company has head offices—New York, London, Paris, Hamburg, Berlin, Sydney—and surmounted by the well-known rooster in gold. It is constructed entirely of ruberoid; the exterior walls are decorated in imitation of gray birch with pilasters of oak; the interior walls and ceiling are painted in floral and allegorical designs and the flooring has a tastefully colored Grecian border; the roof is undecorated. The company exhibits the P. & B. electrical compounds, insulating varnish and tape in the machinery and electrical department of the American Section, and also the P. & B. insulating papers, roofing and other products in the Civil Engineering and Transportation Department. D. C. W.

SOME JULY ACCIDENTS.

July 9th there was a head-end collision between two open cars on the Duryea line of the Scranton (Pa.) Railway Co. at Old Forge, near Pittston. The cars met at the bottom of a hollow, the view of which from one side is obstructed by a curve on the line; it is reported that the signal lamps had been tampered with, probably by mischievous boys. As one of the cars came around the curve mentioned the other car was seen coming down the opposite slope, and the crew and the five passengers jumped. The motorman of the other car, which had 62 passengers on board, stuck to his post and sustained injuries from which he died a few hours later. Only ten of the passengers were hurt, most of them having jumped when the speed of the car was reduced.

July 11th two cars, one loaded with people returning from a church picnic, on the Dayton (O.), Springfield & Urbana Street R. R. collided, injuring 20 of the passengers more or less.

July 17th an open switch on the Kings County elevated road caused a loaded passenger train to run into a siding at Georgia Ave. and Eastern Parkway, Brooklyn, which was filled with empty cars. Three of the empty cars were thrown into the street. No one was hurt.

On the same day a car on the Staten Island (N. Y.) Midland R. R. was derailed while running at high speed; it crashed through a 6-ft board fence and struck soft ground, where it turned over on its side. There were 25 passengers on board, two of whom had limbs broken.

A rear end collision between an electric train and a steam train occurred on the Fifth Ave. elevated line in Brooklyn on July 19th. The electric train had left the Hudson Ave. station, but was obliged to halt by reason of a fuse blowing just after reaching the curve at Fulton St. and Flatbush Ave. The train following was an express train of five cars drawn by a steam locomotive, and as the engineer could not see the disabled train because of the curve he was unable to stop in time to prevent a collision. The motorman of the electric train had gone under the car to replace the fuse and was killed. None of the passengers was seriously injured.

July 21st a car on the Niles and Mineral Ridge division of the Mahoning Valley Rv. was derailed by the breaking of the forward axle while descending a grade about midway between Mineral Ridge and Niles, O. The car turned over on its side and 13 of the 40 persons on board were more or less injured; none was fatally hurt, however.

July 30th two cars of the Dayton (O.) & Xenia Traction Co. collided on a curve at 2 p. m. Ten of the 25 persons on board were cut and bruised, two or three seriously. The crews of both cars state that the signals indicated a clear track ahead, and the company believes that the signals had been tampered with.

Two prominent society women of Montclair, N. J., ran the first cars over a newly opened electric line at that place.

The passengers on a cable train passing through the Chicago Van Buren St. tunnel recently, had a lively time dodging bullets, which were being exchanged between a watchman and three burglars that had taken refuge in the tunnel when discovered by the police.

DETAILS OF THE TACOMA ACCIDENT.

In our July issue were shown four scenes of the accident at Tacoma, in which a car of the Tacoma Railway & Power Co., carrying about 125 passengers went over a trestle on July 4th. Forty-three persons were killed and 65 injured. It was impossible to secure details in time for publication with the illustrations, and since then our own correspondent at Portland, Ore., has visited the scene of the wreck and furnishes the following facts:

"I find that the grade on which the accident happened is in the neighborhood of 1,500 ft. in length and averages approximately 6 per cent; it contains several curves of 200 to 300 ft. radius, while at the bottom there is a 38° curve (150 ft. radius.) The elevation of the outer rail is about 4½ in. and both the outer rail and the guard rail show bright wearing surfaces on the inside, indicating that the flanges bear properly in coming around the curve. There are no marks whatever showing climbing of the wheels, nor are there any marks between the rails on the ties; the outer ends of three of the ties were broken and scratched, evidently by the axle boxes on the truck as the car turned over. Witnesses testify that the speed must have been about 40 miles per hour at the time the curve was struck. The car got away from the motorman soon after leaving the top of the grade, owing to a slight mist having made the rail slippery. The car was heavily loaded, as might be expected on the Fourth of July.

skid easily and a free use of the sand was of no avail. He also tried to reverse but the circuit breaker opened. When the car entered the curve he thought it would make it safely even at the high speed. He states the wheels did not leave the rail, but that the body simply turned over by reason of its inertia, taking the trucks with it. This statement is undoubtedly correct. One of the passengers who jumped as the car neared the bridge and had time to raise his head while lying on the ground, testified he could plainly see the inside wheels rise from the rail and that the body went over toward the outside of the curve. Had it been on the street no great harm would have resulted, but being on the trestle the car tipped over into the gulch.

"The curve is half on the ground at the edge of the gulch, and half on the trestle, which at the point where the car went over is 41 ft. high. The car struck on the roof and then slid down about 50 ft. There are several witnesses who positively state that when the car was about one-third the way around the curve it tipped on its side and slid along the trestle on its side and then slid over the edge of the planking; it then turned still further and dropped bottom upward. It is interesting to note the distance the car went after it began to tilt and the left hand wheels had lifted from the rail. It is impossible to ascertain this with any exactness, but it seems to have been between one and two car lengths.

"Mr. J. P. Clark, of Seattle, formerly superintendent of the line, after examination of the curve testified that in his judgment the



CAR NO. 115—SIMILAR TO THE ONE WRECKED JULY 4TH.

"There is abundant testimony as taken at the inquest, which lasted three days, to prove that an unusually careful inspection had been made of Car 116, as well as of all the other rolling stock. The company expected a heavy traffic on this day and had made every possible preparation to handle it satisfactorily and safely. The testimony was absolute as to the perfect condition of car, motors, brakes, sandbox, etc., when the car took its run. I also find that the motorman brought his car to a full stop at the top of the grade and made the customary inspection of the brakes before starting down. The car, which was 10 minutes late and loaded to the steps, was a substantially built car for interurban work, the body being 24 ft. long and 30 ft. over the platforms. The driving wheels were 33 in. in diameter and the small wheels 20 in., with 3-in. tread and 7½-in. flange. The motors were G. E. 53 with K 11 controllers. Ordinary hand brakes worked with a handle were used and had sufficient leverage to slide the wheels without any great exertion on the part of the motorman.

"The motorman, F. S. Boehm, while a comparatively new man with the Tacoma company, had had three years' experience in Cincinnati on a hill road. He stuck manfully to his post and went over with the car, and while badly injured is recovering at the Paddock hospital. In his testimony before the coroner's jury he stated the rail was moist and slippery and soon after starting down he felt

the speed gaining on him. The rail was so bad the wheels would curve was in perfect condition, and such a car as the No. 116 could safely pass the curve at 20 miles an hour, although there is no necessity for going that fast.

"The jury went down into the gulch and inspected the wheels. Not one of the wheels was found to be injured, nor was there any break or flaw in the flanges. The jury in its verdict placed the blame on the company. This decision, it would seem to me, was suggested by public opinion, which naturally is more excitable and intense than calm and deliberate in such times, rather than the result of the best evidence of record. Passengers and spectators formed opinions quickly and of course without any technical knowledge or practical experience to support their views; but these seemed to count as much with the jury as the testimony of street railway experts.

"One of the local papers here interviewed a large number of leading business and professional men on the verdict and there were quite as many who considered it unjust as endorsed it.

"The manager, F. L. Dame, kindly granted my request for a photograph of Car 115, (Admiral Dewey) which is a sister car to No. 110 which was wrecked. That the trucks did not leave the rail until pulled off by the car body to which they were attached by chains, is highly creditable to their design and construction."

PERSONAL.

MR. WILFRID PHILLIPS has resigned the position of manager of the Niagara Falls (Ont.) Park & River Ry.

DR. LOUIS DUNCAN has accepted the position of chief engineer for the Keystone Telephone Co., of Philadelphia.

MR. A. A. McLEOD, president of the American Railways Co., of Philadelphia, retired from that position on August 1st.

MR. ARTHUR ELLIS, of Bolton, Eng., has been appointed electric tramway engineer by the Cardiff (Wales) Tramways Committee.

MR. F. L. BEARDSLEY, formerly assistant treasurer of the Derby (Conn.) Street Railway Co., has been made superintendent of the road.

MR. B. J. ARNOLD, president of the Arnold Electric Power Station Co., sailed for Europe August 4th on the Umbria for a pleasure trip.

MR. WILLIAM DANIEL RAY was married recently to Miss Joe Lemon, at Glenville, O. The "Review" extends heartiest congratulations and best wishes.

MR. N. E. MORTON has severed his connection with the Lowell, Lawrence & Haverhill Street Ry. He held the office of superintendent of the Lawrence division.

MR. J. B. HOGARTH, until recently chief clerk and auditor of the Florence & Cripple Creek R. R., has accepted the position of auditor of the Denver City Tramway Co.

MR. ALLEN N. JOHNSON, who was appointed receiver of the Little Rock (Ark.) Traction & Electric Co., on May 5, 1900, has asked the court to accept his resignation.

MR. C. A. DORNEY, the largest stockholder in the Allentown (Pa.) & Kutztown Electric Railway Co., has sold his stock to Samuel C. Boyer, Frank R. Wagner and others.

MR. FRANK A. DRAPER, formerly connected with the Detroit, Rochester, Romeo & Lake Orion Ry., has been appointed general superintendent of the Detroit & Northwestern Ry.

MR. CHARLES O. KRUGER, who has been connected with the Union Traction system of Philadelphia since 1893, was recently elected vice-president and assistant general manager of the company.

MR. L. N. DOWNS has resigned as president of the Railways Company General, of Philadelphia, and is succeeded by Mr. Evans R. Dick, president of the Investment Company of Philadelphia, which has recently secured control of the Railways Co.

MR. J. J. COLEMAN, formerly general manager of the St. Louis Transit Co., has accepted a position with the Washington (D. C.) Traction & Electric Co., as assistant to the president. He will have general charge of the operating departments.

MR. HENRY C. PAGE, for 16 years past, superintendent of the Salem division of the Lynn & Boston R. R., was last month made superintendent of the entire system. He is succeeded by Mr. W. S. Wolcott, of Danvers, Mass.

MR. W. H. HOLMES, president of the Metropolitan Street Railway Co., of Kansas City, has been seriously ill, but is now much improved in health and is making a pleasure trip in the East before again taking up his office work.

MR. GEORGE KISSAM, of New York, the well known advertising agent, sailed for Europe on July 18th, on board the steamer Deutschland. He expects to return to the United States in September in time for the convention at Kansas City.

MR. GEORGE A. M'KINLOCK, president of the Central Electric Co., of Chicago, is an enthusiastic golfer, and has succeeded in capturing the honors at a number of contests in competition with some of the crack amateurs from the East and West.

MR. GEO. A. CRAGIN, on August 1st, was appointed assistant general sales agent of the American Steel & Wire Co., with office in Chicago. He succeeds Mr. George H. Ismon, who returns to San Francisco as Pacific Coast sales agent, in place of Mr. Frank L. Brown, resigned.

MR. FRANK ECK, having resigned as superintendent of the Brazil (Ind.) Rapid Transit Street Ry., Mr. Peter Leidinger, who has been in the employ of the company for over six years, has been appointed his successor. Mr. Eck goes to Dallas, Tex., to take charge of street railway lines in that city.

MR. C. O. BRUNNER, treasurer of the Bethlehem Iron Co. and Bethlehem Steel Co. completed on July 12th his fortieth year of service. The occasion was marked by the presentation to Mr. Brunner of a silver pitcher and salver and a handsome cane from his fellow members of the staff of the two companies.

Mr. E. G. CONNETTE, manager of the Syracuse (N. Y.) Rapid Transit Railway Co., received a very flattering offer last month to take the management of the New Orleans (La.) City R. R. He at once declined the proffered position however, as he did not wish to leave Syracuse, which city he has found very pleasant in every way.

MISS MARY ELIZABETH COOKE, daughter of Mr. W. J. Cooke, vice-president of the McGuire Manufacturing Co., was married on June 28th, to Mr. Leslie George Swortwout at the First Presbyterian Church, Oak Park, Chicago. Mr. and Mrs. Swortwout will be at home after September 1st, at the Castleton, Oak Park.

MR. F. D. ROUNDS, general superintendent of the Metropolitan Street Ry., of New York, for personal reasons has resigned his office and his resignation has been unwillingly accepted by the company. The position of general superintendent will be abolished and Mr. Oren Root, jr., will perform the duties of the office with the title of assistant general manager.

MR. FRANK L. BROWN, having resigned his position as Pacific Coast sales agent of the American Steel & Wire Co., has been appointed general sales agent of the Shelby Steel Tube Co., of which company Mr. C. T. Boynton, former general sales agent of the American Steel & Wire Co. is president. Mr. Brown is one of the best known sales agents in the trade, and has the best wishes of a host of friends in his new business. He will make his headquarters in Chicago.

MR. C. D. WYMAN, whose resignation as general manager of the New Orleans (La.) City R. R. was announced in the last issue of the "Review," was tendered an elaborated farewell banquet on July 18th, by his fellow officials and the heads of departments of the company with whom he has been associated during his stay in New Orleans. Many words were spoken testifying to the energy, fairness and executive ability displayed by Mr. Wyman, and expressing regret at his departure.

ELECTIONS.

THE ST. THOMAS (CAN.) STREET RAILWAY CO. has chosen directors as follows: J. H. Still, (president,) John Farley, C. B. Hunt, Col. Stacey and M. A. Gilbert.

THE CONSOLIDATED TRACTION CO., of Pittsburg, has elected new officers as follows: President, C. L. Magee; vice-president, Joshua Rhodes; secretary, F. H. Steele; treasurer, W. L. Elkins, jr.

THE BURLINGTON (VT.) TRACTION CO., at a meeting last month elected the following officers: President, Elias Lyman; vice-president, Joseph A. Powers, Lansingburg, N. Y.; treasurer, W. F.

Hendee; secretary and clerk, B. H. Eagan; superintendent, T. B. Jones. Directors, A. E. Richardson, W. F. Hendee, Elias Lyman, J. A. Powers, C. W. Brownell, F. C. Kennedy, A. O. Humphrey, J. J. Flynn and L. H. Turk.

AT A MEETING of the Cumberland (Md.) Electric Railway Co., all the old officers were re-elected with the exception of Mr. Lloyd Lowndes who at his own request was succeeded by Mr. Jas. A. McHenry, as vice-president.

THE NEW YORK & NASSAU COUNTY RAILWAY CO., organized some months ago to build electric lines in the Borough of Queens, New York City, has elected officers as follows: President, Jos. Bermel; vice-president, P. J. Marra; secretary, W. L. Woodill; treasurer, E. J. McKeever.

THE RAILWAYS COMPANY GENERAL, of Philadelphia, has added to its list of directors the following new names: Evans R. Dick, banker; Richard H. Rushton, vice-president of Fourth Street National Bank; J. Ogden Hoffman, representative of the Carnegie Steel Co.; Jay Cooke, 3d, of C. D. Barney & Co., bankers, and John J. Collier, secretary of the Investment Co., all of Philadelphia.

THE STOCKHOLDERS of the Albany, New York & Schoharie Electric Railroad Co. at a recent meeting voted to reduce the number of directors from 13 to 9. The following directors were elected: Henry W. Burgett, Brookline, Mass.; Charles E. Bibber, Malden, Mass.; William H. Erwin, Albany; J. Sheldon Frost, Albany; Robert J. McCauley, Albany; Benjamin M. Secor, Albany; Ezra Twitchell, Schoharie, N. Y.; Luther C. Warner, Albany, and Thomas J. Wood, of Berne, N. Y.

OBITUARY.

MR. J. R. RAND, president of the Rand Drill Co., died on July 18th. Mr. Rand had but recently taken the presidency of the Rand company, succeeding his brother, Mr. Addison C. Rand, who died on March 9th.

MRS. B. L. KILGOUR, wife of Mr. B. L. Kilgour, electrical engineer of the Cincinnati Street Ry., died suddenly last month at her home in Cincinnati. The employes of the company, on learning of the sad event, at once called a meeting and passed resolutions extending their deepest sympathy to the Kilgour family in this affliction.

NEW PUBLICATIONS.

THIRTY-FIRST ANNUAL REPORT OF THE BOARD OF RAILROAD COMMISSIONERS OF MASSACHUSETTS.—This comprises in one volume the report proper of the commissioners and the tabulated returns from the railroads and street railways of the state, published earlier in the year, and the detailed reports of the individual companies. The preliminary publication of the Board, which was abstracted in our June issue, is a book of 366 pages, and the detailed reports fill 818 pages additional, making the complete report a volume of nearly 1,200 pages. The Railroad Commissioners of Massachusetts are James F. Jackson, Fall River, chairman; George W. Bishop, Newtonville; Hersey B. Goodwin, Cambridge. Wm. A. Crafts, Boston, is clerk.

CAHALL WATER TUBE STEAM BOILERS. Fifth Edition; 120 pages. Issued by the Cahall Sales Department, Pittsburg.—Those of our readers who are familiar with the previous issues of this book will all wish to read the present edition, and others who are steam users and interested in the subject of boilers should write for a copy. The introduction is a well written essay on the evolution of steam generators from externally-fired shell types to the water-tube boilers of today; this is followed by an enumeration of the requirements of a perfect boiler and detailed descriptions of the Cahall vertical and Cahall horizontal boilers, made by the Aultman & Taylor Machinery Co., of Mansfield, O. The boilers especially designed for utilizing waste heat from heating and puddling furnaces are also described. Special attention is directed to

flowed steel headers, swinging man heads, and the Mansfield chain grate stoker. The results of various tests on efficiency and capacity are given; these show an efficiency of 77.4 per cent at 85 per cent above rated load, to 85.9 per cent at the rating. In conclusion are articles on the "Capacity of Boilers" by S. C. Munoz, and "Superheat" by R. S. Hale. The book is profusely illustrated, each alternate page having a half tone engraving.

GOOD RECORD AT GALESBURG.

The Electric Railway & Power Co. at Galesburg, Ill., is making a good record under the management of President Fred Seacord. During the past three years the bonds which are all held by the stockholders have been reduced by the retirement of \$15,000, in addition to spending \$60,000 in improvements to the property. All this has been done out of the profits of the business. When the present management took hold the bonds were quoted at 90 cents and the stock at 10 cents.

A striking combination of good management and good fortune is seen in the expense for damages which has amounted to only \$65 in the year.

NEW ROAD IN WESTERN ILLINOIS.

Mr. M. M. Stephens, of East St. Louis, Ill., who has the contract for building the Collinsville, Caseyville & East St. Louis Electric R. R., writes us that eight miles of the road have been built and it is expected to have the entire system ready for operation on or before September 1st.

The rolling stock will consist of two 42-ft. double truck cars each equipped with 37½-h. p. Lorain "Steel" motors, and three single truck cars, each equipped with two 35-h. p. Westinghouse motors. The company will also purchase a few light cars for trailers. The road will have no power station of its own, but will lease power from the St. Louis, Belleville & Suburban Ry., with which connection will be made at Edgemont or French Village.

REORGANIZATION OF ELECTRICAL HOUSE.

The Miller-Knoblock Co., of South Bend, Ind., has been reorganized under the name of the Miller-Knoblock Electric Manufacturing Co., and has taken over the plant and business of the Northwestern Electric Manufacturing Co., of Chicago, maker of insulated wire. The new company will enlarge its facilities in all departments, and will continue to make and sell commutators and armature coils. It will also produce all sizes of silk and cotton covered magnet wire, and will make a specialty of coarse sizes of single and double cotton covered wire for armature winding and field coils, the consolidation with the Northwestern company rendering the new concern independent of the wire trust.

STREET RAILWAY CLUB IN NEW ENGLAND.

A meeting was held at Young's Hotel, Boston, on July 18th, for the purpose of forming a social club among the street railway superintendents and others interested in street railways in New England. There were about 35 gentlemen present, and the "New England Street Railway Club" was duly formed. Arrangements were made for holding a grand outing in September, at which it is hoped representatives from every road in the New England states will be present.

The officers of the club for the first year are: President, H. E. Bradford, Marlborough (Mass.) Street Ry.; vice-president, L. H. McLain, Newton (Mass.) & Boston Street Ry.; secretary, R. H. Derrah, Boston; treasurer, Geo. H. Burgess, Leominster (Mass.) & Clinton Street Ry. The executive committee consists of the officers and F. G. L. Henderson, Newton, Mass.; E. E. Potter, New Bedford, Mass.; J. F. Whetles, Boston, Mass.; W. G. Meloon, Portsmouth, N. H., and D. F. Burritt, Palmer, Mass.

The rules of the Lynn & Boston Street Ry. permit smoking on the rear three seats of open cars. General Manager Foster has recently instructed his conductors, when enforcing this regulation, to count the seat on the rear platform as one of the three.

ONLY ONE ALBANY GREASE.

Those of our readers who have used this well-known lubricant will readily admit that there is but one Albany grease as far as results are concerned. There have always been many imitations of this very successful lubricating compound on the market. Of late, however, the number has increased largely, owing no doubt to the growing popularity of the real article, and many engineers have the impression that "Albany Grease" is simply a name, and may be applied to any high grade lubricant. This is not so.



The Albany Compound & Cup Co., of which Adam Cook's Sons, 313 West St., New York City, are the proprietors, has been for 30 years the sole maker of the original Albany grease, for which the claims are made that it has become the standard of excellence and the best lubricating compound ever introduced for general machinery. Referring to the matter Adam Cook's Sons said: "The country is full of bogus compounds, that are claimed to be 'similar in looks to Albany,' a 'fac simile of the Albany,' and 'the same as the Albany,' etc. We boldly declare there is no lubricating compound made the same as the Albany, that none will do the same amount of work, that there is only one Albany grease, and we are the only manufacturers of it. If there is any way by which we can make this fact more plain so the consumer and jobber will not be deceived, we would kindly ask one and all of our patrons to tell us what it is and we will give it immediate consideration."

It would seem that deception would be effectually prevented if buyers would look for the distinctive yellow label and familiar trademark here reproduced, which appears on every package containing Albany grease. There certainly is no profit in buying imitations when the genuine can be had at the present prices, but one should have a care that he is getting the real thing. Adam Cook's Sons continue to offer samples of the compound free for testing, so that every engineer may have the fullest opportunity to investigate in a practical way the claim made for it.

SPECIAL EXHIBITION NUMBER.

The issue of the Tramway & Railway World, of London, for July, 1900, is a special exhibition number in honor of the Tramways & Light Railways Exhibition recently held at London. The special features, in addition to the article on the exhibits, are a description of the new works of the English Electric Manufacturing Co., an

CONDUCTORLESS CARS IN MONTGOMERY, ALA.

The city council of Montgomery, Ala., early in July passed an ordinance prohibiting the operation of street cars without conductors, but an amendment was subsequently adopted exempting roads that did not operate six cars. The mayor vetoed the ordinance on the ground that it made an unfair discrimination. He thinks that if the safety and convenience of the public demand conductors on some cars, they are necessary on all.

DOES NOT WISH TRACKS REMOVED,

A temporary injunction restraining the Wichita (Kan.) Railroad & Light Co. from removing what is known as its Fairmount line, has been secured by a Mr. Campbell. The plaintiff alleges that the company which built the road was bound to operate it for the full term of the franchise as that was a condition on which he gave it a right of way over his property and a bonus of \$4,000 in cash. Mr. Campbell had laid out a portion of his property in town lots.

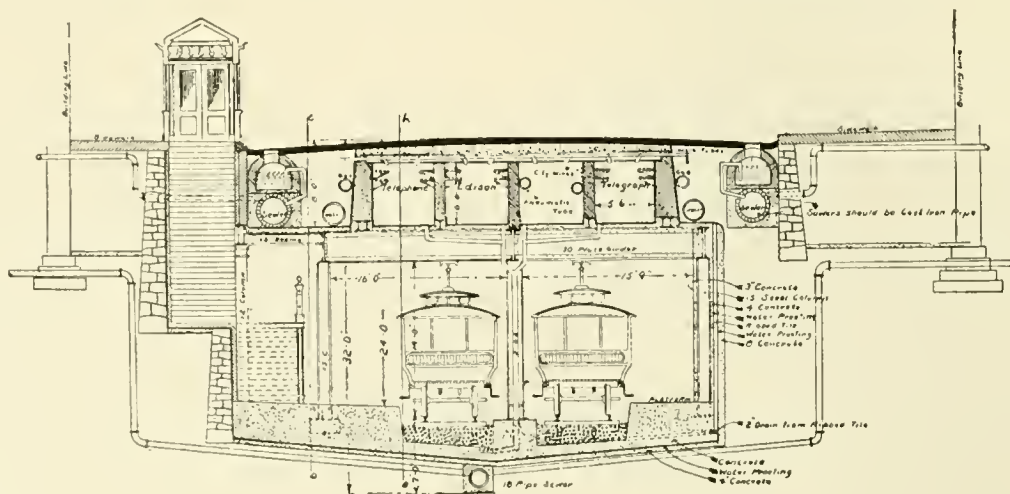
ELECTRIC RAILWAY IN KOREA.

A newspaper dispatch states that the electric railway in Korea is to be trebled in length because of a peculiar superstition. It now runs to the cemetery in which the late queen is buried, which is five miles from Seoul. The royal astrologers declare that the cemetery is not favorably located, and that the queen is not happy there, consequently the king has ordered it to be removed to a point 15 miles from the capital, and the railway is to be extended to the same place, in order that he may visit the tomb conveniently. The dispatch adds that as the road is in American hands, it is not impossible that the astrologers were inspired to utter their warning by means not unknown in the United States.

This is the road that was attacked by the natives on the opening day and almost destroyed, as a result of which disturbance several of the ringleaders lost their heads, literally. A description of the road with an account of this attack will be found in the "Review" for Aug. 15, 1899, page 534.

PROPOSED SUBWAY FOR CHICAGO.

At the request of the Chicago street railway commission, Mr. John M. Roach, president of the Chicago Union Traction Co., has submitted plans for subways in the downtown district, to be used

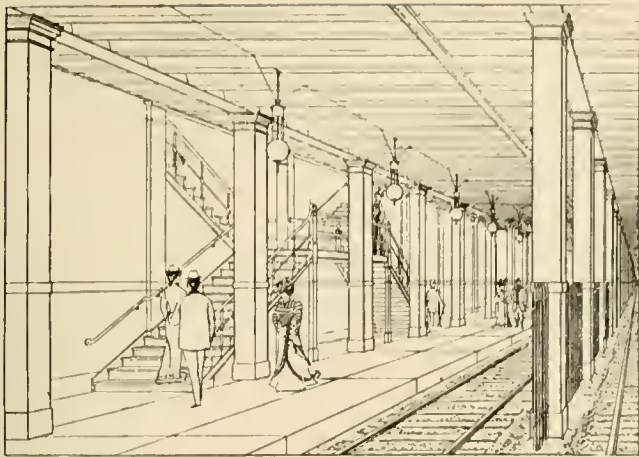


CROSS SECTION OF PROPOSED CHICAGO SUBWAY.

interesting and comprehensive article on "Overhead Electric Tramways for London," by J. Clifton Robinson, which is unusually valuable coming from such a high authority, and a paper on the advantage to be gained by selecting rolling stock for a given service, written by Douglas T. Heap. The number is a credit in every way to the editors and publishers.

by the street railways. In thus preparing plans, Mr. Roach is not representing his company, and the scheme does not contemplate the construction of the subway by the traction companies, nor are franchise terms considered.

The plans provide for six loops, two to be used by cars entering from each of the three divisions of the city, and so arranged that



TRANSFER STATION.

passengers desiring to transfer will in no case have to walk farther than one block, and there is a transfer station in Madison St. A new tunnel under the river at Dearborn St. is specified. Wires and gas pipes will be carried in conduits placed between the roof of the tunnel and the street surface.

The cost of the subway is estimated at \$2,000,000 per mile.

NEW ROADS NEAR HAMILTON, ONT.

Mr. John Patterson, of Hamilton, Ont., writes that construction work on the new street railway lines now building by the Hamilton Electric Light & Cataract Power Co., Ltd., is progressing rapidly and cars will be running on a portion of the route before snow flies.

bridges, one 40 ft. high, with four spans of 150 ft., and one 130 ft. high, with a single span of 600 ft.

Mr. Patterson, who is secretary of the Hamilton Electric Light & Cataract Power Co., is also actively interested in the Nickel Steel Company of Canada, the Hoepfner Refining Co., and the Cataract Power Co., of Hamilton.

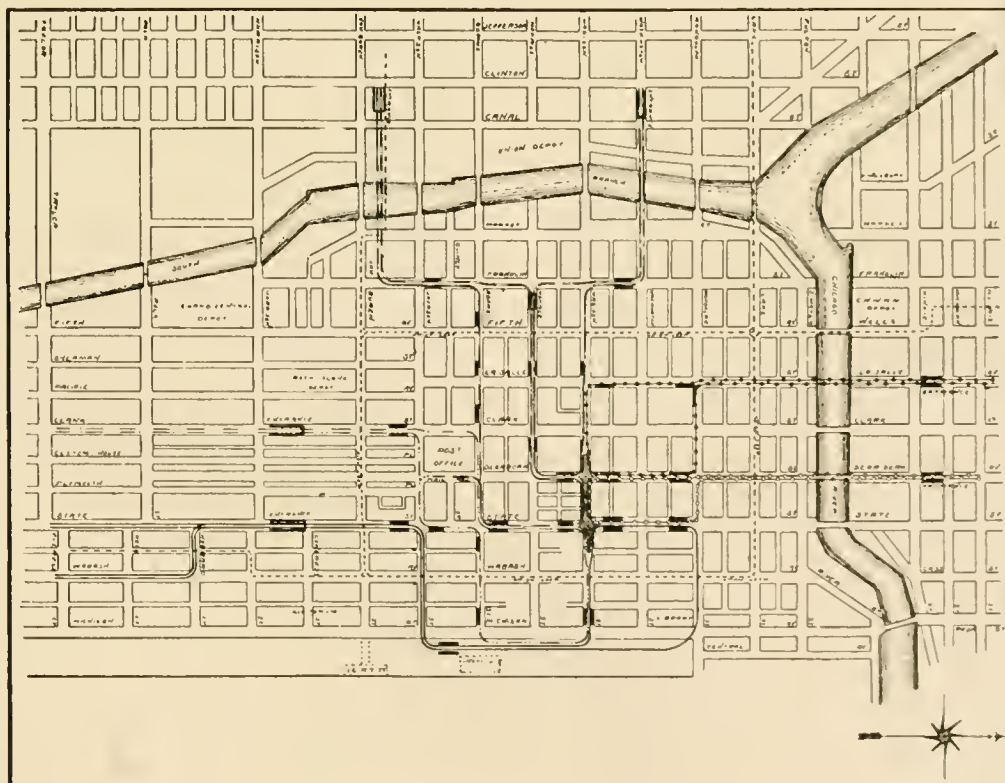
E. C. FOSTER.

Mr. E. C. Foster, who has just been appointed general manager of the individual companies controlled by the Massachusetts Electric Cos., is a self-made man in the fullest sense of the word. Starting in business life as a milk wagon driver at the age of 16, he has pushed on to higher and higher positions of responsibility and trust, without the influence or aid of those about him, except as he has won the confidence and help of his superior officers by his own worth.



E. C. FOSTER.

Mr. Foster was born in Hancock, N. H., Oct. 23, 1852. He attended the public schools of his native town until he reached the age of 15, and after a year at Appleton Academy, Ipswich, N. H., he started out in the world for himself. Arriving at Lynn, Mass., he accepted the first position that offered itself, which was running a milk route, and he stuck to this for three years. He then became a conductor on the Lynn & Boston system and has remained with this company ever since, leaving the rear platform to become starter, then superintendent of track, then general superintendent and finally general manager. His duties have now been increased by giving him direct supervision of the other street



PLAN OF PROPOSED SUBWAY, CHICAGO.

The plans of this company were published in the "Review" for Dec. 15, 1899, page 868, and include the building of an electric railway from Hamilton to Guelph, a distance of 30 miles, and from Hamilton to Waterloo, through the cities of Galt and Berlin, a distance of 44 miles. Power will be taken from De Cew falls, about 35 miles from Hamilton, making the longest transmission about 75 miles.

In addition to heavy grading it will be necessary to build several

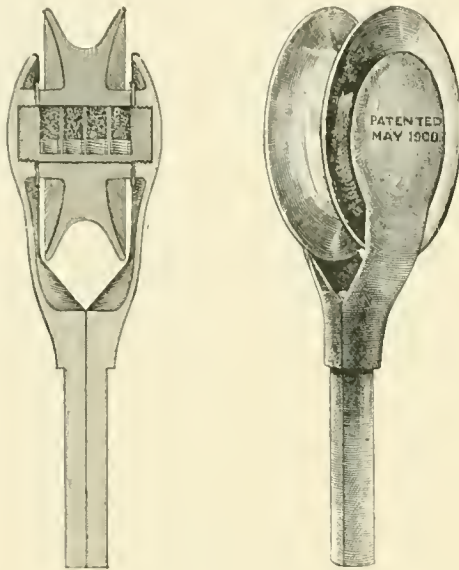
railways of the Massachusetts Electric Cos. He will make his headquarters at Boston.

Among the events on the program for fittingly celebrating the opening of the Goffstown line of the Manchester (N. H.) Street Ry. were a band concert, a display of fireworks and a salute by an old cannon.

THE FEIST TROLLEY HEAD.

There has just been placed on the market a new trolley head, which has a number of novel features which will strongly commend it to street railway men. This device is known as the Feist patent trolley head and differs from the other self-lubricating trolley heads now on the market, in that it is absolutely self-lubricating, without oil, a fact in itself which is most thoroughly appreciated by all users of trolley wheels. The design was developed and perfected by Mr. Fred H. Fitch, then general manager of the Sioux City (Ia.) Traction Co., and the patentee, Mr. C. M. Feist, master mechanic of the same company, and the head has been given a thorough test in actual service for over a year on that line.

After its success had been thoroughly demonstrated, and knowing the demand existing for a graphite lubricated wheel of long life that would require no attention, it was decided to place this head on the market, and accordingly, an arrangement has been



FEIST TROLLEY HEAD.

made, whereby the W. R. Garton Co., of Chicago, becomes sole manufacturer and selling agent.

By reference to the accompanying illustrations, it will be seen that the device consists of a two-piece harp, made of malleable iron, and a hardened steel axle, threaded at its ends, connecting these pieces. Four holes are bored in this axle, in each of which is carried a graphite pencil of special composition, these pencils being held against the bearing of the trolley wheel by helical springs in such a manner as to secure constant and even lubrication, and assure positive contact. One set of lubricating pencils outlasts a 20,000 mile wheel.

Thin lubricating washers are placed on this axle, between the wheel and the arms of the harp, thereby insuring lubrication here, and preventing cutting such as would occur with a metal washer.

The axle for a two motor equipment is one inch in diameter, while for a four motor equipment it is made 1 7/16 in. in diameter. The size of these axles offers an increased bearing surface, thus insuring ample contact and a materially longer life to the wheel, both bearing and axle being evenly and thoroughly coated with the lubricant. An even wearing away of the bearing is thus obtained, effectually doing away with the objections to be found in some of the present graphite bushing combinations, where the wheel bearing is not sufficiently lubricated, causing it to wear away in parts, unevenly, and so rapidly becoming loose, causing destructive arcs between the wheel and its axle. This results in blistering the axle and hence there are frequent renewals and repairs, to say nothing of the short life obtained. Both standard 4 3/8-in. (2 1/2-lb.) wheels and 6-in. wheels are furnished for these harps, either 1 in. or 1 7/16 in. bore. The wheels are made after a special formula, which, it is stated, actual and severe service has proven to be superior to any other thus far used. The Sioux City Traction Co. reports a life of 14,900 miles for one of these wheels, which received no attention whatever from the time it was put in service until it was removed, and even then it was good for more mileage.

The W. R. Garton Co. reports that wherever this trolley head has been brought to the attention of managers and engineers it has met with a most hearty approval and acceptance and it already has assurances from some of the largest roads in the country, that entire equipments will be secured as soon as the wheel is ready for delivery. The company expects to be able to make deliveries within 30 days.

GLASGOW TRAMWAYS REPORT.

We have received a copy of the yearly report of the Glasgow Corporation Tramways for the fiscal year ending May 31, 1900, and reproduce herewith a tabulated summary showing the principal data for the year's operation.

Compared with the preceding year, the report shows an increase in gross receipts of 31,659, an increase in passengers of 8,853,816, an increase in car-miles run of 585,789, and an increase in the receipts per car-mile of .09d.

From the report we learn that arrangements have been made with the corporation of Paisley for the use of portions of the tramways in Paisley and that the Glasgow tramways will be extended to the Paisley boundary. Negotiations are under way with other municipal and county corporations and if these reach a satisfactory conclusion, parliamentary powers to construct other extensions will be sought. On July 12, 1899, an increase of wages of 1 shilling per week was given to the employes in the traffic department.

SUMMARY FOR YEAR ENDING MAY 31, 1900.

	HORSE TRACTION.	ELECTRIC TRACTION.	TOTAL.
Street Miles of Tramway open for traffic, ...	37 1/2	5	42 1/2
Traffic Revenue,	£411,175 1 11	53,611 13 3	464,786 15 2
Total Revenue,	£416,253 12 3	53,711 18 8	469,965 10 11
Working Expenses,	£320,468 13 0	24,252 18 3	344,721 11 3
Fixed Charges,	—	—	£78,675 7 8
Added to Reserve Fund,	—	—	£46,568 12 0
Car Miles run,	8,729,559	927,870	9,657,429
Passengers carried,	112,802,626	14,825,858	127,628,484
Average number of Cars & Omnibuses, (16 hour day),	289.14	27.82	316.96
Percentage of Working Expenses to Gross Receipts,	76.99	45.15	73.35
Average Traffic Revenue per Car Mile,	11.30d	13.67d	11.55d
Average Total do.	11.44d	13.89d	11.68d
Average Working Expenses per Car Mile,	8.81d	6.26d	8.60d
Average Fare per Passenger, ... ..	.875d	.868d	.874d
Average number of Passengers per Car Mile,	12.92	15.98	13.21
Number of Cars in Stock,	384	133 (47 in use.)	517
Number of Horses in Stud,	—	—	4,411
Proveeder and Litter per Horse per Week, (Less Manure Sold),	—	—	7s. 8.60d.
Total amount of Sinking Fund to 31st May 1900,	—	—	£55,592 18 4
Total amount of Depreciation written off Capital to 31st May 1900,	—	—	£124,306 1 0
Amount in Permanent Way Renewal Fund,	—	—	£69,600 0 8
Amount in General Reserve Fund,	—	—	£169,492 0 6

In conclusion the committee expresses gratification at the continued success of the undertaking and particularly at the extremely satisfactory results which have attended the introduction of electric traction. Mr. John Young, general manager of the system, was highly complimented on his excellent work.

An appendix to the report contains a lengthy statement concerning an outbreak of glanders among the tramway horses.

Another interesting statement shows that during the year there were 7,407 articles found in the cars; 3,836 of these were claimed at the tramway office and 3,571 were turned over to the police department. The articles found are thus classified: Umbrellas, 1,240; walking sticks, 95; gloves (pairs), 144; purses, 623; sums of money, 49; watches, 21; coats and waterproofs, 175; spectacles, 97; bags, 744; parcels of clothing, 839; furs, 75; workmen's tools, 95; books, 192; articles of jewelry, 71; music, 25; keys, 248; baskets, 351; boxes, 130; parcels, 727; miscellaneous, 1,466.

FOREIGN FACTS.

The Cardiff (Wales) Corporation Tramways are to be extended.

The Bury (Eng.) Town Council is thinking of building electric trams.

The electric tramway at Carlisle, Eng., has been officially opened for traffic.

The first section of the Metropolitan Underground Ry., Paris, has been completed.

The total length of electric tramways in Italy is 1,974 miles, according to the *Gazetta Ufficiale*.

Dick, Kerr & Co., of London, have the contract for building the Calcutta (India) Electric Tramways.

The municipal tramways at Mannheim, and at Ludwigshaven, Germany, are to be equipped electrically.

A bill is before the House of Commons, authorizing the Mersey Railway Co., of Liverpool, to adopt electric traction.

Mr. Gerald Barker, of London, Eng., has a project for building a light railway between Todmorden and Bacup, Eng.

About 800 employes on the street railway at Budapest have struck for an increase in wages and a reduction in hours.

La Societa Elettrica Alta Italia has contracted to convert the accumulator tramway in Turin, to the overhead trolley system.

Willesden, Eng., is planning to have electric tramways. Mr. E. T. Ruthven Murray is electrical engineer to the corporation.

A new electric line known as the Clontarf (Ireland) & Hill of Howth Tramway has been completed from Dollymount to Howth.

The Marseilles (France) suburban tramways, which are owned by the *Compagnie Generale de Tramways*, are to be largely extended.

Parliament has passed a bill providing for the electrical equipment of the South Eastern Metropolitan Ry., running from Greenwich, London, to Catford.

An electric railway has just been completed at Manaus, Amazonas, Brazil, S. A., by the Manaus Railway Co. The road is 14 miles long and was built at a cost of £120,000.

The Preston (Lancaster County, Eng.) Corporation is seeking powers to reconstruct existing horse tramways for electrical operation, and to build 11½ miles of new lines.

The Board of Trade has confirmed the following orders for light railways: Bexhill & St. Leonards Light Ry., Cheltenham & District Light Ry., and the Cheltenham & District (Extension) Light Ry.

The Chilian (S. A.) Electric Tramway & Light Co., Ltd., during its last fiscal year carried 41,743,687 passengers. The road is now being equipped electrically by the *Allgemeine Elektrizitaets Gesellschaft*, of Berlin.

Valera, Cuneo, Hermanos & Co., owners of the electricity works at San Fernando, Argentine Republic, have obtained concessions for electric tramways from Buenos Ayres to Martinez, San Isidro and San Fernando.

The Budapest Tramway Co. has a home-made snow plow consisting of an ordinary tramcar frame under which, both back and front, are placed cylindrical brushes, 3 ft. 7 in. in diameter, and rotated by means of a 20-kw. motor. There are also track brushes in front of each wheel, which clean the rails of snow and dirt. The car complete weighs 12½ tons.

Mr. W. G. Bingham, who recently secured a concession for an electric railway from the Adelaide (S. Australia) Corporation, has formed a syndicate with over a million pounds sterling capital, and the road will be built at once.

Foreign electrical papers are calling the attention of their readers to the fact that excellent opportunities exist in Porto Rico for the establishment of electric railways in the interior towns, where water power is abundant.

Preliminary plans and specifications are being prepared by the Burnley (Eng.) Town Council for reconstructing and electrically equipping the tramways within the borough. Alderman Armistead is chairman of the tramways committee.

In Sydney, N. S. W., where in some instances electric cars and steam trains operate over the same track, it has been noticed that passengers prefer to stand up in an overcrowded electric car, rather than ride in a comparatively empty steam coach.

Olympio de Assis, an engineer, whose address is Fello Horizonte, Minas, Brazil, is interested in an electric railway to be built at Cidade de Minas, Brazil, and requests that catalogs and price lists of American electric railway supply firms be sent him.

The Ballarat (Victoria, Australia) Corporation has sanctioned the proposal of the British Insulated Wire Co., of Prescott, Eng., to form a local company to acquire the tramways and convert them to electricity. The company will be called the Electric Supply Co., of Victoria.

Alexandria, Egypt, has an electric railway 18 miles long. At present the company operates 50 motor and 40 trailers, each of the motor cars having two motors of 35 h. p. It is expected 12 miles of the line now operated by steam will soon be changed to the electric system.

A syndicate in which Sir William Van Horn and James Hutchinson, of Montreal, and B. F. Pearson, of Halifax, are largely interested, has secured a number of electric railway concessions in the West Indies. It is now building a 10-mile road at Demerara and a 12-mile road in Trinidad.

A company with \$1,500,000 capital is being formed to build an electric railway connecting the Canadian towns of Port Dover and Preston, via Simcoe, Waterford, Boston, Mount Pleasant, Brantford, Paris, Ayr, Blair, Doon and Berlin. It is proposed to acquire the Brantford (Can.) Street Ry., the Galt, Preston & Hespeler Electric Ry., and the Berlin & Waterloo Electric Ry.

The employes of the Sheffield (Eng.) Corporation Tramways recently threatened to strike because, they claimed, there was no one person in authority over them and they often received conflicting orders from two or three officials. The company settled the difficulty by promoting the electrical engineer to the position of general manager. His salary was raised to £600 per annum.

The London County Council has purchased for £1,075, the entire exhibit which the British Westinghouse Co. had at the Tramways Exhibition. This comprised a tramcar fully equipped, rails and conduits for a sample section of track and the gas engine and dynamo for operating the car. The sample line will be laid down at the Camberwell depot, and will be used as an object lesson to the highways committee and the council's engineers.

In the House of Lords the following bills have been read a third time: Manchester Corporation Tramways; South Staffordshire Tramways; Mersey Ry.; Liverpool Overhead Ry.; Southport Extension & Tramways; Glasgow & District Tramways; Central London Ry.; Stockport Corporation Tramways; Great Grimsby Tramways. The following have been read the third time in the House of Commons: Blackpool, St. Anne's & Lytham Tramways; Christchurch & Bournemouth Tramways; Huddersfield Corporation Tramways; Jarrow & Hebburn Electricity Supply; Newry, Keady & Tynan Light Ry.; Metropolitan District Ry.; London United Tramways.

NEW TRAMWAY IN SPAIN.

U. S. Consul-General Lay, of Barcelona, Spain, writes the department that the Barcelona & San Andres Railway Co. is about to build an electric tramway between Barcelona and Horta, a distance of four miles. Mr. Lay states the concession is owned by the Societe Anonyme d'Entreprise Generale de Travaux, Liege, Belgium, and suggests that American dealers in electric railway apparatus and supplies correspond with this company at once. The corporation is a very large one and has built many miles of tramways in Europe, and is now constructing lines in Russia.

ABUSE OF COMMUTATION TICKETS.

When the Brooklyn Rapid Transit Co. announced an increase to 10 cents in the fare from Brooklyn Bridge to Coney Island, it was also announced that the company would sell to permanent residents in the suburban territory below 22d Ave. and Kings Highway, commutation tickets at 5 cents per ride, good only when presented by the person whose name appeared thereon. It has been decided to discontinue these, however, as it is found many non-residents have obtained the tickets, and furthermore conductors have been detected turning in five-cent tickets for 10 cent cash fares collected.

Mr. J. C. Brackenridge, in a recent interview, is quoted as saying: "We are still desirous of maintaining a five-cent fare for the residents of the localities south of Kings Highway and 22d Ave., but we have been unable to devise any system of tickets which does not permit of abuse. If the residents of those localities can suggest any practical method for overcoming this difficulty we shall be glad to adopt it."

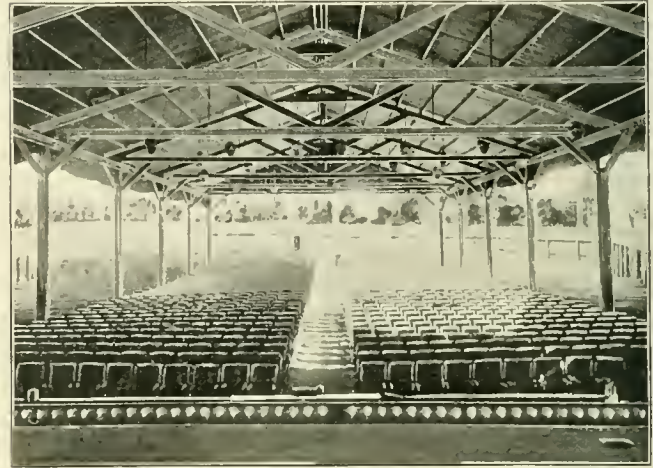
STEEL, COPPER AND TIE QUOTATIONS.

The iron and steel markets remain practically unchanged, but there is a scarcity of orders, especially large ones, and the market prophets predict a slump in prices before the fall buying commences. Steel rail quotations are as follows: Heavy T sections, \$35 to \$37; light T sections, \$30 to \$35; girder sections, \$40 to \$44. At Chicago angles are selling at \$1.60; spikes, \$1.70; bolts, \$2.20; relaying rails,

this year has absorbed 90,277 tons of the total 134,577 tons produced for that period in the United States. Lake copper is selling at 16³/₈ to 16¹/₂ cents; casting copper at 16¹/₄ to 16³/₈ cents.

NEW THEATER AT SYRACUSE.

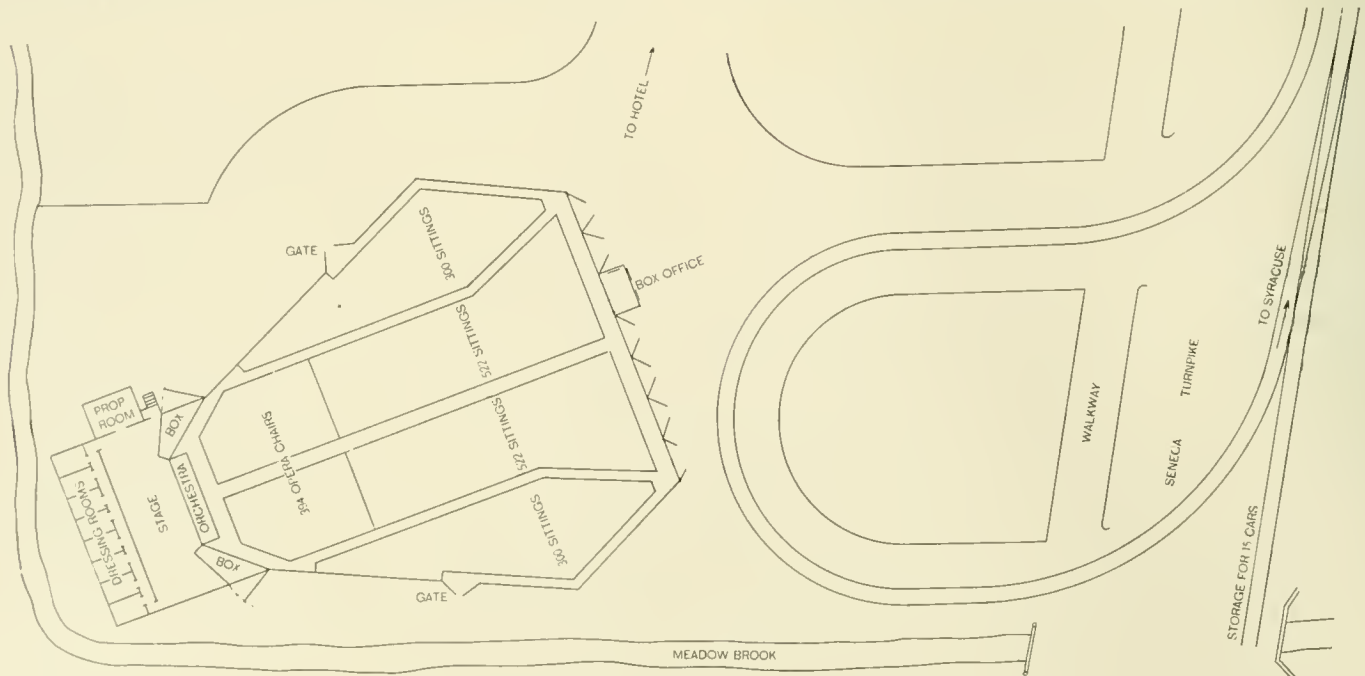
The Syracuse (N. Y.) Rapid Transit Railway Co. last month completed an outdoor theater where light summer opera will be given during the present season. The building, as shown in the



VIEW FROM STAGE.

accompanying diagram, is kite shaped, its greatest length over all being 165 ft. and its greatest width 120 ft. From the front of the stage to the rear row of seats is about 125 ft. The stage proper is 52 x 19 ft., and has a property room 11 x 15 ft. at one side, and eight dressing rooms, each 7 x 11 ft. at the rear. The total seating capacity is about 2,000.

In laying out the terminal arrangements, excellent provision has



PLAN OF VALLEY THEATER AND LOOP, SYRACUSE, N. Y.

\$20 to \$22. Good steel relaying rails, T sections in 30-ft. lengths may be purchased f. o. b. Pittsburg at \$24 to \$26; angles at \$1.50.

Cedar ties are quoted f. o. b. Menominee, Mich., 24 and 26 cents. At New York prices have advanced 1 cent over last month, yellow pine ties selling as follows: 7 x 9 in. x 8¹/₂ ft., 65 cents; 6 x 9 in. x 8 ft., 60 cents; 6 x 8 in. x 8 ft., 55 cents; 6 x 7 in. x 8 ft., 50 cents.

Copper quotations are again advancing, due, it is said, to the enormous foreign demand which during the first six months of

been made for loading and unloading passengers. A loop passing close to the front of the theater permits cars to land passengers almost at the box office, and after the performances are over, or at the approach of a sudden shower, a number of cars can be bunched on the loop to care for the homeward bound rush. A spur track having a storage capacity of 15 cars is also laid down as indicated, to facilitate the movement of extra large crowds.

Mr. E. G. Connette, vice-president and general manager, to



A PERFORMANCE OF "BOCCACCIO."

whom we are indebted for the diagram and photographs, writes, under date of July 23d, as follows: "We have now run the summer opera for three weeks, and it is growing in great favor with



EXTERIOR, SHOWING ARRANGEMENT OF EXITS.

the people of Syracuse. We are attracting large crowds of the very best people of the city. Conductors sell tickets at 25 cents for the round trip, which includes admission to the opera."

◆◆◆
WAGES INCREASED.

The Cincinnati & South Covington Street Railroad Co. will hereafter pay all its conductors and motormen 18 cents per hour. The Trenton (N. J.) Street Railway Co. has increased the pay of trainmen from \$1.60 to \$1.75 per day. The employes of the Camden (N. J.) & Suburban Railway Co. were agreeably surprised recently when the company presented each man that had been in its service five years or over with a new uniform suit; the men that had served 10 years received two suits, and those that had been employed 15 years received two suits and an overcoat.

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TOLEDO & ADRIAN ELECTRIC RY.

Mr. L. B. French, 314 Hammond Bldg., Detroit, advises us that the Toledo & Adrian Electric Railway Co. is now in a position to let a contract for the construction and equipment of the 28½-mile line between Adrian and Toledo. It is expected that the contractor will take a portion of the bonds. The survey has been completed and a private right of way for the entire distance secured.

It is authoritatively stated that the Baltimore & Ohio R. R. has decided to install a third rail conductor to take the place of the overhead trolley in the tunnel at Baltimore.

HALF FARES.

The Louisville (Ky.) Railway Co. has fitted up a bath room for the use of its employes.

Arrangements are about to be made for giving Kansas City, Mo., a street railway mail service.

The general offices of the Fort Wayne (Ind.) Traction Co. have been moved from Chestnut St. to the new office building on Holman St.

To overcome as much as possible the crowding of cars in San Francisco, the Market Street Railway Co. has introduced 19 ft. rolling stock.

An electric line 55 miles long to connect Pueblo, Col., and La Junta is proposed; other towns on the route are Rocky Ford, Boone, Fowler and Baxter.

The South Side Elevated R. R. of Chicago carried a daily average traffic of 60,972 passengers in July, against 52,644 in the same month in 1899, a gain of 8,328.

The Brooklyn Rapid Transit Co. has taken advantage of an old unused franchise, granted in 1893 to the Nassau Electric Railway Co., to lay tracks in Union St.

The value of the Stockton (Cal.) Electric Railroad Co.'s franchise is placed at \$25,000 by the board of equalization. The company owns 12 miles of track and 26 cars.

The Boulder Railway & Utility Co., operating a 4-mile electric road in Boulder, Col., will extend its line to a new park of 1,800 acres to be opened near Boulder.

Montgomery, Ala., and Columbus, Ga., have recently passed "Jim Crow" ordinances requiring separate street cars, or separate compartments for the white and colored races.

A new pleasure resort will be opened by the Wilmington (Del.) & New Castle Electric Railway Co. at Cofield, where there is plenty of salt water and a good white sandy beach.

Two attempts were made early in July to blow up cars owned by the Toledo (O.) Traction Co., by placing giant torpedoes on the track. It is not known what motives prompted the acts.

By a curious happening an old horse car barn, belonging to the Brooklyn Rapid Transit Co., has been rented to a company that intends to turn it into a factory for building automobiles.

Rumor has it that Mr. Charles T. Yerkes, who is now in London, is endeavoring to secure control of the Metropolitan & District railways of that city, but this Mr. Yerkes strenuously denies.

The Xenia (O.) Rapid Transit Co. has arranged to give a free band concert every Tuesday and Friday evening during the remainder of the season, at Lucas Grove, which is located on its line.

A new line to Chickamauga Park was opened last month by the Chattanooga (Tenn.) Rapid Transit Co. This will add greatly to the convenience of tourists visiting the famous battle-fields in the vicinity.

Sand, washed onto the tracks of the Twin City Rapid Transit Co., of Minneapolis, by heavy rains, recently delayed cars for from one to three hours, and in several instances caused cars to leave the rails.

An excursion guide to Detroit and its suburbs is being sent out by the Detroit & Pontiac Ry. It contains a description of many pleasure trips that can be made out of Detroit by electric railway and steamer, illustrations showing places of interest in and near the city, time cards of the electric railway and steamship lines, and other information of value to the tourist.

The Supreme Court has decided that by virtue of a contract entered into with the city in 1892, the Binghamton (N. Y.) Railroad Co. is required to pay but one-fifth of the expense of paving between the tracks.

The Milford (Mass.) & Uxbridge Street Railway Co. is securing locations and hopes to have its proposed electric railway from the end of the Milford, Holliston & Framingham line to Uxbridge in operation this year.

Cleveland has a Rapid Transit Commission, appointed to find a way by which the cars of the suburban electric lines may reach the heart of the city, at higher speeds than they can now travel in the crowded streets.

On July 31st, the Appellate Court rendered a decision confirming the legality of the transaction whereby the Alley L property of Chicago was transferred to the South Side Elevated Railroad Co., the present owner.

A coroner's jury at Muskegon, Mich., has returned a verdict that a man who fell dead on a street car, came to his death by reason of his left hand coming in contact with an unprotected lighting wire under the hood of the car.

The Amsterdam (N. Y.) Street R. R. has been sold to the Fonda, Johnstown & Gloversville Railroad Co. and it is expected that the line will be extended across the country and connect with Johnstown and Gloversville.

The receipts of the Harrisburg (Pa.) Traction Co. for the last fiscal year were \$332,583, an increase of \$19,000 over the previous year, when the large number of regiments at Camp Meade greatly increased the normal business.

The International Traction Co., of Buffalo, each summer gives every man in its employ, and his family, a day's outing at the company's expense. The men take their day in small parties at a time so as not to cripple the service.

A wire netting is being placed on the left hand side of all open cars operated by the North Jersey Street Railway Co., of Jersey City, N. J., to protect passengers from injury by putting their heads out toward the other track.

The street railway company at Galveston, Tex., has opened a new pleasure resort, where it gives a band concert every evening from 8 to 10, followed by a grand free ball from 10 to 12. No intoxicating liquors are sold on the premises.

At the regular meeting of the New England Street Railway Co., of New Haven, Conn., it was decided to pass the regular quarterly dividend of $\frac{3}{4}$ per cent and devote the surplus money on hand to retiring part of the company's debt.

July 18th a strike was ordered on the Dallas (Tex.) Consolidated Electric Street Ry., but was a failure from the start, as only 15 of the 70 men went out. It was alleged that men had been discharged because they had joined the union.

A contemporary is authority for the statement that during a severe thunderstorm at Hartford, Conn., a deaf and dumb man, who was leaning against an iron trolley pole, received a shock so severe that he yelled loudly for the first time in his life.

Suit has been filed against the Augusta (Ga.) Railway & Electric Co. to recover \$5,000 damages. The plaintiff was injured by a tie falling on him from a flat car, and he alleges the company was guilty of negligence in not having a proper car for carrying ties.

The Chicago, Harvard (Ill.) & Geneva Lake Electric Railway Co., during its first year of operation, has carried 46,486 passengers. From Sept. 15, 1899, to July 1, 1900, 603 cars of freight were hauled, the number of pounds of miscellaneous freight handled being 921,684.

If the city of Lexington, Ky., will spend \$15,000 in purchasing property for a public park, the Lexington Railway Co. offers to spend \$40,000 in improving the grounds, building a casino and laying out golf links, base ball grounds, tennis courts and croquet grounds.

The campaign has developed a new field of usefulness for the trolley car. The wife of a Brooklyn man who wishes to go to Congress, charters cars, invites her husband's political friends with their wives and while everybody is enjoying the ride and the inviting lunch, she deftly wins the votes.

The annual report of the North Jersey Street Railway Co., of Jersey City, for the year ending Apr. 30, 1900, shows gross receipts from all lines of \$2,653,990. According to the new state law the company must pay the cities in which it operates 5 per cent of this amount, or \$132,699, as a franchise tax.

The New Jersey & Philadelphia Street Railway Co. has bought the upper Delaware River Bridge in Trenton, N. J., and announces that it will be running cars between Trenton and Philadelphia by January 1st. The company intends to acquire the Philadelphia & Bristol Passenger Ry., and to incorporate under the Pennsylvania railroad law.

The report of the St. Louis & Suburban Railway Co. for the quarter ending June 30, 1900, shows that during that period, 5,179,373 passengers were carried, an increase in traffic of nearly 65 per cent over the corresponding quarter of last year. This represents an increase of nearly \$100,000 for the three months, due in a large measure to the strike on the Transit company's lines.

The Burton, Jefferson (O.) & Andover Electric Railway Co., which was incorporated a year ago, has secured a 99-year franchise in Ashtabula County, a 25-year franchise in Jefferson and Andover Counties, a 50-year franchise in Trumbull County and a 25-year franchise in Cortland. Mr. Eugene Rawdon, of Windsor, O., is president and the chief promoter of the scheme.

According to local papers the Dayton & Union R. R., a steam line now operating between Dayton and Greenville, O., has served notice on a company that is building a parallel electric road, that it will carry passengers between the two points for five cents less than the fare charged by the traction company, and if the latter makes a five-cent rate, the Dayton & Union will haul passengers for nothing and in addition give them street car tickets for any line in Dayton.

KODAKS IN YELLOWSTONE PARK.

The widespread use of small cameras, of one sort and another by travelers, has led to a great development of amateur photography. Yellowstone Park is by far the most prolific spot in this country for the gratification of this calling or amusement, particularly for those interested in prize contests. To photograph the soaring geyser; the eagles on their nests; the numberless cascades and waterfalls; the beautiful springs, or the Golden Gate and the Grand Canyon, is to obtain a noted collection of pictures.

But the park is also the only place where wild animals, as they live in nature, can now be easily caught with the camera. The elk, deer, antelope, bears, coyotes, buffalo, etc., that, while wild, have not the timidity of hunted game, make it comparatively easy to photograph them there. The bears especially are easily found.

When riding on the stage coaches, if cameras are kept in readiness, opportunities sometimes occur for snap shots at elk and deer drinking from the streams or crossing the roads. By exploring the forests and parks a little remote from the hotels, the animals can be found with little difficulty.

"Wonderland, 1900," a finely illustrated book published by the Northern Pacific Railway, has a chapter on Yellowstone Park and the animals there, and will be sent by Charles S. Fee, General Passenger Agent, St. Paul, Minn., upon receipt of six cents.

For rates, etc., address F. H. Fogarty, General Agent, 208 South Clark St., Chicago.

CHAS. J. MAYER,
President.

A. H. ENGLUND,
Sec'y & Treas.

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Send for Catalogues.

TRADE NOTES.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has declared a quarterly dividend of 1½ per cent.

THE GENERAL ELECTRIC CO. will issue 47,150 shares of new common stock which will bring the total capitalization up to \$25,242,200.

THE BURT MANUFACTURING CO., of Akron, O., has made some important shipments of its Cross oil filters on foreign orders during the past month. These orders came from Denmark, Sweden, Spain, France, England and Mexico.

THE PETER SMITH HEATER CO., of Detroit, has recently closed a contract with the Mahoning Valley Railway Co., of Youngstown, O., for equipping 12 cars with its heating system. This will take the place of electric heaters now in use.

THE POTOMAC TERRA COTTA CO., of Washington, D. C., has just shipped to the Morris Electric Co., of New York, four car loads of conduits, intended for reshipment to Havana, Cuba. This is in addition to the 50 car loads shipped some time ago.

A CREDITORS' COMMITTEE, appointed to inspect the works of Laing, Wharton & Down, Ltd., 80 Coleman St., London, E. C., has recommended that the stock, plant and machinery of the firm be sold at public auction for the benefit of the creditors.

MR. H. L. PRATHER, Cleveland agent for the Morris Electric Co., of New York City, recently closed several large orders for the Morris rail bond. One contract was from the Dayton & Northern Traction Co., and was for all the bonds for 42 miles of track.

THE CHISHOLM & MOORE MANUFACTURING CO., of Cleveland, O., has just received an order for 14,500 "American Standard" rail joints to be used on the Dayton & Northern Traction

Co.'s, new road. It has also closed a contract for 11,000 joints for the Sandusky, Monroeville & Norwalk Street Ry., of Sandusky, O.

THE BETHLEHEM STEEL CO., of South Bethlehem, Pa., advises us that the Northern Pacific Railway Co. has specified Bethlehem nickel-steel for the driving-axles and crank-pins for 20 locomotives now building at the Schenectady Locomotive Works.

MR. GEORGE E. PRATT, representing the Star Brass Works, of Kalamazoo, Mich., was a "Review" caller recently. He was very enthusiastic over the increasing business of his company and states there has been a big gain in the number of roads using the Kalamazoo trolley wheels.

THE BABCOCK & WILCOX CO., of New York City, has closed an order for boilers aggregating 1,400 h. p. from the Cumberland Electric Light & Power Co., Nashville, Tenn., and one from the Richmond (Va.) Passenger Railway & Power Co., for boilers aggregating 1,200 h. p.

D. W. PHELAN, of New York, has recently sold the Union Railway Co., of New York, 75,000 ties and 1,000 octagonal poles. These are for the new extensions of the lines through the Bronx and White Plains districts. Mr. Phelan has also sold, among other orders, 2,000 poles to the Albany & Hudson Ry., of Hudson, N. Y.

THE EGAN CO., of 322 to 342 West Front St., Cincinnati, O., has just issued a large illustrated hanger showing nearly 100 different wood-working machines, many of which have been patented since January 1st. One of the hangers will be forwarded on application and should prove of value to anyone desiring information on this class of machinery.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., is sending out a short circular entitled, "Coal at one end, power at the other—the lubricant in between." The claim is made that

the addition of 10 to 15 per cent of Dixon's pure flake graphite to any oil or grease will enable the oil or grease to do several times more work as a lubricant.

THE ELECTRIC STORAGE BATTERY CO. and the Electric Boat Co. have filed papers in suits for infringements of patents, in the United States Circuit Court, Southern District of New York, against the Gould Storage Battery Co., and in the United States Circuit Court, Northern District of Ohio, against Sipe & Sigler, makers of Willard storage batteries.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, describes in circular No. 58, an installation of 60 "Chloride" accumulators at the Arnold Print Works, of North Adams, Mass. The battery is used sometimes as a regulator to eliminate the fluctuations of the generator load, also for peak work during certain times of the year and for all night lighting.

THE CHASE CONSTRUCTION CO., of Detroit, has just received contract for erecting the overhead work for the new Dayton & Northern Traction line, which will be about 42 miles long, running from Dayton to Greenville, O. The contract calls for nearly 570,000 lb. of copper. The above firm is also finishing up construction work on the Erie Transit Ry., at Erie, Pa.

J. HOLT GATES & CO., Monadnock Block, Chicago, have been awarded the contract for a new electric lighting plant at Urbana, Ill., which will contain one 60-kw. and one 120-kw. Warren alternator, direct connected to Ideal engines. Gates & Co. have also received orders for two 30-kw. Warren alternators and one 40 arc light machine for the new city lighting plant at West Hammond, Ill.

THE MORRIS ELECTRIC CO., 15 Cortlandt St., New York City, recently shipped the following: A quantity of small forges, picks, bars and other track construction tools, 4,000 rail bonds and a Conant rail-joint testing instrument to Lisbon, Portugal; 300 cast-iron wheels, made by McKee, Fuller & Co., to Mexico, and 50 Crouse-Hinds electric headlights and one 30-ft. Hathaway transfer table to other cities.

W. C. STERLING & SON, of Monroe, Mich., report a large business in cedar poles and ties, and are now carrying in stock, sorted ready for shipment, 75,000 poles of all sizes and lengths and over 150,000 cedar ties. They are shipping ties this month to street railways at Chicago, Buffalo, Cincinnati, Dayton and other cities. This firm reports it is holding all its old customers, as well as gaining many new ones, and it is anticipating a heavy fall trade.

THE CHIEF OFFICES of the Standard Paint Co. in Europe are at 50 Boulevard Haussmann, Paris, and 59 City Road, London, E. C., both of these offices being in charge of Robert W. Blackwell & Co., Ltd., and at 16 Friederich Strasse, Berlin, and 33 Grimm Strasse, Hamburg, the German offices being in charge of Allut Noodt & Meyer Co., Ltd. American visitors in Europe this summer will be heartily welcome at these offices, and every possible courtesy will be extended to them.

THE McGUIRE MANUFACTURING CO., of Chicago, is very busy in all departments. Among the many truck orders on hand is one just received for 100 McGuire No. 39 double trucks for the Chicago Union Traction Co. The snow plow and sweeper department is working on five sweepers for the Metropolitan Street Ry., of Kansas City, in addition to several single orders. The McGuire company has also booked numerous sales of its "New Columbia" heaters. Mr. McGuire believes the fall trade will be a record breaker.

THE CHICAGO MICA CO., whose main works are at Valparaiso, Ind., reports a gratifying increase in sales of its "Micabond" products. Mr. W. F. Hatch, the company's secretary, is at present making his headquarters at the Ottawa office, and has closed contracts for the entire output of one of the largest amber mica mines in the province of Ontario. Fully 75 per cent of the output of this mine is what is known to the trade as silver amber mica, and this will be used exclusively in making this company's well known No. 104 "Micabond."

THE SPEER CARBON CO., of St. Mary's, Pa., has brought out a new motor carbon brush which it has christened the "Long-Lived," because as the result of severe tests, it is believed the brush will last from one-half to two-thirds longer than any other design on the market. The new carbon is due to the experiments and research of Mr. J. S. Speer, the head of the company. On a recent eastern trip Mr. Speer booked orders for large numbers of the brushes. The Speer company on August 1st, doubled its working force and is now able to ship all orders promptly.

THE B. F. STURTEVANT CO., the pioneer in the introduction of fans instead of chimneys for securing draft for boilers, recently stated that the sales of its apparatus for stationary boiler plants were last year over three times those for the year before, and that they now amount to nearly 1,000 h. p. per day, about equally divided between stationary and marine plants. It is also interesting to note that in a number of the technical schools of the country experimental mechanical draft apparatus has been installed, principally for the purpose of instruction, and that numerous graduating theses are concerned with the investigation of this subject.

E. P. ROBERTS & CO. have in hand a number of important contracts. The firm is preparing plans and specifications for the Central Traction Co. of Indiana, for 65 miles of road; is supervising the completion of the Indianapolis & Greenfield Electric Ry.; has finished plans and specifications for the Dayton & Northern Ry., which will be 39½ miles long; is about to make a test on the Cleveland & Eastern Electric Ry., for which it acts as consulting engineers; is about to prepare plans and specifications for an incandescent plant for Henderson, Ky.; has under construction an electric light plant for Collinwood, O., and an electric light plant for the Deaf and Dumb Asylum at Columbus, O., besides a number of reports, special investigations, etc.

THE KEYSTONE CAR WHEEL CO., of Pittsburg, lately organized to make and sell car wheels, sends us the following information, supplementing the statement of the company's organization, published on page 340 of the "Review" for last June. Mr. Chas. V. Slocum, the organizer and general manager of the new company, was a few years ago treasurer of the New York Car Wheel Works of Buffalo and was later organizer and manager of the Pennsylvania Car Wheel Co., of Pittsburg. Mr. John Howard Yardley has been made secretary of the new corporation. He was also formerly of the Pennsylvania Car Wheel Co., and previously was vice-president of the Philadelphia Car Wheel Co. Mr. Yardley will have charge of the eastern office with headquarters at No. 807 Girard Building, Philadelphia.

THE McGUIRE MANUFACTURING CO., of Chicago, has recently issued a new catalog containing a collection of handsome halftone engravings showing the trucks, snow sweepers and other apparatus for which it is so widely known. Among the trucks illustrated are the No. 35 type used by the Brooklyn Elevated, the No. 39 double truck designed for high-speed interurban service, the No. 2 maximum traction, the solid steel "Columbian" single truck and the A 1 suspension truck. Interesting features of the catalog are a list of companies operating the McGuire combination snow plow and sweepers, of which there are over 500 in use, and a list of street railways using the "New Columbia" stoves. Other specialties illustrated are ratchet brake handles, "Elastic" brake hangers, "Royal Flush" fenders and the Roach spring guards for trail cars.

ELECTRIC RAILWAY FOR YOKOHAMA, JAPAN.

We are advised by Mr. Zensuke Tanaka, whose address is Miyazakichos, Yokohama, that he is one of the promoters of an electric railway to run from Yokohama to Kanagawa and Kawasaki, Japan. A company is not yet formed but application has been made for a charter, which Mr. Tanaka thinks will be granted in the near future.

The Metropolitan Street Railway Co., of Kansas City, has appealed to the criminal court to determine its right to drive a wrecking wagon through the streets at high speed when necessary to make emergency repairs on the line. The police court recently fined the driver of the tower wagon \$1 for fast driving.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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On another page we give a diagram of the exhibit hall and the list of those exhibitors to whom space has already been assigned. Particular attention of exhibitors is called to the shipping instructions given in connection with the convention announcements on page 531.

The American Street Railway Association has followed the precedent set last year and assigned but five subjects on which papers will be presented at the coming convention in Kansas City, the idea being to give ample time for a full discussion of each, and in order that those attending the convention might have sufficient opportunity to prepare discussions, the executive committee announced the subjects early in March. The paper dealing with the effect of street railway consolidations upon the public is particularly timely and sure to arouse much interest; that treating of the various systems of electrical distribution is also of great importance just now. The other subjects are of interest to the operating department.

The Street Railway Accountants' Association also has an interesting program including three papers and two committee reports. One of the latter is that of the committee on a standard unit of comparison and is a direct consequence of the animated discussion that followed Mr. Mackay's paper on the car-hour as a unit, which was presented at Chicago in October, 1899; the other report is that of the standing committee on a standard system of accounts.

Where electric interurban railways have come in competition with steam roads there has often been a rate war, which usually resulted in the steam suburban service being greatly reduced or abandoned. So long as such a contest was merely one between a steam and an electric line, the manager of the latter looked upon it as the natural result of the introduction of an improved

method of transportation—it was an example of an animal of superior organization seizing the feeding grounds of an inferior animal.

Recently a steam railroad entering Detroit found that an electric competitor was seriously interfering with its business, and made a traffic agreement with another electric line and cut the through rate from Detroit to a popular summer resort. This is the first case of this kind of which we have knowledge, but there is a lesson to be drawn from it. In future the builders of electric interurban lines must seriously consider whether they are paralleling a similar road, and if wise they will carefully avoid the building of competing lines. Competing street railway lines, once so popular, are now almost a thing of the past in cities, experience having demonstrated that the necessary end of such competition is consolidation after all parties have suffered loss.

The children of Brooklyn in the crowded districts where there are no adequate playgrounds have a game of dodging the trolley cars, which gives them much needed exercise and excitement. Unfortunately an accident sometimes occurs, and then the poor motorman is blamed.

The churches and charitable organizations of Boston have a powerful ally in the Boston Elevated Railway Co., which, through these societies, this summer distributed 100,000 street railway tickets thus affording mothers and children and sick and aged persons who could not pay fare, the opportunity of a journey to the woods or seashore. In other cities individuals have distributed large numbers of street car tickets to poor children, many of whom were thus given their first chance to visit the parks.

That the boycott is a two-edged weapon, and that the imposition of fines for patronizing a boycotted institution is in the nature of a boomerang, are being realized by the trades unions of St. Louis. During the first half of August nine unions rescinded the fines ordered imposed on members who should ride on the cars of the St. Louis Transit Co.

The secretary of the Building Trades Council of America is thus quoted: "To continue the boycott and the fine is sheer nonsense now, because it imposes a greater hardship on union men than it inflicts injury on the Transit company. In short, the whip intended to punish the other fellow is stinging us as hard as, if not harder than, it is him."

The attention of our readers is called to the case of another fake accident operator, Frank Lieblang, described on page 497. The arrest of this man is due to the efforts of the Cleveland Electric Railway Co., which last year became suspicious of him because of the large number of claims for damages he was bringing against the company, and set a detective to work. The detective did not have an easy task, because the principal preferred to do the planning only and have the "accidents" happen to his partner, the detective. After an unsuccessful trip through the East, which seems to have failed because the performances were not sufficiently realistic, the pair last month landed in Detroit, where better results were achieved, and Lieblang is now in jail awaiting trial on the charge of defrauding the Detroit Citizens' Street Railway Co.

The number of interurban electric roads on which express matter is handled is constantly increasing but just at present there does not seem to be any recommended practice in methods. In many instances agreements are made with one of the old established express companies and the business is conducted just as it would be on any steam railroad, and where other arrangements have been made the reason has generally been that the steam railroads either refused to accept express from the electric lines or would not permit the express companies to make contracts with the latter.

In Cleveland a special street railway express company has for some time been conducting its business with marked success and a similar company is also operating in Connecticut; the reason for organizing separate express companies was in both cases that stated above. In other places the electric railways are themselves handling express. One of the latest additions to this class is the Southern Ohio Traction Co. which on September 1st began run-

ning express cars between Dayton and Cincinnati, superseding and extending the service rendered during the past three years by Wells, Fargo & Co. which had a contract with the electric line between Dayton and Hamilton.

The tendency now is, we believe, to operate separate cars for express matter rather than to carry it in a compartment car, for the reason that passengers do not like to have cars held while parcels are being loaded or unloaded.

In spite of all that has been written during the last three years concerning the development of electric traction in Great Britain, we doubt if there is even yet a full appreciation of the situation there. A summary of the work of the Light Railways Commission shows the aggregate length of the roads for which applications have been made to the commission in less than three and one-half years is over 3,000 miles; while light railways, by which we believe was intended what in this country are called interurbans, are not of necessity operated by electricity, that motive power is contemplated in the great majority of applications. Some 250 miles of what are street railways or tramways have been authorized under the light railways act.

The attitude taken by the steam railroads towards the light railway projects was at first one of opposition, but four years have sufficed to convince those interested that the light railway develops a new traffic, and does not necessarily "compete" with the older line.

The article by Mr. Henry L. Beach entitled "Advertising a Street Railway," which we publish in this issue, will be found very interesting by those managers who are seeking to develop the full possibilities of the pleasure riding and excursion traffic of their systems. The success of the advertising campaign conducted by the Chicago Union Traction Co. during the past summer has shown the importance of the principle enunciated by Mr. H. M. Kennedy, then general passenger agent of the Brooklyn Heights Railroad Co., in a paper read before the New York State Association two years ago. Mr. Kennedy then said: "We keep the public well informed as to where and how to go, and how to keep cool for a nickel during hot weather."

In summer months the pleasure riding business is very large and Mr. Beach states that on the Chicago Union Traction system the difference in receipts between a pleasant and a rainy Sunday often amounts to \$20,000. This business can be largely increased by "keeping the public well informed as to where and how to go," and the various methods by which this can be done are well worth considerable study. The opportunities for this work are naturally greatest in the large cities, but even in smaller places there are possibilities.

The overhead trolley system is now making advances in Great Britain. As here, the anti-trolley prejudice fades away upon actual construction and demonstration. A very important feature peculiar to England, will moreover constitute a strong obstacle to the adoption of conduit systems. Owing to the extreme mildness of the climate water and gas pipes are laid near the surface. The installation of conduits for street railway use, therefore, involves the removal of practically all water and gas mains on the streets used. The enormous expense of doing this, to say nothing of the annoyance, loss and danger attending such changes, combine to put so many difficulties in the way as to almost prohibit the attempt to build this form of electric road. And when it is completed it has only doubtful advantages over the overhead trolley from an operating standpoint, while in several respects it is positively inferior.

We desire to say a few words concerning one of our regular departments, that entitled "Recent Street Railway Decisions."

The layman probably has but little idea of the immense volume of legal decisions reported in this country. There are the Federal Supreme Court, the Circuit Courts of Appeals and the Circuit Courts, and 44 State Supreme Courts, to say nothing of the various State Appellate Courts whose decisions are regularly reported. The court reporting concerns issue these decisions as fast as they are rendered in pamphlets of from 50 to 400 pages, of which nine are published each week; these are reissued later in bound volumes for the lawyers' libraries.

In our legal department are to be found carefully prepared abstracts of all the important street railway decisions which are to be found in the great mass of the reports for the month. In preparing these abstracts the object in view is to omit no vital matters, yet make the digests brief, so that a busy man may find time to read them; to give all new points, whether of law or fact, that arose in each case, and to omit technicalities that none but a lawyer would understand. It is quite important to point out that the abstracts given are not merely a reprint of the "head notes" with which the court reporters preface the opinions; such head notes are often found to be misleading, or not to fully cover the case.

Thus there are brought together and laid before the reader a digest of late decisions which will be found equally useful to the company's attorney, who wishes to keep in touch with the course of current decisions and has not the time to hunt them up and read them; to the manager, who has to instruct his subordinates as to what they may and may not safely do, and to the claim adjusters, who should know what the decisions have been in cases that arose on states of fact similar to the ones they may at the time be trying to adjust.

"How much depends on the point of view," remarked a prominent interurban manager to a group of friends recently. "Before our line was built I frequently traveled through our territory on the steam road that we now parallel, and many are the times I have sworn at the service provided. But since our road has been opened I occasionally go over the steam line and take huge delight in noticing the dust and cinders, the inconvenience of showing tickets at the stations when one is in a hurry, the long time between trains and all the other deficiencies, because I know these but make more conspicuous our own clean cars, our quick service and the many attractions in general of traveling by trolley."

The street railway commission appointed by the city council of Chicago has prepared a list of questions which it will submit to the people with the expectation that the answers will be of assistance in formulating a policy which the commission can recommend to the council.

Perhaps the most interesting of these questions are those grouped under the heading "Co-ordination of Service." It is suggested that the city ought, as a matter of public policy, to require that surface street railway routes should be arranged with the view of delivering the long haul business to the steam and elevated lines on the ground that these latter can make faster time. Also that a special low fare on such feeders is desirable.

The work of the commission must in the end meet with popular approval or be rejected, but it would seem to us that the commission should make its own investigations after the manner of the committee appointed by the Massachusetts Legislature in 1897, and then seek to convince the public by argument that its conclusions are correct. We fear that the most voluminous answers to the commissioner's enquiries will be from those least prepared to discuss the subject understandingly.

Notwithstanding the development of the electric railway mail service has been less than was confidently predicted when it was first tried, there is no question as to its efficiency and value. The street railway service in Chicago was last year transferred from the railway division to the local post office; here one new route has been established, and on two of the four old routes independent motor cars operating over electric lines have recently been substituted for trial cars attached to cable trains. The facility with which an electric car can be transferred to other streets and dispatched around blockaded points is a very great advantage. Where there is a comprehensive system of interurban electric lines great possibilities in time saving are afforded and it is no surprise to learn that the department has made preliminary arrangements with the street railways connecting Jersey City, N. J., with the Hudson County towns to the north and south, for a pouch service; this will result in increasing the number of mails which can be delivered on the same day as posted. The letter boxes on cars that have been introduced in several cities should also be noted. In the few instances where the street railway pouch or letter box service has been abandoned the reason was the appropriations available were insufficient.

The Street Railways of Portland, Me., and Vicinity.

System of the Portland Railroad Co. Suburban Line of the Portland & Yarmouth Electric Railway Co. — Parks and Theaters— Physical Features and Equipment—Special Shop Tools and Methods.

BY C. B. FAIRCHILD.

The city of Portland is highly favored as a street railway city. On every hand one hears only praise for the facilities offered, and for the management, especially from the summer tourists and other strangers, who have occasion to patronize the cars while on their way through the city. The favor, however, is not all one sided, for the location brings the city in direct line with a very large tourist travel for it is the natural gate-way to the woods and streams of Maine, the state that is known as the "play-ground of the nation," and it is estimated that a quarter million of tourists visit Portland every summer. Besides this, the street railways are benefitted by the proximity of the numerous islands—said to be 365—within the limits of Casco Bay, on which the city is located.

The Portland Railroad Co.'s system is operated in nine divisions, some of which are located within the limits of "Greater Portland," for since the acquisition of Deering and other neighboring villages the city has taken on this pretentious name.

One of the divisions is the "Belt Line," of about 10 miles; other lines connect neighboring villages or run to one of the parks, and one is known as the Cape Elizabeth division, three miles in length, which connects the Cape with the city, and which has come under the control of the Portland Railroad Co. comparatively recently.

As both of the Portland companies make a specialty of park attractions, as a means of increasing traffic, this feature will have attention before taking up the physical description and methods of

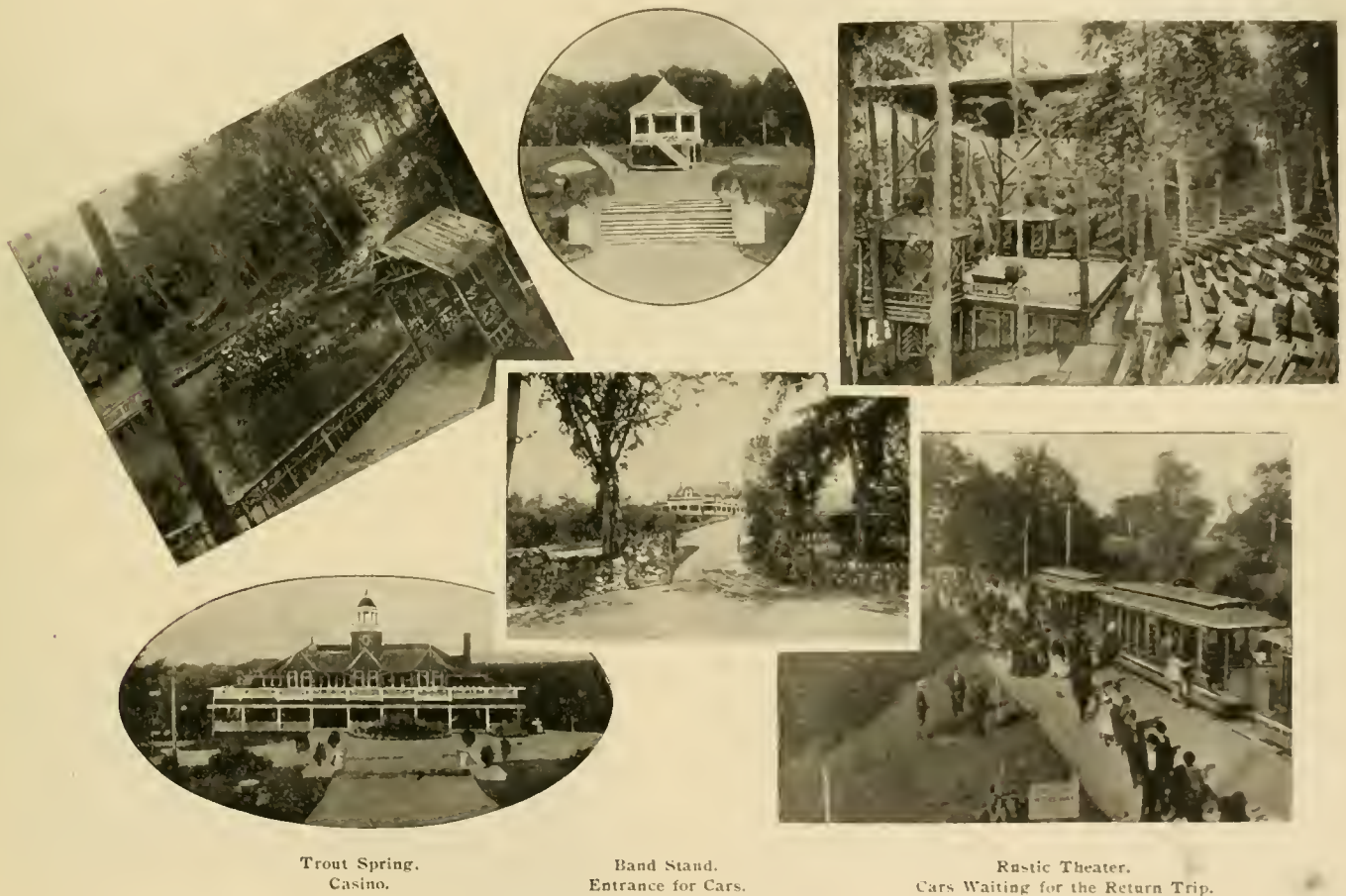


FIG. 1—VIEWS AT RIVERTON PARK.

On all the large islands, are numerous hotels, boarding-houses and cottages, for summer residents, and all within easy reach of Portland by means of steamers; so that the street railway patronage is not limited to the resident population, said to be about 55,000, but is more than doubled by the transient summer patronage.

Two companies control the street railway lines of the city and vicinity. The Portland Railroad Co. is the principal one and has 46 miles of track and 161 cars. The system is operated under the direction of Mr. W. R. Wood, president, and Mr. E. A. Newman, general manager. The second is the Portland & Yarmouth Electric Railway Co., with 14 miles of track and 25 cars. This road is a direct line between Portland and Yarmouth, being almost wholly a suburban system, and is operated under the direction of Mr. Seth L. Larrabee, president, and Mr. S. E. Whitaker, superintendent and general manager.

operation. The principal outing tract is known as Riverton Park, (Figs. 1 and 2), which is an inland park, located on the banks of the Presumpscott River, five miles from the business center of the city. The park embraces 40 acres, consisting of a rolling plateau, which terminates in a bluff sloping abruptly to the river. For natural beauty, the park is unsurpassed by any to be found in the Eastern states, if not in the country. The grounds are artistically laid out, with areas of open lawn, and other sections, shaded by native forests, with gorges and rugged banks, and many of the rambles cross rustic bridges and by pretty rustic arbors and resting stands. On the shady borders of the lawn are numerous lawn-swings, and also a merry-go-round and other attractions for the children. One section which embraces the wildest portion, and which is surrounded by a high wire-fence, is known as the Deer, Moose and Elk park, where fine specimens of these animals roam

with all their native freedom. There are besides, cages for monkeys, raccoons, squirrels, and other small animals, and also for parrots of different varieties. The landscape features are also enhanced by clumps of shrubs and by beds of choice flowers, in artistic designs. The climate seems to be especially adapted to the growth of coleus and other bedding plants, and many of the flowering plants produce such choice colors in profusion, that even a florist hardly knows some of their familiar species, because they



FIG. 2—RUSTIC BRIDGE AT MOOSE PARK.

are so much more beautiful than those usually found in such parks.

The principal attraction of the park, however, is the large casino, and next is the open air theater. The casino is a large, handsome structure, with broad piazzas on three sides, built on the sloping bank near the river, and commanding from its upper floors a view of the entire grounds. There is a large dining-hall, and tables are also spread on the rear piazza. Here lunches or elaborate dinners are served at reasonable prices, a specialty being made of sea food. The service is exceptionally clean and dainty, and entirely free from the slovenly appearance that is usually found at such places. Women only are employed as waiters and they are always polite and attentive. On the same floor is the ladies' reception-room, which is finished in colonial design, with elegant furniture in red, and with pictures of high artistic order on the walls. There is a smoking parlor with sumptuous furnishings, a room with tables for games, and a reading-room with oriental effects. There is also a large dance hall, which is light and airy. The casino is kept open the entire year, and, during the winter season, supper, card and dance parties are entertained, and the patronage is said to be good all the year.

The rustic theater has a seating capacity for 3,000 people, and is located in a natural amphitheater sloping towards the river with a rustic stage, which stands just on the bank of the river, giving a beautiful background; the whole is well shaded by tall and graceful trees. The stage is large, and sheltered by a high rustic roof, and there are two dressing-rooms, one at each end, as shown. Stairs communicate with these at the rear. The stage is illuminated by four arc lights, and 250 incandescent colored lamps, arranged in festoons, or in artistic designs. The trees and walks are also illuminated by numerous electric lamps, properly distributed. Admission to the theater is free for all who enter the grounds by the cars and have paid the 10-cent fare from Portland. A charge of 10 cents is made, however, for all others, while reserved seats are to be had for an additional charge of 10 cents. Among the special attractions this season is Matus' Hungarian Court Orchestra, which gives concerts at the theater afternoon and evening, and during supper hour renders selections at the casino. The band is supplemented by high-class vaudeville, the troop and programme being changed every week.

The vaudeville troops are engaged for the season, from the J. W. Gorman Park Attraction Agency, of Boston, and so far have proved highly satisfactory to the railroad company and patrons, and the

latter include apparently all the best people of Portland. On every pleasant evening the seats of the theater are always filled, and the scene on a moonlight night is brilliant and attractive beyond description. Other attractions include a boat and canoe-house, where canoes owned by private parties are stored, and where flat-bottom boats are provided at a moderate charge for all who wish to take a row on the river. Just below the casino an electric launch is moored, one of the launches that was employed on the lagoon, at the Chicago Columbian Exposition in 1893, and which is still in first-class order. For a charge of 10 cents per passenger the launch makes trips of seven and a half miles in either direction up or down the river, and the ride is a most delightful one. The river, which is not over 40 ft. wide, is deep and safe, and on both sides is shaded by overhanging forest trees and vines. The batteries of the launch are charged from the street railway current, while the boat is at her moorings, suitable switches, a water rheostat and necessary instruments being provided. Just below the launch is a circular trout pond, with a number of fine specimens of the speckled beauties. This pond is fed from a nearby spring, from which the water boils up with great force, and from which, by means of a hydraulic ram, drinking water is forced to tanks in the casino and other places where water is required. The lawn swings mentioned, of which there are twenty or more, are all of the pattern known as the Fairfield lawn swing, made at Brunswick, Me., and are said by the management to be a very desirable park attraction.

The cars enter the park through an ornamental stone gate-way, with flowering plants growing on the top of the wall. The track loops, after passing the casino and encircles the mall and the section of the woods when it emerges on the street for the return trip. The scene shown in Fig. 3 is every pleasant day seen on Monument Sq. in the city about one o'clock; the open cars are banked in line ready to handle the park traffic, the cars being dispatched in rapid succession from the starting station at the head of Preble St., which is near the company's office, but not shown in the picture. The ordinary headway on this line is 15 minutes, but as a number of cars are run on one car's time, the traffic is readily handled. After the afternoon and evening entertainments, the cars, to the number of 30 or more, are banked at the park end of the line. The cars shown in rear of the monument in the picture, are park cars, ready to leave for Cape Elizabeth, being daily banked for the start on a neighboring street. The ordinary attendance at Riverton Park is from 2,800 to 3,000, while on special occa-



FIG. 3—MONUMENT SQ., PORTLAND.

sions the cars carry as many as 10,000 or 11,000 in a day. The affairs of Riverton Park are under the direct supervision of Mr. D. B. Smith, who is attentive to every detail, and very popular with all the patrons.

It is the aim of the manager to provide sufficient cars at the close of all entertainments so that all can get seats for the return trip. The people all know that there will be plenty of seats, so they are not, as a general thing, in a hurry to return, and there is

no rush or crowding. This feature is important, as it brings to the park a refined class of people who would not otherwise patronize the cars. The manager aims to please people who have money and are willing to spend it. The result is that many wealthy people who formerly drove to the park, when they did go, now take the cars and frequently take their friends out and entertain them at the casino.

The Cape Elizabeth Park (Fig. 4) is located on a bluff near the point of the Cape, on the left bank of the principal ship channel, which is the entrance to Portland Harbor. Joining the park grounds is the new Fort Williams and just beyond is the Cape Elizabeth light tower, one of the oldest light houses on the Atlantic coast. The outline of the coast is rocky, irregular and wild in the extreme, and during rough weather the surf scenes are among the finest to be found on the coast. Along the banks, on

able for the street railway companies during the present season, but they have been favored by a large influx of strangers during the month of August, to observe what has been termed "Old Home Week," which included the days between August 5th and 12th, at which time all the former residents of the state of Maine, and all home people were invited to meet in Portland. Tuesday of that week was made a special day for Portland, while Wednesday and Thursday were special days for Brunswick, Bangor, Bath and other cities. People came from all the states, and from foreign countries for that matter. Great preparations were made in advance for entertaining the visitors, while the public buildings, business blocks, and many private residences were profusely decorated. By the courtesy of the Secretary of the Navy, the North Atlantic squadron, consisting of six ships, was ordered to Portland Harbor, and on Tuesday the marines from the squadron paraded in the line with



Casino and Lawn.

Summer Theater.

FIG. 4.—VIEWS AT CAPE ELIZABETH PARK.

the water side, among the rocks below the casino, wild plants and shrubs grow in great profusion; among these are secluded walks and rustic seats, and on some of the more prominent heads, attractive pavilions are provided, where visitors can rest and get the best views of the neighboring islands and harbor. The ship channel is about three-fourths of a mile wide, and is bounded by Cushing's Island on the opposite side. A small bay, leading in behind the Cape, provides a fine sandy beach, for salt water bathing. This park, like that at Riverton, is tastefully laid out, and in front of the casino is a beautiful lawn interspersed with beds of rare flowers; so that on one side the visitor looks out upon nature in all its wild beauty, and on the other finds the beauty of the scene enhanced by art. The buildings consist of a fine large casino, with broad piazzas, a dining-room, dance-hall, reception and smoking parlors. A specialty is made here at the casino of what are termed "Shore Dinners," including soft-shell clams, fish, lobster, and such other food as the ocean supplies. A large building on the opposite side of the lawn is occupied by the theater, which is built after the prevailing style of city theaters, with stage and shifting scenery, and circular balcony and galleries. The entertainments here for the present season are conducted by a stock company, the programme being changed every week. The street railway tracks loop around the mall, past both buildings, and cars are readily loaded after the entertainments from platforms provided along the tracks. Both the parks above described enjoy very liberal patronage, and are considered paying institutions. Cape Cottage Park is also conducted under the supervision of Mr. D. B. Smith, assisted by Mr. F. S. Hatch, local superintendent, who is also popular with the patrons.

The traffic along these park lines is not limited by the pleasure riding alone, but along the entire route are farm houses and suburban homes, while in the vicinity of Cape Elizabeth are numerous hotels and summer cottages, owned by people from Boston, New York and other cities. Not only has the park traffic proved profit-

the local, military and civic societies. Notwithstanding the increase of strangers, and the great throng that attended the display of fireworks in the evening at the Eastern Promenade, the railroad companies handled the extra traffic without difficulty, and without an accident. The cars of the Portland Railroad Co. carried on Tuesday, August 6th, 94,032 revenue passengers, besides the transfers, a total of 102,919, winning the admiration of all. There was necessarily some crowding of cars, and after the evening entertainment, one conductor reported a load of 175 people, on a 12-hench open car. Besides the parks above described, as traffic promoters, there are two sections of the city, to which the street car lines cater, and which attract a good many visitors. These are known as the Eastern Promenade and Western Promenade. The former is on Munjoy Hill, the eastern terminus of the city, and from which a commanding view is had of the harbor and neighboring islands, Fig. 5. Many of the sight-seeing tourists visit this promenade in the early morning, to watch the sun rise, as it breaks over the distant line between the sky and ocean. On this promenade is located Fort Allen Park, with souvenir cannon of the War of 1812. The Western Promenade is also the termination of a high plateau, and the view is over a neighboring valley, with the Union Depot directly below, and a broad expanse of farm land lying to the west of the city. From this point, on a pleasant day, the snow-capped peaks of the White Mountains are plainly visible, although 90 miles away. Here is located the Maine General Hospital, and bordering the Promenade on the city side are numerous fine residences, this being the fashionable residence district of the city.

The cars pass near the Western Promenade, to and from the Union Depot. As the different lines of cars come to the depots a special effort is made to meet all incoming and outgoing trains, so that no hotel bus is required. One line also runs to the Grand Trunk Depot, and along the streets adjoining the wharfs of the Boston and New York steamers, as well as the local boats which ply between the neighboring islands.

PHYSICAL FEATURES.

The principal lines of the city were operated by horses up to five years ago, or until October, 1895, when all were changed to electric power. Two lines, however, one of which ran to Deering, had been electrically equipped as early as 1891, the cars being operated



FIG. 5—EASTERN PROMENADE, PORTLAND.

by W. P. motors. By delaying the equipment of the main lines the company had an opportunity to study the weak points of the original equipment, and when finally convinced that electricity was practicable, it took advantage of the low prices of materials in 1895, (copper being then only 10¼ cents per pound, and rails correspondingly cheap,) and equipped the lines as well as the state of the art then warranted. The tracks in the city were laid with 9-in., 90-lb. girder rails, with ties resting on a gravel foundation; 60-ft. rails were used. Nearly all the city lines have double tracks, so that after five years of service, the track is still in excellent condition, no joint repairs having been required. Some of the special work, however, where the switch-points were worn, has required repairs. The suburban lines are laid with 56 and 60-lb. rails. All steam railway crossings are made with single track, but over these

POWER EQUIPMENT.

At present two power houses supply the lines with current. The one from which the Cape Elizabeth road has been operated, is about to be shut down, but may be kept for the present as a reserve supply, but it is proposed to operate the entire system from the main power house. This is located on tide water on Forest Avenue. The building, Fig. 6, is of brick, on pile foundations, and is quite an imposing structure, the ground plan being 110 x 110 ft., and the walls 45 ft. high. The roof is of steel, making the building practically fireproof. A new Rice & Sargent engine made by the Providence Engineering Works, Providence, R. I., has recently been installed.

The new unit, shown in Figs. 7 and 8, is a 1,500-h. p. vertical



FIG. 6—POWER HOUSE, PORTLAND R. R.

compound engine direct connected to a 1,050-kw. General Electric generator. The engine has cylinders 26 and 50 x 42 in. and runs at 100 r. p. m. with 120 lb. steam pressure. The piston rods extend as tail rods through the heads of the cylinders; the receiver between

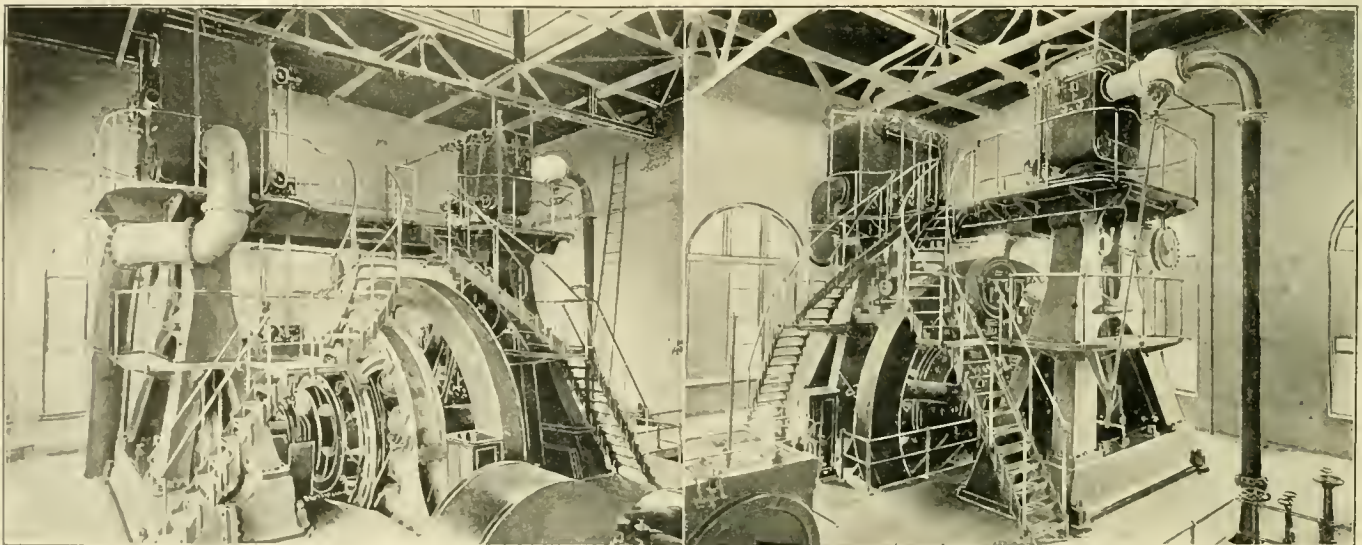


FIG. 7—1,500-H. P. RICE & SARGENT ENGINE.— FIG. 8.

sections two lines of trolley wires are carried, so as to avoid overhead switches. The bonding, overhead construction and feeders were all put in in a first-class manner, and are still maintained with very little repairs. Guard wires are used above the trolley wires on the principal streets in the city, this being required by the city electrician, who has not yet been convinced that these are useless.

the cylinders is cylindrical, extending across the frame, and mounted behind it, as shown in the illustrations; the exhaust pipe curves around the frame, and passes down beneath the floor to the condensers. The throttle is controlled from three positions by means of hand wheels, attached to a shaft, one at the floor and one at each platform. The valve gear is of the Rice & Sargent type, and

has silent vacuum dash pots. The main shaft is 22 in. in diameter, at the armature. The fly-wheel weighs about 85,000 lb.

The valves and valve mechanism of these machines are of special interest. All the valves have double ports, and the exhaust valves are set nearer the piston than the steam valves, so that the clearance is largely reduced. The valves are operated by direct motion from the eccentrics without the medium of wrist plates. There are two eccentrics, one for the inlet valves and one for the exhaust, on each cylinder. The range of cut-off is from zero to $\frac{3}{4}$ stroke, which gives the engine great capacity for overloads, and ensures perfect regulation under any condition of load. Proper motion for the exhaust valve is secured by means of a toggle joint on each exhaust bonnet, without the intervention of wrist plates. A further advantage of this construction is that the moving parts have small mass, and are therefore fitted to operate at comparatively high speeds with quietness. The cut-off latches operate without springs, dropping by their own weight, and are so constructed that the pressure from the eccentrics is on a line below the pivotal point, so that the latch cannot jump up. The wearing contact plates on the latches are square and are made of hardened steel so that by shifting a plate and turning it over, there are eight corners for wear. The point of cut-off is determined by a rod from the governor which actuates a yoke behind the latch, operating by means of roll-

reamed fits in their holes. The main bearing caps are adjusted by means of set screws against which the ordinary cap bolts act, this construction giving a very accurate adjustment of the main bearings. The parts are oiled by chains on the shaft, of which there are three on each bearing, leading the oil from large reservoirs in the pillow blocks. There are also four sight feed oil cups upon each bearing. On the crank side, the waste oil from the bearing is led out into the crank pin, and on the other side there are channels which convey it back to the bearings.

Drip pans are provided at each end under the crank disk from which the oil is led to the filter. The platforms about the machine are so arranged that any part can be reached and inspected without any danger to the attendant. The stairs are not spiral, but bend slightly and are not very steep, so that they are easily traversed. The engine frame is very strong and the outlines pleasing to the eye.

The original equipment of this station comprised three Allis engines, each direct connected to a General Electric generator; two of these are 400-kw. and one 200-kw.; the pressure is 550 volts. The switchboard has General Electric switches and Weston meters. The brush holders on these generators were designed by the chief engineer of the station and have a novel feature in the springs which press the brush against the commutator. This spring is made with

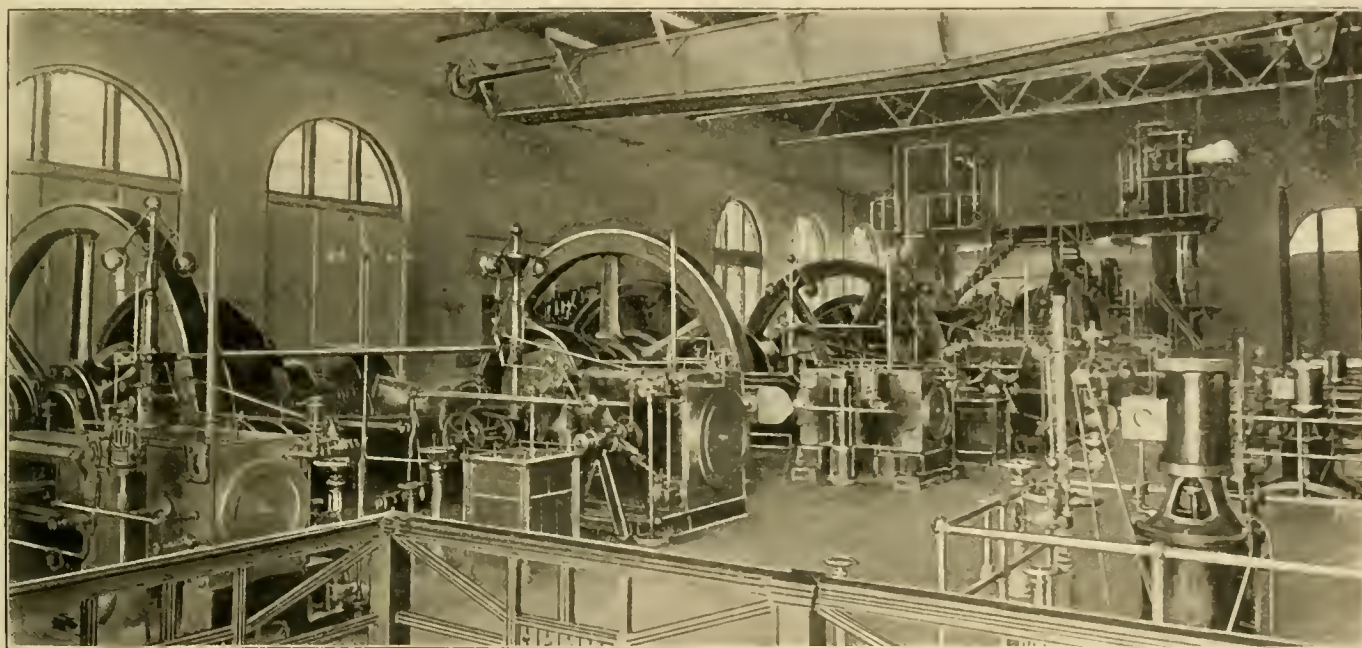


FIG. 9 GENERAL VIEW OF POWER STATION, PORTLAND R. R.

ers on a curved lever attached to the cut-off too. The mechanism is so balanced that it requires very little power and there is consequently little stress on the governor at the instant of cut-off. The entire design is so disposed that the utmost quietness in operation is secured, and in fact at a short distance from the engine, while in operation, it would be almost impossible to tell whether the parts were in motion or not. The intermediate rocker mechanism is supported by means of box brackets and girders bolted to the engine frames. The governor is so designed that a centrifugal effect combined with an inertia effect is obtained. The governing wheel is about 3 ft. in diameter and is located, as shown in the illustration, on the first gallery. The governor is extremely sensitive and rapid in its operation, and the regulation of the engine under varying loads is very satisfactory. In connection with the governor is a safety device, designed to shut off the steam in case the governor belt should break or fail to work properly. The connecting rod is so designed that by removing one bolt, it can be detached from the crank pin, and being swung to one side, the engine can be run by one cylinder if necessary. When it is found necessary to remove the connecting rod, it can be swung out sidewise through an opening in the frame.

The fly-wheel is built in eight sections, each section consisting of a piece of the rim and an arm. The rim joints are made by arrowhead steel keepers, and the arms are bolted to an octagonal box section hub by means of pads which are perpendicular to the axis of the arms. The bolting is done by through bolts, which are

two leaves, one longer than the other, pivoted at the stationary end. By taking hold of this leaf, and turning it to one side, the brush is readily removed, and a space is left free for polishing the commutator when necessary.

The two large Corliss engines have governors made by the Lombard Water-Wheel Governor Co., of Boston, and the chief engineer speaks in the most favorable manner of the results that have been obtained with them. The switchboard instruments show load variations of 600 h. p. to 800 h. p. per engine, yet the speed indicator shows that the variations of speed are extremely slight and slow. The Lombard governors completely rectified all the difficulties that had been experienced with the governors formerly used and give a speed regulation that is in every respect satisfactory.

The exhaust from each engine is led into a Reynolds condenser, located partly below the floor, as shown in the illustration. The engineer of the station is profuse in his praise of the original engine equipment of the station, and is looking for equally good results from the new unit, which starts off in a highly satisfactory manner, and during the middle of the day, is able to supply current for the entire system. The engine floor is spanned by a hand power traveling crane, which, together with the structural roof, was made by the Boston Bridge Co.

The oiling features employed, about the engines, are particularly interesting. Each of the horizontal engines has a Rochester lubricator, and, in addition to this, the engineer has provided, on the top of the main bearings a long, closed oil cup, or tank, which has

on its top, a small tell-tale balance lever, of brass, which indicates by its position the depth of oil in the cup. The oil from the engines is led by pipes in the usual manner to an oil filter, which is located in a fireproof room in the basement. No pumps are used and the engineer has designed a novel method of forcing the oil back to the engine floor. From the filter, pipes lead to a vertical cylindrical tank, about 12 in. in diameter and 10 ft. high, which was made by closing the ends of a section of steam pipe. The oil being let into this is forced up to the engine floor by means of water pressure let into the bottom of the tank direct from the city mains. When the oil has been forced out the water is drawn off and this operation creates a vacuum which causes a new supply of oil to flow into the tank from the filter, when the water is again turned on and the process repeated.

The oil pipe connections are cleaned by letting live steam through

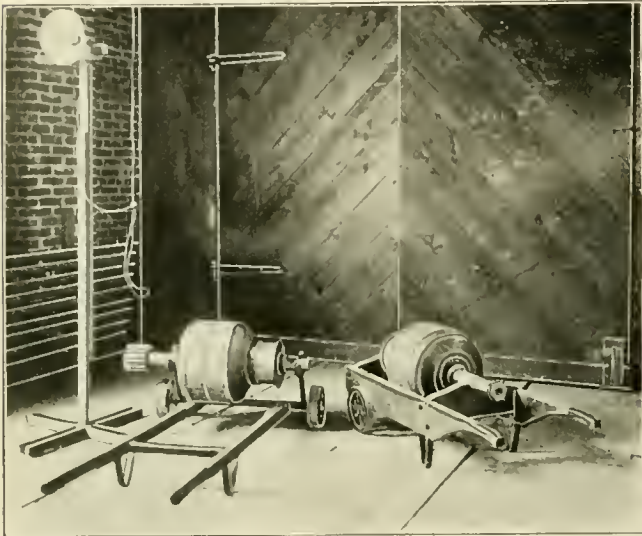


FIG. 10—ARMATURE TRUCKS AND STAND.

them, which drives out all fiber and sediment that may have collected. In the same room, near the filter, are large oil supply tanks and facilities for cleaning and drying the waste that has been used on the machinery. The waste is first put into a hand press, and the oil pressed out. Then it is put into a tank of water, heated by steam pipes and a small quantity of soda ash added; the waste is turned about by hand and afterwards removed and placed in an adjoining horizontal, galvanized iron cylinder, having a partition through the middle, on which the waste is laid to dry, being heated by steam pipes in the lower half of the cylinder. Hinged doors are at the end of the drying cylinder. A batch of waste will dry during the night, and a quantity of this is then mixed with a small lot of clean waste and is again used. Only the best grade of white cotton waste is used. Before the drying process was instituted, one bale of waste lasted for the three engines about six weeks, now one bale lasts for eight months or more.

As an auxiliary to the condenser pumps a separate pump is provided, with condenser connections, by means of which, either fresh or salt water may be forced into the condensers, in case their own pump should fail for any cause. Water may also be let into the condensers by the pressure direct from the city mains. As an auxiliary to the boiler feed pumps, a large vertical cylinder, or tank, is provided, which is kept filled with salt water, under pressure from a weighted piston. In case the feed water supply, or pumps fail, this reserve can be utilized without any machinery to feed the boilers, as it is found that salt water can be used in the boilers for a limited period without injury. The steam equipment consists of Babcock & Wilcox boilers, and two Blake feed pumps. A damper regulator, of the Spencer type is employed. The furnaces are stoked by hand.

As stated, the power station is located on tide water, near a wharf, close to which the coal schooners have access. The coal is unloaded and delivered into large storage sheds. A mixture of soft Virginia coal and hard coal screenings is burned. The soft coal costs from \$2.75 to \$3.25 per ton and the screenings from \$1.25 to \$1.50; about 2,500 tons are used per year. The coal is delivered to the boiler room by iron wheelbarrows, and each load is weighed on a platform scales on its way to the boiler room. The fire room

is divided lengthwise by a low, slanting, plank partition. On the outside of this partition the two kinds of coal are dumped on the floor, and after being wet down with a hose, are thoroughly mixed by shoveling, and then the mixture is thrown over the partition in front of the furnace doors ready for firing. It is found that by wetting the fuel, and thoroughly mixing the two grades, better results are obtained than by burning either alone. The power house is a model of cleanliness, and this feature, together with the auxiliary devices above described, speak well for the skill and energy of the chief engineer, Mr. William E. Knowlton.

There are four car houses in different localities for storing cars, and from each of these the cars start for their first morning trips. The main house, with which is also the repair shop, is a large brick building, formerly one of the horse stables, and is located on Munjoy Hill, near the Eastern Promenade. Here the master mechanic, Mr. Charles P. Garland, makes his headquarters, visiting the other stations as occasion may require. The repair shop proper, with the exception of the blacksmith department, is located on the second floor of the building, and to this the car bodies are lifted on an elevator operated by electric power. For shifting the car bodies, after being removed from the trucks, a four-wheeled wagon truck is employed. The wheels of this truck have a wide tread, and are about 20 in. in diameter. The car body being shifted to its proper position in the paint room, it is jacked up, and supported by suitable blocking, when the truck is free for use under another car.

The repair shop has a fair complement of wood and iron working tools which are driven by power from a 15-h. p. motor. The equipment includes a 125-ton wheel press, made by the J. T. Schaffer Manufacturing Co., of Rochester, N. Y. Car body repairs of every description are made, some of the old cars are spliced into long cars, and, in the early history of the company, a number of new cars were built in the shops. The blacksmith shop is on the ground floor, and is provided with four forges, and the usual equipment of blacksmith tools. The paint shop is on the second floor, adjoining the wood department, but separated by a partition. The elevator is so placed that cars may be delivered either into the wood shop or paint shop.

Among the appliances used to facilitate the work about the shops are two armature trucks, shown in Fig. 10. One is in the form of a two-wheel, hand barrow, with the wheels about 8 in. in diameter; the side bars terminate in handles, and the cross bars provide for holding an armature, which is placed lengthwise, and

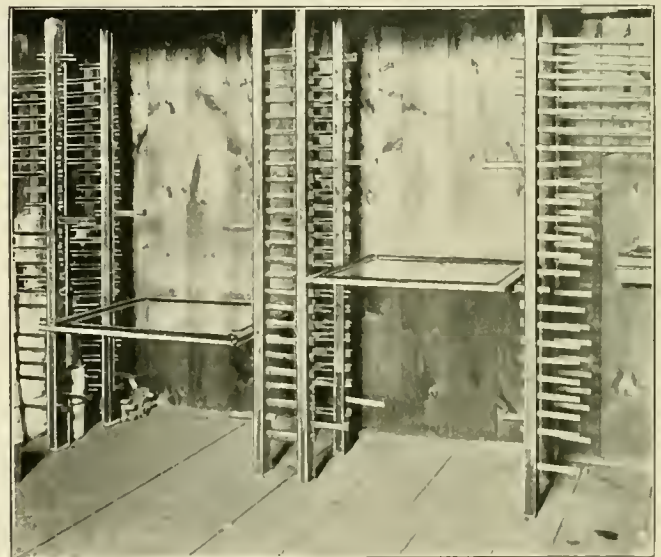


FIG. 11 SASH RACK.

supported in bearings which receive the ends of the shaft. By this means armatures are readily shifted about the shop, or they can be shipped, truck and all, on wagons, to any of the other houses. The other type of truck shown in the illustration is used at the different car houses; by it an armature can be readily picked up and shifted, without any hand lifting. This truck has an iron shaft, which forms a journal for the two 8-in. iron wheels, and also carries on its upper side two forked iron projections. By lifting the handles

the forks are tilted back, so they can be run under the ends of the shaft of an armature; then by bearing down on the handles the armature is lifted or loaded and can be wheeled easily along the floor, and deposited by reversing the process.

A lamp stand is also shown in Fig. 10; this is for holding an incandescent lamp, with its shade in position to reflect the light against the side of a car, and is designed for use by the painters when the day is dark, or when it is found necessary to work at night. These stands are made with a base, as shown, and have an extension, or jointed, stem so that the upper part, which carries the reflector, can be shifted up or down to throw the light to any height on the car, even to illuminate the upper letter board. By placing one of these stands on either side of his position, the painter can work to advantage when it is dark.

Fig. 11 shows a rack, which is used in the paint stockroom, for holding car windows after the sash have been newly varnished; the

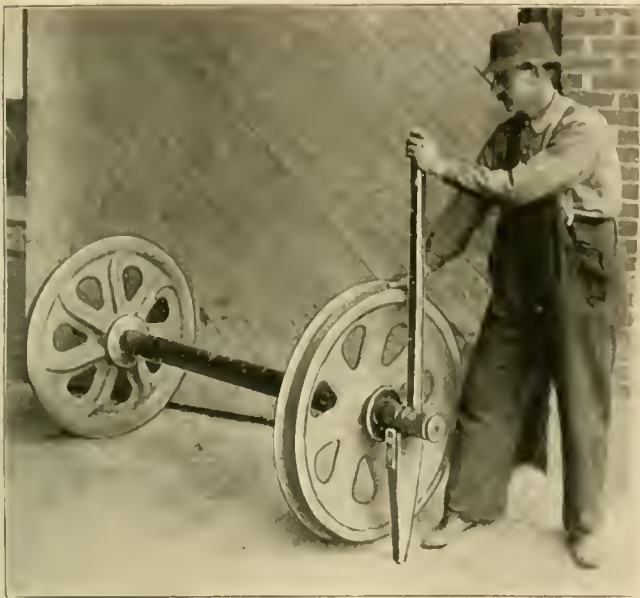


FIG. 12 WHEEL STICK.

varnish is allowed to dry without moving the frames. The sash are first varnished on both sides, while they are supported on the stand that touches only the glass, then they are carefully lifted and placed upon the plugs, in the rack, beginning at the bottom. The corner posts of the rack have mortises at short intervals, and, in these adjustable plugs are placed, each plug being provided, at its outer end, on the upper side, with a knob or shoulder. By pulling the four plugs that are on the same level partly out, the sash can be placed upon them so that the weight is supported entirely by the glass, which rests upon the projecting ends of the plugs, leaving the frame free so that the varnish cannot be marred. Racks of different sizes are provided, as shown, and a large number of sash can thus be stored in a small space.

The plugs are from 8 to 12 in. long, and 1 x 1/2 in. in cross section. In another department there are expansion or adjustable rack boxes provided, in which all the sash from the same car can be stored by themselves in regular order and labeled, so that when wanted they can be returned to their particular car without any chance of being mixed up, or having misfits.

The painting of the cars is given special attention, the master painter being specially skilled in this branch of work. Great pains is taken in cleaning and repairing the cars for paint or varnish, and certain days are assigned for receiving and sending cars from the paint-shop. Paints and varnishes are purchased principally from the Sherwin-Williams Co., the Hildreth Varnish Co. and Pratt & Lambert, American agents of the Robert Ingraham Co. Good results are obtained by mixing American and English varnish.

Motor repairs are very light on this system, only one man being employed for winding fields and armatures. Of the cars that are run in the city proper, only two armatures have burned out, so as to require repairs, during the five years that the lines have been operated. On the Deering division, there have been a few burn-

outs, but not an excessive lot. Of the G. E. 1,200 motors, only one armature has ever burned out, including those used on the snow plows. Gear wheels and pinions are purchased for the most part from the General Electric Co. The trolley wheels are of the "Eureka" type, made by J. F. Newell, of Gardiner, Me.; these wheels have graphite bushings, having in one side a small hole, which communicates with a chamber, in the hub of the wheel containing powdered graphite which sifts through upon the bearings, increasing the lubricating effect. No oil is ever used on the trolley wheel bearings, and the life of the wheels is thus prolonged.

Among other useful appliances, is a wheel stick, illustrated in Fig. 12, which is used in directing a pair of car wheels in any direction, or steering them on to the wheel press. This stick is about four feet in length, and is provided with a shoulder on one side, in which is a bearing to fit the axle journal. The end of the stick, below the shoulder, is a trifle longer than the radius of the wheel, so that by placing the stick under the journal, and bringing it to an upright position, the end of the axle is easily lifted, freeing the wheel from the floor; then, by taking hold of the near wheel with the free hand, it can be turned, and the opposite wheel made to travel so as to swing the axle around at any angle. This device is not new in street railway practice, but it is claimed that it was originated at these shops, and was in use here more than 20 years ago. Owing to the numerous grades on the system, a good deal of trouble is experienced in the winter time from flat wheels. Until recently flat wheels were turned on a wheel grinder, but this is not now used.

The Deering division car house is three miles from the city, and is the largest one in the system. The walls are of brick; the ground dimensions are 372 x 78 ft. It is divided into two sections, by fireproof partition and doors. Each track in the front section is over a pit, giving ample room for inspection and repairs. The pits are connected under the floor, and some of the spaces are used for storing the car scrapers. This section is thoroughly warmed in winter by coils of steam pipes, which are located in a horizontal position beneath the floor sections between the pits. This provides for thoroughly drying the cars and motors during the winter season. Light repairs only are made at this house. Sometimes, however, the painting crew comes over from the repair shop, and does the necessary painting. Back of the pit department are storage tracks, and near the main building is an annex 200 x 42 ft., of wood, in which cars and snow plows are stored, there being 12 or 13 plows. Near by this car house is a sand bank, of considerable extent, which is owned by the company, and from which the supply of sand, for use on the rails, is obtained, and also gravel for ballast. Tracks with overhead wires lead directly into the sand pit, so that flat cars can be loaded and hauled to any position on the system. Sand for use on the cars is sifted, dried in the sun, and stored in large bins in a building near the car house.

ROLLING STOCK.

The car equipment includes 56 closed motor cars, 60 open motor cars, and 30 trail cars, of which 22 are open. The open cars are mostly 12-bench, and were made by the J. G. Brill Co.; they are mounted on Brill maximum traction trucks. The cars on the Cape Elizabeth line were made by the J. M. Jones Son's Co. Most of the single cars are mounted on Peckham trucks.

The snow plow equipment consists of 12 or 13 electric plows of the Brill and Taunton make. On some of the plows the nose wing has been reinforced on the top by a curved steel plate, extending 2 ft. above the wing. This was found necessary in order to overcome the deep drifts which frequently occur in this region. In the winter, as a general thing, only four-wheeled cars are operated. The motor equipment includes 154 G. E. 800 motors, 38 G. E. 1,000, 4 G. E. 1,200, 8 G. E. 52, 4 G. E. 62, and 10 W. P. 50's. The electric heaters used are of the Consolidated type. No power brakes are used, and none of the cars is equipped with fenders, but most of them have wheel guards.

The Brill cars are equipped with Brill sand boxes, and in addition to the sand boxes, which are on all the cars, in some cases an open box is carried attached to the front of the dash board, from which the motorman can distribute sand by hand on the rail when necessary. Sand is also carried, in some cases, in a bucket on the platform. Some of the sand boxes used were designed and made by W. A. Mitchell, of Saco, Me. Nearly all the cars are fitted with the Wilson trolley pole catchers furnished by the Frank Ridlon Co., of Boston, and the management speaks very highly of this device.

New Haven fare registers are used on the Cape Elizabeth line. On the lines where a multiplicity of fares are collected, the conductors carry bell punches, and register fares by punching slips of different colored pasteboard, which are suspended from clamps attached to the coat.

There are 270 trainmen, the pay of each being \$1.75 per day, or 20



FIG. 13—TUKEY'S BRIDGE.

cents an hour for extra men. The men are required to wear regular full uniform, and in winter they wear ulsters that are all alike. A number of conductors are college or university men, who work during their vacations; others are country boys, or men from neighboring cities in the state.

Besides the cars described, the company owns a fine parlor car, built by the Brill company, which is hired to private parties, as may be desired. Transfers are issued on all connecting lines, except that to Cape Elizabeth. In winter the company is required to cart the snow away from the tracks in the city and for this purpose country teams are used. For these, with one driver and a pair of horses, \$4 per day is paid, a standing arrangement being made with the owners of country teams, which report for service when-



FIG. 14—MILL CREEK.

ever there is a hard storm. The franchise of the company is for 50 years, from 1888, an extension of 25 years having been obtained at that time.

All the cars start from or pass Monument Sq. The company's office, adjoining a large waitingroom, is at the corner of Congress and Preble Sts., and as the cars arrive or depart the conductors

announce in a low tone the destination of the cars to those in waiting. Here is also the principal receiving station of the system. The different rooms of the offices are conveniently arranged and provided with all necessary appliances for the clerical force; there is also a handsome room set apart for the use of the directors.

The regular cars run at night till 11:30. A few cars are run at 2:00 a. m. and again at 4:00, to meet trains on the steam roads. Power for these night cars is generated by a small engine, which is started up for the purpose.

Portland & Yarmouth Electric Railway Co.

As mentioned in the introduction, this is a suburban line; it was opened two years ago to connect Portland with the village of Yarmouth, a distance of 13 miles. The line starts from Portland at Monument Sq. at the corner of Congress and Elm Sts. The cars go through Elm, Oxford and Washington Sts., across Tukey's drawbridge, Fig. 13, and along the main thoroughfare of East



FIG. 15—UNDERWOOD SPRING CASINO.

Deering. After passing the United States Marine Hospital, and over Martin Point Bridge, which spans the Presumpscott River, the cars speed along the Falmouth shore, through Falmouth Foreside and Cumberland to the Grand Trunk Depot in Yarmouth, passing Underwood Spring, the street railway park, which is midway on the line.

Yarmouth was formerly a prosperous ship building port, but of late not much has been done in this industry. A ride over this line is most enjoyable, for, after leaving Portland, the route is east along the shore line of Casco Bay, on high ground, giving delightful views of the sea which is dotted with the numerous wooded islands. As the cars cross, or wind about the numerous inlets, with which the shore line is notched, ever changing views are presented. There is cultivated and wild land, alternating with trees and shrubs of almost every variety. On the land side, along the entire route, are farm houses and small villages, and on the shore side are numerous hotels and cottages, the summer homes of a part of the great army of city people who seek this delightful region during the summer months.

Not only the residents of the shore cottages are patrons of this line, but also the people from the island hotels and homes are more or less frequent riders. The principal attraction for pleasure traffic, however, is Underwood Spring, some views of which are shown in Figs. 15 to 18. This is a new park opened last season, but is already a popular resort in summer and winter. It comprises a well-wooded tract, sloping abruptly to the shore. Of the native woods, pine prevails, but there are also large elm, oak and chestnut trees. Most of the area has been left wild, but walks and rambles, with rustic bridges, and shelters, have been provided. The park is on the head of an inlet and the shore line is protected by a curved wall, as shown in the illustration.

On the height is a large casino, open summer and winter, overlooking the water, with broad piazzas, dining-room, concert-hall, parlors and reception rooms. Here a specialty is made of shore dinners but the menu embraces almost all the items found in a

casino bill of fare. There is also an open air auditorium, with rustic seats, on the sloping hillside, and a stage, having a flaring sounding-board towards the audience. Here concerts and vaudeville plays are offered each afternoon and evening, the concerts during the present season being given by the Fadette Orchestra, of 18 women.

Adjoining the auditorium, on a circular bit of level ground at the foot of the bluff, is located a very fine electric fountain, Fig. 17, which plays with beautiful effects every evening during the intervals of the entertainment. This fountain was installed by the Chase-Shawmut Electric Co., of Boston, and is so designed and provided with adjustable nozzles and sprays that a wider range of effect is produced than is usually found in fountains of this character. The fountain reflects great credit upon the designer and makers. The water pressure is obtained by means of a rotary pump, operated by an electric motor, in a small building near the neighboring spring. The color screens are shifted, and the valves operated by attendants in a chamber beneath the fountain, a water proof covering being provided.

A boating pier and pavilion are leased to the owners of a steam yacht and pleasure boats, and for a moderate sum visitors can take a sail on the bay, or visit the neighboring islands. Among other improvements are rustic stairs, leading from the water up the bank in different directions, some to Japanese houses and various shelters, and others to the casino. The park takes its name from Underwood Spring, a boiling spring of abundant pure water, which pours out under the bluff to the right of the auditorium. This is said to be the purest spring water that has ever been found in the country, and it is bottled in great quantities and shipped to all neighboring cities. Below the auditorium, near the shore, the bottling establishment is located, and here the water is not only bottled in its pure state, but great quantities of ginger ale, soda water and root beer are also made.

All about the casino are beds of choice flowers, which add greatly to the attractive features, and scattered about under the trees are

there is a telephone, so that the movements of the cars can be safely directed. Most of the telephones were supplied by the Couch & Seely Co., of Boston. A few of the National company's telephones are also used. The line is built with 59 lb., 60 ft. T rails, with ground throw spring switches at the turnouts. The surface is undulating throughout the entire route, and there are some very



FIG. 17. ELECTRIC FOUNTAIN.

steep grades, one said to be about 14 per cent. In addition to the local traffic, the cars carry a great many Sunday school and other excursion parties, which come in from neighboring towns and villages, and for which special low rates are made to the park. So successful has the road been that the steamers from Portland, which formerly touched at two or three points along the route, have ceased to make landings, as the people prefer the cars. The through trip requires 65 minutes, while the park is reached from Portland in 35 minutes. The trolley wire is No. 6, and the feed wire is No. 0000; there are two feeders on the entire Portland end and on the Yarmouth end, two for about two miles from the power house, and one over the rest of the route.

The power house is located on the shore of the bay, not far from Underwood Spring, so that it is near the middle of the line; the building is an eighth of a mile from the track, and is a plain,



FIG. 16.—UNDERWOOD SPRING PARK FROM THE WATER.

lawn swings of the Fairfield type. Arc and incandescent lamps are profusely distributed, so that the scene in the vicinity of the auditorium at night is a brilliant one. The street railway tracks loop through the grounds and all the cars, from both directions, enter the park. The patronage during the present season has been very liberal, both from Portland, Yarmouth and the neighboring islands. In busy hours 20 cars are operated at one time, and on pleasant evenings, or when there is any special park attraction, as many as 3,000 people are transported in a single evening. The charge from either terminal to the park is 10 cents. This entitles the passenger to free admission to the auditorium and all the park attractions.

The road is a single track line, but the turnouts are 300 ft. in length, so that although the headway of the cars in summer is 15 minutes, by running a number of cars together per trip, the heavy park traffic is readily handled without delay, there being sufficient room on the turnouts for all the cars in the group. No signals are used at the turnouts, but at each one and also at the drawbridges



FIG. 18. RUSTIC BRIDGE, UNDERWOOD SPRING.

wooden structure, shut in by trees and woods. The coal is delivered by barges and unloaded on the shore. The boiler equipment of the station consists of 400-h. p., Babcock & Wilcox water tube boilers.

A 400-h. p. Westinghouse compound engine, direct connected to a 250-kw. Westinghouse generator, and two tandem compound

McIntosh & Seymour engines, of 250 and 200-h. p., respectively, each driving by belt a 150-kw. Westinghouse generator, constitute the engine and power equipment. The direct connected unit is operated alone or in parallel with one of the belt-driven units, the other belt-driven unit being kept idle for use in emergency. A 100-kw. generator, driven by belt from the direct connected unit, supplies the lights for the railway park. The feed water is obtained from a neighboring brook.

ROLLING STOCK.

The car equipment includes 4 double truck open cars, 12 single truck open cars, 6 single truck closed cars, 2 double truck closed cars, 1 express car and 3 snow plows. All but 3 of the 24 passenger cars were built by the J. G. Brill Co. The 8-wheel open cars are

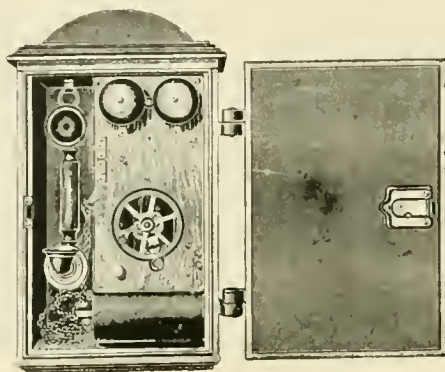


FIG. 19—COUCH & SEELY TELEPHONE.

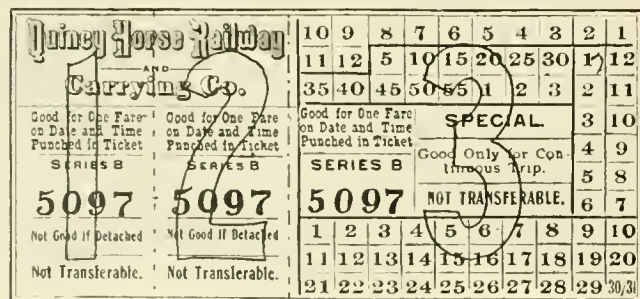
extra wide, with a seating capacity for 84 persons; each is equipped with air brakes with axle-driven compressors, and the new type of platform valves. In winter three snow plows are used, one of the rotary type, made by the Peckham Truck Co., and two of the Taunton type. The express car makes two trips daily in each direction between Portland and Yarmouth. The express business is conducted by a local express company, and the car is usually heavily loaded.

The closed cars are provided with vestibules; the 4-wheel cars seat 32 persons, and the 8-wheel cars seat 44 persons. The large open cars each have two G. E. 57 motors; all other cars have two G. E. 1,000 motors. All the cars are equipped with triple fare registers made by the New Haven Car Register Co.

The road is popular with all the regular patrons and tourists, the visitors especially being loud in their praise of the management and the politeness of the employes. From every appearance the road is a paying one, and the officers are to be congratulated.

NOVEL FORM OF TICKET.

By the courtesy of Mr. H. E. Chubbuck, manager of the Quincy Horse Railway & Carrying Co., Quincy, Ill., which, notwithstanding its name, operates an electric road, we have received samples



SPECIAL ROUND TRIP TICKET.

of a very novel and interesting form of round trip ticket with which the company is experimenting. The ticket is designed for the use of pleasure riders; it is sold for 10 cents, and permits the passenger to make a complete round trip, leaving the car at the same point he boarded it.

The original is 2 x 4 in. printed in black, with the figures 1, 2 and 3 (shown in outline in our reproduction) printed in solid red. It is divided into three parts by perforations, indicated by the dotted lines, each coupon having a serial number to correspond to the body of the ticket. The words "Date," "Month," "Hours" and "Min." are also printed in red over the proper figures, but are not shown in an engraving. The numbers 1 to 31 at the bottom of the form are for the day of the month; those from 1 to 12 at the right end for the month; those from 1 to 12 and from 5 to 55 at the top for the hour and minute.

The left hand coupon is good for transportation from the point of boarding the car to one terminus; the next coupon carries the passenger to the other terminus, and the body of the ticket is good for the return to starting point. Doubtless a passenger may continue past his proper stopping place, but even if he does the company loses nothing, because when he returns an additional fare is collected.

Mr. Chubbuck states the scheme is meeting with some considerable success.

NEW INDIANA ROAD OPENED.

On September 1st the first car was run over the new 16-mile interurban line from Terre Haute to Brazil, Ind., carrying a party of city officials and other guests. The car left Brazil at 8:30 p. m., and returned at 11:30; the first car from Terre Haute made its trip the following day. The line is to be divided into four sections, on each of which a 5-cent fare is charged; the division points between sections are different for each direction, being arranged to give patrons a satisfactory service, and at the same time provide rules easily followed by the trainmen. The sections are as follows: First from any terminus in Terre Haute to the east side of the golf links; second, from the golf links to the east side of Seeleyville; third, from Seeleyville to the east side of Williamstown, and fourth, from Williamstown to any terminal in Brazil. Westward the sections end on the west side of Williamstown, Seeleyville and the golf links. Transfers are issued from any terminal line in Terre Haute or Brazil, which are accepted on the first section of the interurban line.

EXPRESS SERVICE BETWEEN DAYTON AND CINCINNATI.

Mr. Warren Blicknell, auditor of the Southern Ohio Traction Co., advises us as follows concerning the company's plans for an express service between Cincinnati and Dayton.

For the three years preceding Sept. 1, 1900, the Wells, Fargo & Co. Express had a contract with the Cincinnati & Miami Valley Traction Co., one of the constituent companies of the Southern Ohio Traction Co., for the carrying of express matter over its line between Dayton and Hamilton. At the expiration of this contract the Southern Ohio undertook to operate its own express business over the entire line from Dayton to Cincinnati, and has been making preparations since September 1st to carry on this business. It is intended to make two round trips a day between Dayton and Cincinnati a distance of 52 miles. There will be offices in each one of the following towns through which the road runs: Dayton, West Carrolltown, Miamisburg, Franklin, Middletown, Trenton, Overpeck, Hamilton, Mt. Healthy, College Hill, Cincinnati. As soon as the business shall justify it, another car will be put on so that four round trips a day between these points can be made. The company has taken two of its regular passenger coaches, removed the seats, put in center doors and rebuilt them as much as seemed necessary for the carrying of express matter. The rates are about midway between the rates of the steam road express companies and the freight rates. The method of handling the business is identical with that of the express company.

MUST NOT GAMBLE.

The Citizens' Street Railway Co., of Detroit, does not approve of its employes playing the races, and has recently posted a bulletin reminding the boys that there is a rule to that effect. The men take the regulation in good part, and especially those who do not care to bet on horses agree that it is a good thing.

changes which have taken place and showing the veteran of today how he appeared 35 years ago. Both drawings were reproductions of pictures taken at the time. The reading matter will give an idea of the construction of previous Sunday advertisements.

The general effects of the summer's work have been good. While there is no way of estimating the returns directly due to this advertising, it is believed that the pleasure riding for the season was materially increased and that the returns were greater than the outlay. These returns are largely cumulative as the information given to one person soon finds its way to others, and is effective next year as well as this. Again, many have become familiar with places where they may find cheap land for building purposes, and thus a family is established which will be a constant source of revenue.

There has also been a marked change in the temper of the people who ride on the cars. Heretofore the street car companies, justly or unjustly, have appeared in the light of monopolists indifferent to the wishes of the public, and not caring whether they patronized the cars or not. Mr. Roach's advertising campaign has changed this for the Union Traction system so that now the public is receiving a polite invitation to use the cars of the company with the assurance of courteous treatment and the best the system affords. There has been a radical change in the general "atmosphere" surrounding the position occupied before the public by the company in the last few months and much of it may be traced directly to the spirit which invites rather than simply tolerates.

The pleasure riding business of the city runs into the thousands of dollars on Sundays during the summer months. The difference between a wet, disagreeable Sunday and one of pleasant weather and sunshine is often as high as \$20,000. That this business is worth catering to seems hardly to admit of argument and when it comes to reaching into the homes to get the people out and into the cars there seems to be no question as to the value of the daily paper. It might be said that "they come high but we must have them."

GERMAN DELIVERY OF GOODS BY STREET CARS.

The United States consul at Coburg, Germany, sends the State Department a brief account of the methods of hauling freight over the street railway lines in Gera, Frost and Spronberg. These are not large places, but industrially very active, especially in textiles. The power used on the tramways is electricity or steam; the goods are transferred at the station into smaller trucks, or the railway cars are taken over the town lines. At Frost, there are three morning and three afternoon deliveries. At Gera, perambulator cars, with flangeless wheels apart from guide wheels, have been tried with indifferent success. All these plants have been worked with a profit for several years, and though people have grumbled, the utilization of tramways for the goods traffic has points which can not be dismissed without due consideration.

DOUBLE TRUCK CARS FOR CHICAGO CITY.

The Chicago City Railway Co. has decided to put in service five double truck cars with center aisles and cross seats, seating 52 persons each. They will have window sash which drop down into the car side giving practically an open car.

It is the intention of the management to experiment with these cars and determine whether the company's patrons approve of them. Capt. McCulloch has a number of bids under consideration but the contract has not been let as yet.

SAFES INSTEAD OF RECEIVERS.

The Consolidated Traction Co., of Pittsburg, has decided to dispense with receivers at its car houses and substitute safes in which the men will make their deposits, the money being tied up in canvas bags and placed in the safe through an opening arranged somewhat as are the later type of postal letters boxes. A car will make a trip to the barns and take the receipts to the office. The advantage of the system is that but one counting and checking will be necessary and thus a smaller force can handle the work.

TORNADO AT SHEBOYGAN, WIS.

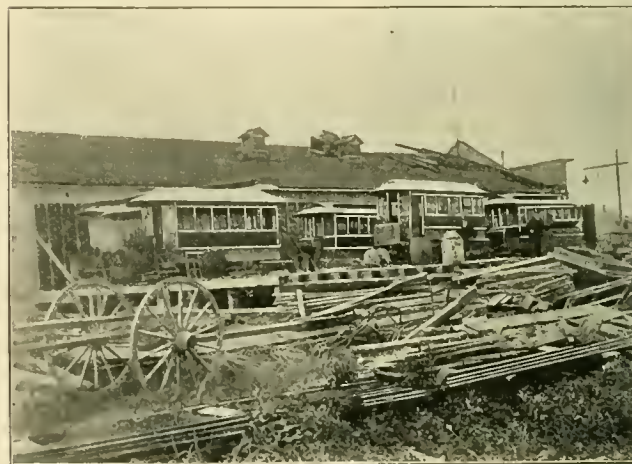
August 20th a severe storm passed over Sheboygan, Wis., doing much damage to property. The Sheboygan Light, Power & Railway Co. suffered, but not as badly as stated in the press reports. Mr. F. I. Saemann, treasurer of the company, writes us that one of the car barns was blown down and the other partly unroofed; an iron smoke stack at the power house was blown down and in fall-



POWER HOUSE AFTER THE STORM.

ing struck the pole and wires leading from the station. In addition to this only eight poles were broken and some wire torn down. A few trail cars were injured when the car barn fell. As a portion of the old material of the wrecked car barn can be used for rebuilding the total loss will probably not exceed \$1,300. Loss of revenue because of interrupted service will increase this figure to perhaps \$2,000.

The company could furnish no service whatever from Monday,



WRECKED CAR HOUSE.

the 20th, at 1 p. m. until Tuesday evening. Tuesday evening it was able to supply most of its arc and incandescent lamps and to give motor service after 6 p. m. On Wednesday the regular light and power service was restored and on Thursday the street cars were again started.

SEIZED FOR TAXES.

The Ossining Electric Railway Co., of Sing Sing, N. Y., during the last five years has shown deficits of from \$3 to \$12,000, the aggregate being \$27,745, and naturally has little money to pay taxes. Last month the tax collector for the town levied upon the company's plant and stopped the operation of the road. The cars were compelled to stop just where they happened to be and the passengers put off. The seizure took place just as the Methodist camp meeting was ready to open and was really an effort to spoil the only two weeks' good business of the year.

QUALITY OF EMPLOYES.

President Vreeland, of the Metropolitan Street Railway Co., of New York City, recently said in discussing, with a party of railroad men, the operation of his road: "A very important factor in the operation of a railroad is the quality of the men. When I came here there were only 50 men employed in running the cars who had been in the employ of the road during the preceding five years. Now there are 2,200 men who have been in the employ of the road during the past five years. Our object is to get men who will learn the business and stay with us. We don't want a man who only takes a job as motorman or conductor until he can get something else. We don't want men who simply make a convenience of us. There isn't today on this road a starter, car inspector, section foreman or superintendent who hasn't worked up from a position of motorman, driver or conductor. This has a great effect on the men. Every once in a while a young fellow comes to me who has been around trying to get a job in some store or office, and can't find anything that will pay more than \$6 a week. Well, I send him around to be examined, and if he is fit I give him a job. He has chums, perhaps, who are earning \$7 a week in offices, and they laugh at him. But he is earning \$15 a week, and can afford to be laughed at. Besides, his job is sure, and is good rain or shine. And he knows that when his turn comes, if he is efficient, he will be promoted. You should notice the number of men with stripes on their sleeves. They wear a blue stripe for every year they have been in the service up to five years. Those who have been in the employ of the road five years or more wear a gold stripe. All this shows in the operation of the road.

"The same thing is true of the construction force. We take young men into that—fellows who, because of insufficient education, have been able to earn only chance laborers' wages. In this work they get \$1.60 a day, and learn a mechanical trade in which they can find employment anywhere in the country. And they also can look for promotion."

BROOKLYN RAPID TRANSIT REPORT.

On August 18th the Brooklyn Rapid Transit Co. issued a preliminary statement of the business for the year ending June 30, 1900, showing receipts and expenses and the changes when compared with the preceding year, as follows:

	1900.	Increase.
Passengers	\$11,206,716	\$412,732
Freight, mail and express.....	61,305	24,514
Advertising	108,783	*704
Rents	167,253	26,442
Other miscellaneous incomes.....	224,493	*10,467
Totals'	\$11,768,550	\$452,517
Maintenance of way.....	\$415,729	\$ 40,782
Maintenance of equipment.....	882,183	*101,033
Operation of power plant.....	964,665	15,916
Operation of cars.....	3,551,476	*41,891
General expenses	494,530	*87,645
Damages	797,790	58,953
Taxes	736,721	100,086
Net fixed charges.....	3,398,684	*261,304
Totals	\$11,241,778	*\$276,136
Surplus	\$526,772	\$728,653
Surplus June 30, 1899.....	96,654	....
Total surplus, June 30, 1900.....	\$623,426	....

*Decrease.

The operations of the Kings County Elevated for the months of June, July and August are not here included, the company having been operated independently during that period.

The Quincy (Ill.) Horse Railway & Carrying Co., whose line is operated by electricity, is now building an extension of 2½ miles into the southern part of the city to give better access to the factory district. The track will be laid with 60-lb. T-rails in 60-ft. lengths.

ANOTHER FAKE ACCIDENT WORKER.

A man giving his name as Frank Lieblang is now under arrest at Detroit on the charge of defrauding the Detroit Citizens' Street



FRANK LIEBLANG.

Railway Co. by means of a fake accident. Lieblang is 43 years of age, a molder, and makes his home in Cleveland. The facts of the case are as follows: On August 27th J. A. Hosman fell from a car, feigned injuries, and was removed to a hospital, where the doctors made an examination and said his spine was injured. Lieblang, as Hosman's friend and representative, then effected a settlement with the company for \$200, of which he gave \$95 to Hosman. As soon as he received the money Hosman got out of bed and Lieblang was arrested, Hosman charging that the accident was a

fraud and had been planned by Lieblang.

Frank Lieblang, whose portrait we have received by courtesy of John Martin, superintendent of police, Detroit, is described as follows: Age, 43 years; height, 5 ft. 6¼ in.; weight, 170 lb.; German; stout build; hair, dark chestnut mixed with gray; mustache; eyes, slate blue; nose, prominent; marks, wreath, "Good Luck" in German above, crossed hammers, "F. L." in wreath, and clasped hands on left forearm; also, man holding flask, with "Good Luck" above, and "A Strange Molder" in German below, on right arm.

Last fall Lieblang secured a verdict for \$5,500 from the city of Cleveland for injuries alleged to have been received by falling in a manhole, and opened a summer garden. He had also effected some private settlements with the claim department of the Cleveland Electric Railway Co., and the company becoming suspicious by reason of the number of his claims detailed one of its detective force, J. A. Hosman, to investigate the matter. Hosman secured employment as a bartender in Lieblang's garden and thus describes what followed:

"I was waiting for my chance and when he had a quarrel with his wife I suggested that he start some legitimate work and travel, for he had told me of his accident business. Then he had circulars printed, making him appear as patentee and manufacturer of a portable summer screen house. We started out and went east. He had me fall from several cars and in New York I fell three times. The motormen, though, seemed to pay no attention to us and kept on going. So our scheme did not work.

"We were all through the east and at Paterson, N. J., Lieblang, who is an anarchist, donated a sum of money to the fund being raised by the anarchists there. He always spent money freely when he had it and treated me good. But we did not have a successful accident.

"He had all kinds of books in his valise, and experimented on me with belladonna. He put it in my eyes to make it appear that I was suffering from concussion of the brain. I fooled even the company's doctors with it in Cleveland, and I guess the company's doctor here (Detroit) and the hospital physicians think now that I fooled them, too. I did sprain my wrist, though, in this Detroit fall, but when they said my spine was hurt, I could hardly keep from bursting out laughing."

There is some doubt concerning Lieblang's real name. Among his papers were found naturalization papers in two names, Frank Lieblang and Charles J. Betiet, both taken out in Cleveland, the former in 1893, and the latter in 1891. He had also papers on him showing that in 1895 he was discharged under the name of John Bedit from the United States naval service. Whether these are his own papers or whether they came into his possession in some manner is unknown.

The Cleveland authorities assert that, while in the German army Lieblang shot an officer and was sent to an insane asylum, from where he escaped and came to this country.

It is also alleged that he posed as a union man during the Cleveland molders' strike and secretly made contracts with a number of firms for the importation of non-union men.

CORRESPONDENCE

HOME MADE CROSSING.

Portsmouth, O., Sept. 6, 1900.

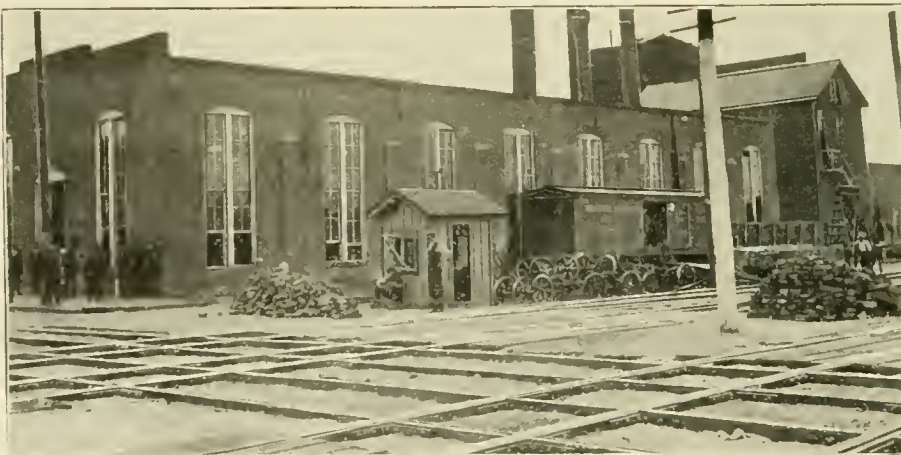
Editor "Review": Believing that the matter may be of interest to your readers we send you a photograph of a double track crossing over four steam railroad tracks. This crossing was built complete in our own shops and without employing any additional skilled labor.

The running rails of the steam railroad, the easing rails on the outside of their regular running rails and the guard rails on the inside are all continuous from one side of the crossing to the other. The knees at the intersection of the steam railroad tracks are of especially heavy forged steel held securely by 1-in. bolts besides being reinforced with a 5-8-in. plate 4 ft. square under each rail crossing and securely riveted thereto. The street car tracks have guard rails on both sides throughout the crossing. The steam railroad tracks are each made of a different section of rail to correspond with the section in use by the road in question. The crossing is on a skew, and no two of the steam railroads have the same gage for their tracks, the gage varying from 4 ft. 8½ in. to 4 ft. 9 in.; the roads also require a different spacing of the guard rails from the running rails.

This crossing has been in use now for 60 days and is spoken of very highly by officials of all the railroads using it and especially by the patrons of the street railroad. The cars cross with sufficient momentum to carry them over the crossing in the event of any accident to trolley, power circuit or controllers. This crossing is used by over 100 steam trains every 24 hours and by the street railway with a train each way every 15 minutes. The large brick building in the background is the power station.

We feel considerable satisfaction in the fact that the crossing was made and hauled to the place and fitted so perfectly that the street railway traffic was only interrupted about nine hours, the first car crossing at 4:05 p. m., the last car having passed over the old crossing at 7 a. m.

Last fall when we laid the double track on this street we laid the high T-rail to within a uniform distance of 5 ft. of the steam railroad tracks, thinking this would be a convenient length for the arms for the new crossing, but when we came to make the survey for the crossing we discovered that the distance of our heavy rails varied from 4 ft. 11 in. to 5 ft. from the railroad



HOME-MADE CROSSING AT PORTSMOUTH, O.

rails, this being caused, we think, by the expansion and contraction of the rails during the winter; this complicated the construction of the crossing somewhat. In making the survey we had a long pole constructed in sections so as to be readily separated and laid that down on the ground marking all the gage lines of the steam railroad tracks and of the abutting rail ends of

the street car tracks. In securing the angle at which the street railroad crossed the steam railroad we stretched two fine steel wires, one parallel with the gage line of the street railroad track and the other parallel with the gage line of one of the steam railroad tracks, and made a wooden frame of seasoned white pine with arms 10 ft. long securely braced. We used this pattern in laying out all the crossings and also used the pole for all measurements so that when the crossing came on the ground there was nothing to do but put it in place and put in the bolts, excepting the cutting of the connections in the steam railroad tracks.

Yours truly, S. P. BAIRD.

Asso. Mem. Am. Soc. C. E., Supt. Portsmouth Street Railroad, Light & Power Co.

NEW YORK STREET CAR BRAKE TEST.

Editor "Review": I have read with much interest your criticism of the brake test in New York State, and think it is well-timed and to the point. I am satisfied that the commissioners desired a fair test, but, as this was the first public test of its kind, there are several details which might have been improved upon. It is a fact that none of the contestants were allowed to put their cars into service prior to the test, and we all labored under this great disadvantage. I was told that I would be allowed two days' service before the test was to take place, but, when the time came for the service test, the engineer was unable to get the permit to allow our car to go on the road, and we practically had never had an opportunity to run the car except in the limited space in the barn. This was particularly hard on our company. We did the best we could under the circumstances, knowing that we could have made a much better showing if we had been able to have used our car for a couple of days prior to the test. In our opinion, the test amounts to very little, we believing that the best way for a street car company to test the merits of a brake is to take it and use it, giving it regular daily service, and in this way only can the value of any braking device be accurately determined. Yours truly,

A CONTESTANT.

CHILDREN'S FARES.

Macon, Ga., Sept. 5, 1900.

Editor "Review": In reply to your request for confirmation of the report that this company had decided to charge fare for three-year old children in order to prevent nurse girls taking with them, when riding on the street cars, other children besides those properly in their care, I beg to say that the report is incorrect. Such a statement was printed in one of our local papers but I have no idea where the reporter got his information, as no such orders have been issued. It has always been the rule with this company, as is customary elsewhere, to charge for children over four years of age, but I never heard of a street railway company exacting fare for a three-year old child. On the contrary, I have always pursued a very liberal policy towards nurses with children and instructed my conductors not to be too exacting with them, as this class of riding is generally done at a time of day when other travel is light. And if we undertake to draw the line too closely, it is my opinion that we will lose more money by parents failing to send the children and nurses than we would gain by strictly enforcing the four-year old rule. In other words a mother may find it convenient to spend 10 cents a day to send her nurse and two or three children out for a ride, where she would not send them once a week, if the cost were 20 cents a day. Taking this view of the matter I always adopt a liberal policy towards this class of riding. Yours truly,

E. E. WINTERS.

Supt. Macon Consolidated St. R. R. Co.

BURGDORF THUN RAILWAY.

This line links together three of the main lines radiating from Berne, namely, those to Olten, to Lucerne, and to Interlaken. The

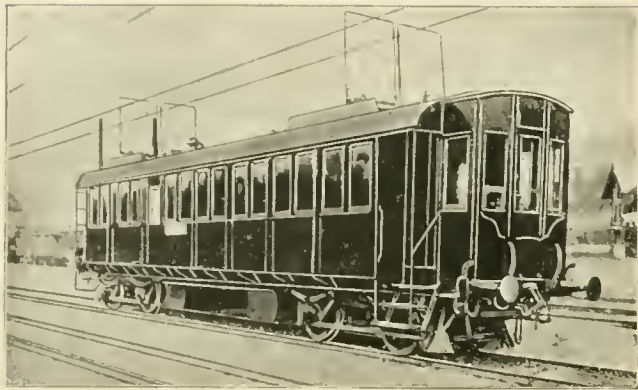


FIG. 3—EXTERIOR OF MOTOR CAR.

first of these is met at Burgdorf, the second at Konolfingen, and the third at Thun. From Burgdorf to Hasle the line runs side by side with the main line to Lucerne. At Burgdorf connection is also made with Solothurn. The distance from Burgdorf to Konolfingen is 16 miles and from Konolfingen to Thun is 9 miles, making the whole line 25 miles in length. The line is of normal gage, and carries the ordinary rolling stock of the other Swiss railways to which it is connected. It is worked entirely by electricity on the polyphase system, the power house being situated at Spiez, at a distance of five miles from Thun. A plan of the line is given in Fig. 1 and a profile in Fig. 2. From Burgdorf to Thun there are 11 trains daily, and 12 from Thun to Burgdorf. From Thun to Konolfingen there are 15 trains daily, and 14 from Konolfingen to Thun. Each train generally consists of one motor car and one trailer, together capable of seating about 100 passengers. Some of the above mentioned wires of 5 mm. in diameter to the step-down transformers situated

at intervals of two miles along the line between Thun and Burgdorf. The current is here transformed down from 16,000 volts to 750 volts, and carried from thence to the two hard copper trolley wires, 8 mm. in diameter, and to the rails forming the third wire. From the trolley wires two sliding contacts convey the current to the stator of the motors, the third connection being through the wheels of the carriages. The rotors of the motors are provided with rheostats and sliding contacts for purposes of control.

A general view of one of these cars is given in Fig. 3. Details of the construction are shown in Fig. 5. The main frame is 49 ft. long and 6 ft. 6 1/2 in. wide. The distance between the center line of the bogies is 31 ft. The wheelbase is 7 ft. 2 1/2 in. The car, when completely equipped, weighs 71,680 lb. empty, and has seating capacity for 66 passengers. Each bogie is provided with two motors, geared to the driving axle of the car. The method of suspension is shown in Fig. 7. There are 83 teeth in the spurwheel, and 28 in the

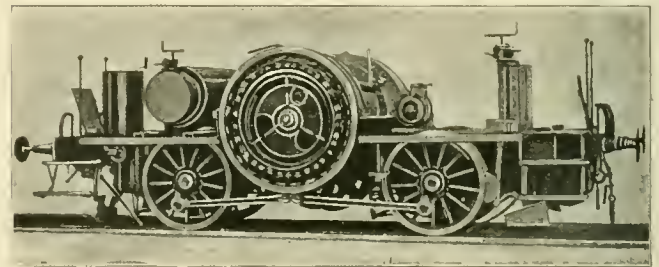


FIG. 4—LOCOMOTIVE.

pinion, giving a gear ratio of 2.96. The diameter of the driving wheel is 40 5/32 in. when new. The trailers used are of lighter construction than the motor cars, and weigh 26,880 lb. Each motor car is fitted with one of Messrs. Peyer & Favarger's tachygraphs, for recording automatically the speed of the car.

The motors are of the three-phase type, with eight poles, and designed to give 64 brake h. p. each when connected to a line having a tension of 750 volts and a frequency of 40. The speed of

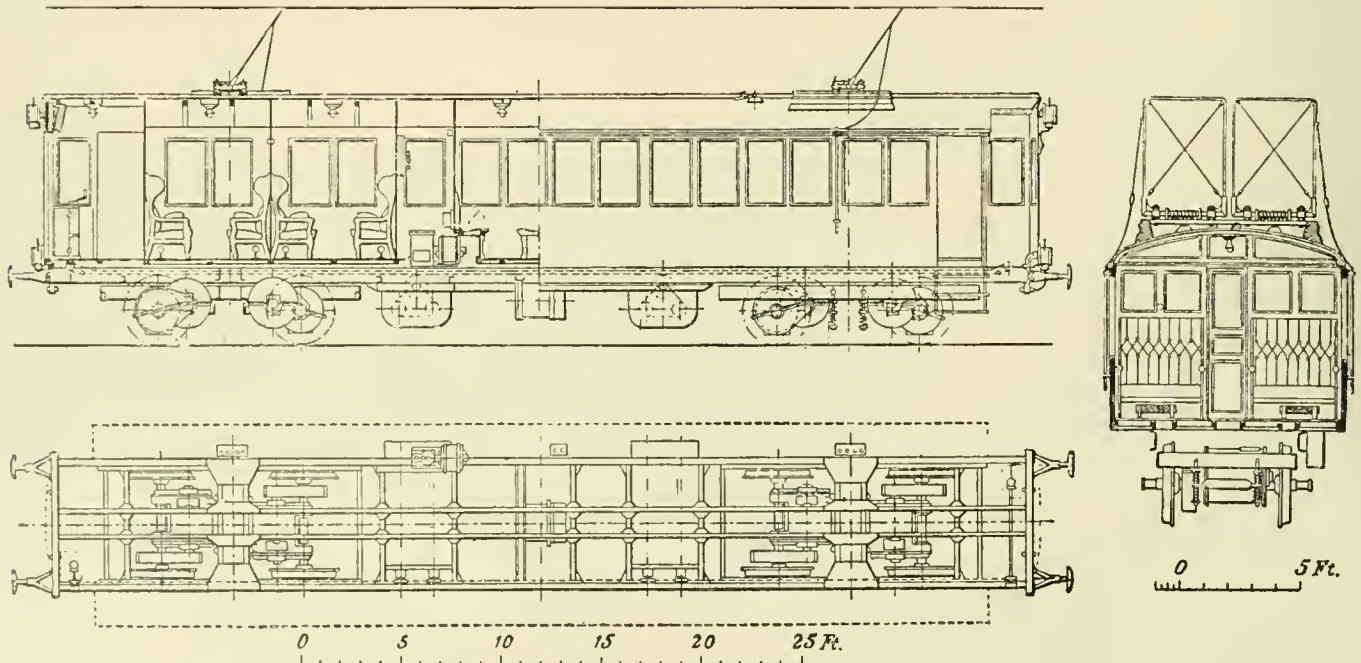


FIG. 5—DETAILS OF CAR.

trains are supplementary trains, running at about 10 minutes headway.

Fig. 9 is a diagram of the electrical connections. The generators at Spiez generate current at 4,000 volts, which is transformed to 16,000 volts in the step-up transformers. The current is carried at this tension from the power house along three overhead copper

synchronism of the motor is 600 r. p. m., making the speed of the car 35.5 ft. per second, or 24.2 miles per hour, or 39 kilometers per hour. The torque curves for these motors, with different rotor resistances, are given in Fig. 17, showing the resistance per phase that has to be put in the rotor circuit to obtain any required speed. The action of the four motors is regulated by either of the two

controllers, that in the forward vestibule being the one generally used. The four stators are connected in parallel, while the four rotors are each connected to four rheostats placed under the body of the car, and electrically independent of one another. The rheostats are worked simultaneously by rods and miter gear from the controllers. The first motion of the controller connects the stators to the line and puts the full resistance in the motor circuits. The

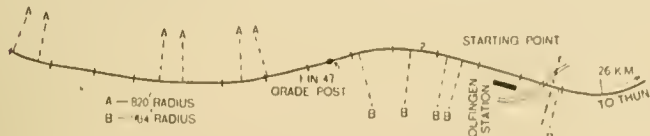


FIG. 6—MAP OF TEST LINE.

subsequent motions gradually take out the resistances, leaving the rotors short circuited.

Automatic speed records taken with the tachygraphs mentioned are interesting. On leaving Burgdorf a sharp curve and rise of 1 in 100 reduces the acceleration, which would otherwise be uniform up to full speed, as explained above. In one case the maximum speed is 39 kilometers or 24.2 miles an hour, and is kept practically constant, the slight variations being caused by irregularities in the track, and varying curves and grades. On leaving Oberberg the record shows where the train left the level and passed on to the grade of 1 in 143, thus making the acceleration curve slightly bent

has in this case led to the adoption of such grades as largely to nullify the valuable property of polyphase motors referred to. The practical effect of the grades on the working of the line is that when the capacity of the train has to be increased beyond that afforded by one motor car and one trailer, in order to deal with a temporary increase in the traffic, a second motor car and trailer have to be added. The makers of the electrical equipment were not responsible for this.

From what has been said it might appear that the best results on a line, such as that from Burgdorf to Thun, would be obtained, if the track were absolutely level; but this is not the case, since the motors have to be able to exert an abnormal effort in order to start the train, and this effort may be utilized in mounting a grade. Thus the maximum permissible grade depends upon the effort required to start. The ability of polyphase motors to accelerate, and their economy in so doing, are thus matters of importance, and the author has therefore made a number of tests on the Burgdorf railway with a view to obtaining definite information on these points. Some of the results will be quoted here. Allowing 94 per cent as the efficiency of the gearing at full load, the actual horizontal effort of the motor cars on the Burgdorf railway, at 60 kw. input, is 3,500 lb., from which has to be deducted the axle and track resistance of the motor car itself; taking this at 15 lb. per ton of load, for both motor cars and trailers, we find that a single 32-ton motor car will get up full speed, 24.2 miles per hour, in 26 seconds. The time observed in the tests was 30 seconds. The addition of one trailer will increase the time of getting up speed to 38 seconds. Two trailers should by calculation take 51 sec-

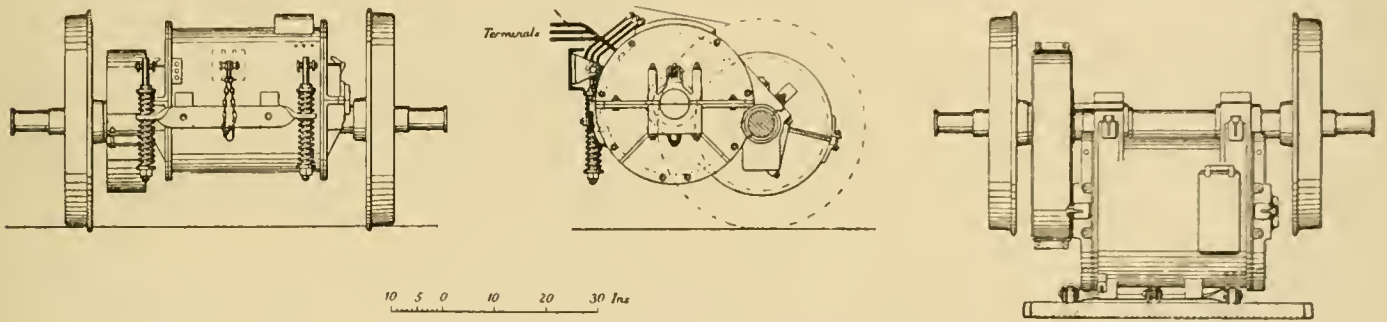


FIG. 7—MOTOR AND SUSPENSION.

over; the same thing is shown in other places. The first part of the distance from Biglen to Gross-Hochstetten is an up grade of 1 in 40; this is followed by a short level stretch, and then by a down grade of 1 in 40. The record clearly shows the slight reduction in speed, 2 per cent, on climbing the up grade, then the return to 39 kilometers an hour on the level, and the slight increase of speed, 2 per cent, on descending the grade of 1 in 40. On leaving

onds, the test gave 57; three trailers should take 67 seconds, the test gave 71. Five trailers would take 106 seconds to get up speed. The discrepancy between calculation and test is probably due to the resistance to motion having been taken too small.

In Table 1 are given the number of trailers which can be drawn up different grades by one motor car; also the corresponding acceleration with full load on a level, and the difference of time to starting with maximum load as compared with the motor car only.

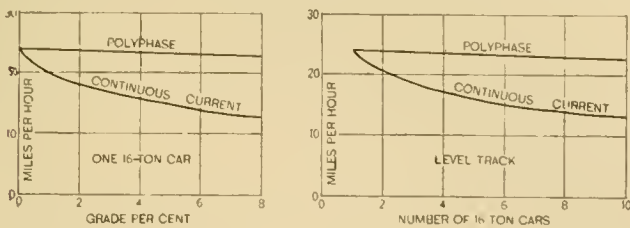


FIG. 8.

Gross-Hochstetten the acceleration curve is markedly increased when the train gets on to the grade of 1 in 40.

The grades are excessive, and have an important influence on the working of the line. The 32-ton motor cars are each equipped, as explained above, with four 64-h. p. motors. These are able, when acting together, to drive the motor car itself, and one 12-ton trailer up the maximum grade of 1 in 40. If the maximum grade on the line had not exceeded 1 per cent, four more 12-ton trailers, making five in all, might have been added when occasion required. Thus, in attempting to reduce the expense of construction by admitting steep grades, the usefulness of the electrical equipment has been seriously affected. The general impression that it makes no difference how steep the grades are on an electrically-driven line

TABLE 1.—SHOWING TIME LOST IN STARTING *Calculated*

GRADE.	Number of 12-Ton Trailers.	Total Maximum Weight.	Acceleration f.p.s. per Second	Time lost in starting. Difference between Maximum and Minimum Load.	
				One Station.	Fourteen Stations.
		tons.		seconds.	minutes.
1 in 40.....	1	44	0.92	6	1.5
1 in 62.....	3	68	0.52	20	4.5
1 in 100.....	5	92	0.33	40	6
1 in 200.....	8	128	0.17	87	20

It will be seen that as the maximum grade is reduced the maximum possible load is increased, but at the expense of a considerable increase in the time lost in starting. Thus five trailers could be hauled up a grade of 1 in 100, but 9 minutes would be lost in starting. This would probably be inadmissible, in view of the necessity of making connections with the main lines. If 5 minutes is fixed as the maximum permissible starting delay, a load variation of three trailers could be dealt with, and this would mean a maximum grade of 1 in 62. In general, the maximum permissible starting delay should be fixed first; this determines the number of trailers, and this again the maximum grade. The fewer the stops the larger will be the number of trailers, and the smaller will be the maximum grade.

In considering the application of electricity to existing railroads, the grades and station intervals are of course fixed. The average station interval in this country (England) is probably greater than that on the Burgdorf railway, which is $1\frac{3}{4}$ miles, and the grades would not be so steep. If one assumed 3 miles as the average station interval, and 1 in 100 as the maximum grade on a line 25 miles long, a motor car with an electrical equipment of 250 h. p. could haul a maximum of five trailers, or a total weight of 92 tons, with a time difference of only 5 minutes between minimum and maximum load.

On the Burgdorf railway the goods traffic is hauled by locomotives specially designed for the purpose, Fig. 4, each of

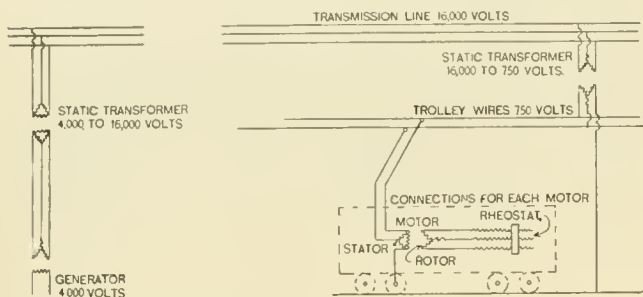


FIG. 9—DIAGRAM OF ELECTRICAL CONNECTIONS.

300 horse power; these can haul a total maximum train weight of 50 tons at full speed up the steepest grade of 1 in 40. The locomotive itself weighing nearly 30 tons, leaves only 20 tons for the weight of the train; hence it has been found necessary to reduce the speed of the locomotives by gearing, so that they can run at half speed, and draw loads of 70 tons up the steepest inclines, the total train weight then being 100 tons. A reference to Table I shows that if the steepest grade had been 1 in 100 instead of 1 in 40, as at present, the same locomotives could either carry a train of 100 tons at full speed, or a train of 200 tons at half speed. The

made during the intervals between the passing of the regular traffic, were conducted on a motor car to which trailers could be attached.

The method of conducting a test was as follows: One of the engineers of the line took charge of the controlling apparatus and acted as motorman. In the forward vestibule an assistant gave the time from a stop-watch to an observer who noted the ammeter reading at each instant. In the rear vestibule a second assistant gave the time from a stop-watch, while one observer noted the voltmeter reading, and another took the reading of a speed indicator. Two men were told off to keep a lookout and announce points passed on the track, such as grade posts, etc. The speed indicator



FIG. 10—ACCELERATION CURVES, CONTINUOUS CURRENT.

made a continuous automatic record of the speed, which was detached and numbered after each test. The motorman signalled the start, at the same moment throwing over the controller, so as to give the motors the maximum current, which was maintained constant as long as possible. The readings of all instruments were taken at five second intervals from the moment of starting, and one voltmeter reading was taken immediately before starting. Each observer recorded his own observations, and filled in those of the other observers after every test. The car was allowed to proceed for some distance after full speed had been reached, the current

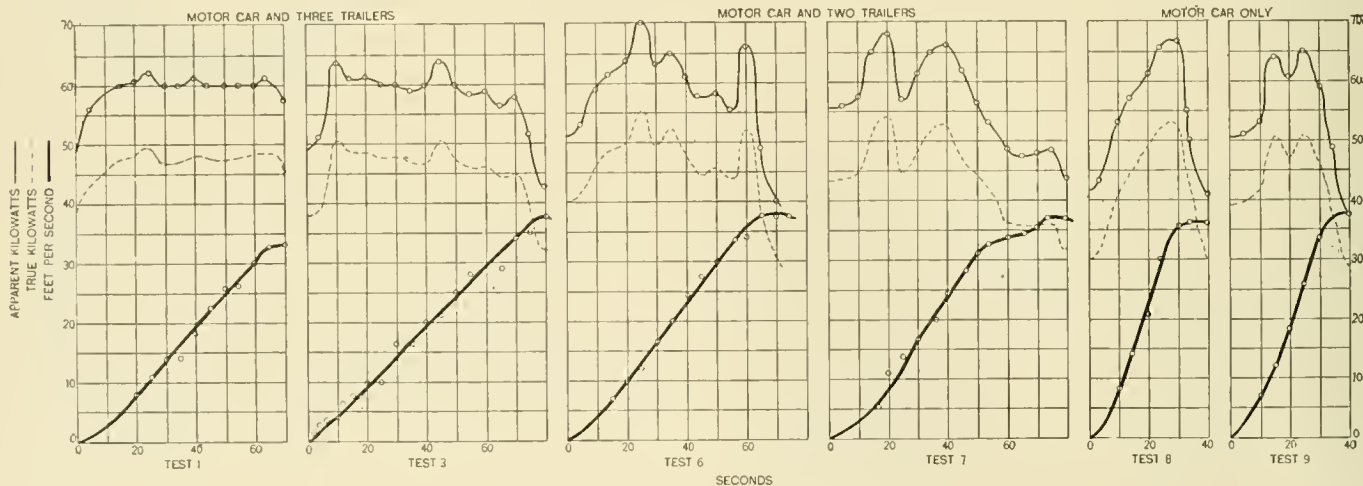


FIG. 11—ACCELERATION TESTS, POLYPHASE MOTORS.

influence of the existing grades on the carrying power of the locomotives has already been found to be a serious drawback. It may, however, be questioned if it is wise to use locomotives for hauling goods on such a line, since their use means so large a percentage of dead weight. The motor cars weigh about the same as the locomotives, carry 66 passengers, and can haul 60 tons behind them up a grade of 1 in 100. Supposing the average passenger load to be one motor car and two trailers, making 56 tons, there remains 36 tons which might be made up by goods. Since there are 12 trains per day one way, the motor cars have a goods-carrying capacity of 430 tons, or six times that of the existing locomotives. It would seem, therefore, that there is much to be said in favor of combining goods and passenger traffic on such a railway.

ACCELERATION TESTS.

In September, 1899, a series of tests were carried out at Konolfingen, under the author's direction. The tests, which had to be

was then cut off, the brakes put on, and the car brought to a standstill. Three sets of experiments were made: with the motor car only, with the motor car and two trailers, with the motor car and three trailers.

The apparent power input, obtained by multiplying together the instantaneous values of the voltmeter and ammeter readings, was plotted in kilowatts as a curve, Fig. 11, on a time base, and continued up to the point at which full speed was reached, as shown by the speed indicator readings, which were plotted on the same base. The power factor for any given watt input, being independent of the rotor resistance, is the same as when the motor is running synchronously with an equal input and with short-circuited rotor, and can be found from the curve given in Fig. 16. The true watt input was thus obtained and plotted beneath the curve of apparent watt input, the area enclosed by the curve giving the energy expenditure in watt-hours up to any given time. The weight of the train being known, the number of watt-hours per ton expended in bring-

ing the train to full speed was then determined. In all the tests the experimental train started at the point shown in Fig. 6, and moved in the direction of Burgdorf, thus encountering successively a 300-meter curve, a main line crossing, and a second 250-meter curve. After starting the train ran for a distance of 1,700 ft. on a level before reaching the grade of 1 in 47.

Three sets of experiments were made with different trains, namely, one set of four tests with one motor car and three trailers, the total weight being 68 tons; one set of three tests with one motor car and two trailers, the total weight being 56 tons; one set of two tests with the motor car by itself, the total weight being 32 tons. The observations obtained in two tests out of each set have been plotted, and are given in Fig. 11. At the time the tests were being conducted the automatic regulators governing the motion of the turbines in the power-house at Spiez were being overhauled, and consequently out of action, the governing being performed by hand. The result was that the speed of the generator, and hence the frequency, varied considerably, and this was shown in a variation of the speed of the train when full speed had been reached.

The variations in the power input are due in part to irregularities in handling the controller, but the most important variation is caused by the large drop that takes place in the tension. The transformer stations are about two miles apart, and the tests were conducted on a portion of the line about midway between two stations, and therefore at a point where the drop is a maximum. The effect of the drop is shown in the diminished input and the consequent reduction of torque and acceleration at the moment of starting, resulting in an energy expenditure about 10 per cent more than would be required if the tension were kept constant. The speeds given in Fig. 11 were obtained from the indicator readings in all cases but that of Test No. 3, where they were deduced from observations made from dropping clay balls on the track at noted time intervals, and afterwards measuring up the corresponding space intervals. In Test No. 1 the motors were switched off before full speed had been reached. In Test No. 7 the trolley jumped off the overhead wire when the car struck the main crossing, causing a drop in the power input and in the acceleration.

The areas of the true power curves in Tests 3, 6, 8 and 9 have been calculated up to the point at which a speed of 23 miles per hour, or 33.6 ft. per second was reached, and the areas of the curves in Tests 8 and 9 have also been calculated up to 24 miles per hour, or 35.2 ft. per second. The results are given in Table II. The energy expended per ton of load moved increases with the number of tons per motor. The reason of this is that the energy is proportional to the time occupied, and the time increases in a greater ratio than the load. Thus if the load per motor is increased by 75 per cent, the time is increased 100 per cent, and energy per ton 14 per cent. This shows the importance of ample driving force, and the value of high initial acceleration in obtaining good efficiency. The best results were obtained in the tests with the motor car alone, and of these results the lowest energy expenditure was observed in Test No. 8, where 41.5 watt-hours per ton was the energy expended in getting up a speed of 23 miles per hour. With the motor-car and two trailers, giving a weight of 14 tons per motor, the energy expenditure rose to 52.8 watt-hours per ton. In calculating these results, the power factor has been taken rather too large, so that the actual energy expenditure is somewhat lower than the values given above.

One of the most recent continuous-current railway equipments is that installed on the South Side Elevated R. R. at Chicago. The trains on this railway are made up of motor cars operated on the Sprague multiple unit system. Each car weighs 19 tons, and is equipped with two motors making 9.5 tons per motor. The diameter of the driving wheel is 33 in.; there are 65 teeth in the spurwheel and 22 in the pinion, making the gear ratio 2.95. The tension of the line is 653 volts at the switch-board and 600 at the cars. The motors, made and installed by the General Electric Co., are rated at a maximum output of 52-h. p. at 500 volts, though in practice they are driven considerably beyond this, the maximum horizontal tractive effort actually exerted being 1,000 lb. Series-parallel control is used. To compare the weights of the cars in the two cases, we may note that each motor car on the Burgdorf Railway weighs 32 tons and carries 66 passengers, giving 1.070 lb. per passenger. Each car on the Chicago Railway weighs 18.2 tons, and has seats for 40 passengers, giving 1.020 lb. per passenger, so that there is but little difference between the two equipments in this respect.

A complete series of tests was made at Chicago on Sept. 3, 1898. The results of two of these tests, which are typical of the rest, have been inserted in Table II, while the curves are given in Fig. 10. It will be seen that the continuous-current equipment can get up a speed of 23 miles per hour with 34.7 watt hours per ton in 30 seconds, as compared with 41.5 watt-hours in 28 seconds with the three-phase equipment. Similarly, the continuous-current motors get up 24 miles per hour with 39.5 watt-hours in 37 seconds, as against 45.1 watt-hours in 30 seconds for the three-phase motors. Thus for the lower speed the continuous current motors use 84 per cent of the energy used by the three-phase motors, while for the higher speed the proportion is 87 per cent; while in the latter case the three-phase motors get up full speed in 81 per cent of the time taken by the continuous-current motors. The reduction of energy in the continuous-current motors is due to the use of the series-parallel controller, compare Fig. 13.

Comparing the maximum power input in the two cases, it will be observed that the power curves of the continuous-current equipment show a maximum of 150 kw. for two motors, or 75 kw. per motor, as against 53 kw. per motor in Test No. 8 with the three-phase equipment. In some of the tests made at Chicago the maximum input reached 90 kw. per motor, but this was because the controller was not properly handled. The large majority of the tests gave 75 kw. as the maximum power input. It thus appears that the maximum power input as obtained in actual practice with the three-phase motor is only 70 per cent of that with the continuous-current motor.

TABLE II.—ACCELERATION TESTS.

RAILWAY.	Test Number.	Maximum Speed.	Weight of Train per Motor.	Acceleration f. p. s. per Second.	Time to full Speed.	Maximum Kilowatt Input per Motor.	Watt-Hours per Ton.	Watt-Hours per Motor.
Burgdorf Railway polyphase.	3	23	17	0.48	70	51	52.6	896
	6	23	14	0.60	46	55	52.8	741
	8	23	8	1.20	28	53	41.5	332
	9	23	8	1.08	31	53	48.8	391
	8	24	8	1.17	29	53	45.1	361
	9	24	8	1.07	33	53	53.2	425
South Side Elevated continuous current.	23	23	9.5	1.12	31	75	34.7	331
	24	24	9.5	0.96	37	75	39.5	375

The tests described above were made with the object of ascertaining the ability of polyphase motors to get up speed under ordinary conditions of railway service, and the economy obtainable in so doing when compared with that observed with the best continuous-current motors. The results of the tests go to show that polyphase motors are admirably adapted to getting up speed. A comparison of the results with those obtained with one of the best and most complete continuous-current equipments shows that there is very little difference between the two in economy of starting. The continuous-current motors have a slight advantage in the amount of energy expended, while they occupy a longer time in reaching high speeds, and require larger maximum power inputs than the polyphase motors.

THE POLYPHASE MOTOR.

The action of a polyphase motor may be likened to that of a continuous-current motor in which both the fields and the armature are capable of rotation. Supposing the fields of such a motor to be fully excited, and rotating at full speed with the armature at rest, a current of any desired magnitude may be induced in the armature by simply short-circuiting it, since the generation of a current depends simply on the relative motions of the field and the armature. The torque produced by the action of the fields on the induced current will tend to turn the armature, and if the fields be kept rotating at a uniform rate, the armature will speed up until the relative motion of the fields and the armature is sufficient to generate a current that exactly balances the load; uniform speed has then been reached. The slip, or the difference between the speed of the armature and the speed of the fields, is generally stated in per cent of the speed that would be reached if the load were nothing; that is, if the armature were rotating at the same speed as the fields. This speed is spoken of as the speed of synchronism. In a polyphase motor the rotation of the field is produced by magnetizing the fixed part, or stator, by two or more alternating currents in

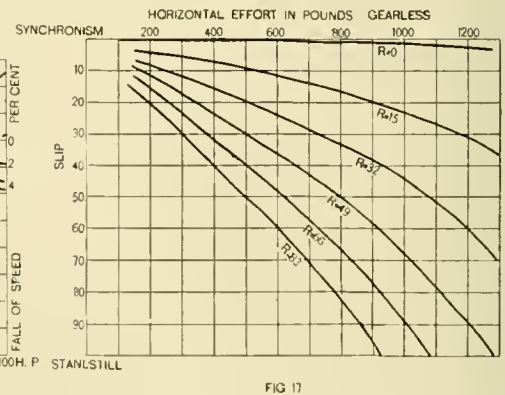
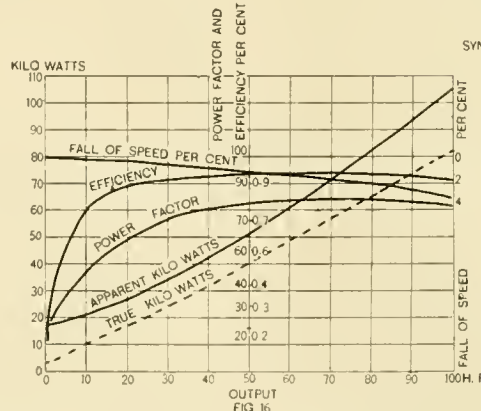
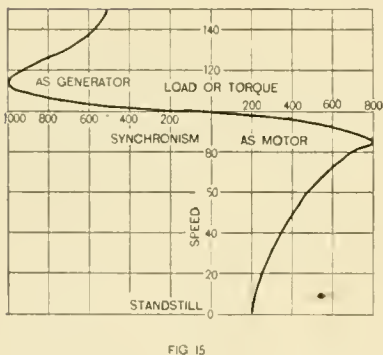
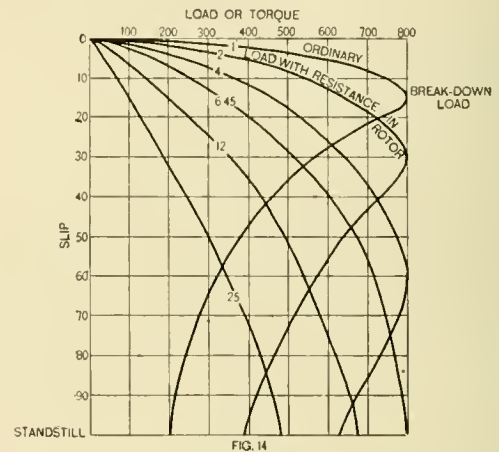
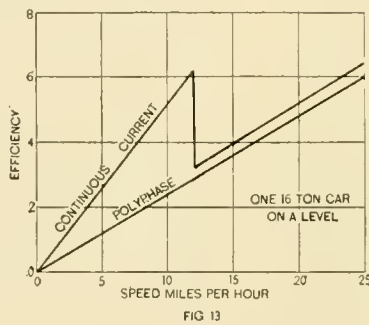
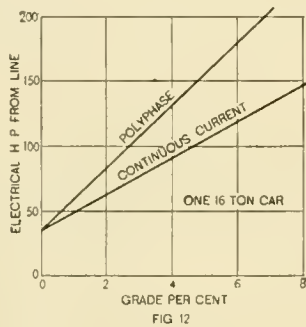
such a way that the resultant magnetic field rotates at a uniform speed. In the motors used on the Burgdorf railway three alternating currents are used differing in phase by 120°. One great advantage of such a motor over the continuous-current motor is found in the absence of a commutator, for the current in the armature, or, as it is called, the rotor, can be induced by short-circuiting its coils through a simple form of slip ring, the current from the line being led directly into the stator without any moving contacts.

In a polyphase system the ratio of the current usefully employed to that generated, as measured by the power factor, depends mainly upon the width of the space between the fixed and moving parts of the motor. Hence it is of great importance to reduce the clearance to the smallest limit consistent with safety. Thus the 64-h. p. motors on the Burgdorf railway have a clearance of 1.5 millimeters on a radius, and the 150-h. p. motors have a clearance of 3 millimeters. This necessitates very careful construction, and special precautions have to be taken to prevent any chance of contact between the rotor and the stator. Some details of the 150-h. p. motors are: Speed, 600 r. p. m.; frequency, 40; number of poles, 8; tension, 750 volts; diameter of pinion, 224 mm.; diameter of gear wheel, 664 mm.; gear ratio, 1:2.96; diameter of driving wheel, 1,020 mm.; weight of motor with pinion, 1,350 kg.; weight of gear wheel, 130

off in a greater ratio, until the maximum load of 800 is reached, where the slip is about 15½ per cent. This is the breakdown load. If the load be increased beyond this the motor cannot recover itself, and is brought to a standstill. In practice, the maximum working load should not exceed 50 to 60 per cent of the breakdown load. Thus in the Burgdorf motors the maximum working load is 1.8 of the normal.

If a resistance be placed in the circuit of the rotor so as to increase the total resistance, say, to double it, the action of the motor will be represented by the curve lettered 2 in Fig. 14, in which the slip for equal torque is double what it was with the original resistance. The maximum torque is the same as before, but takes place with a slip of 31 per cent instead of 15½ per cent. Thus with any load any required speed can be obtained by merely altering the rotor resistance. The polyphase motor is therefore capable of perfect speed regulation for all loads.

The efficiency at reduced speed is, of course, less than that at full speed, on account of the heating of the rheostats. The polyphase motor herein resembles the continuous-current motor, but it is at



kg.; weight of casing, 60 kg.; weight of suspension parts, 60 kg. Some mechanical engineers consider the necessity of such a small clearance to be a fatal objection to the use of polyphase motors on railways, but experience shows that such motors can be constructed to run continuously without accident.

In a polyphase motor the speed is practically independent of the load. Thus the 64-h. p. motors on the Burgdorf railway run at full load with a slip of only 1.8 per cent. This is in marked contrast to the action of a continuous-current series-wound motor, such as is generally used on electrical railways, in which a reduction of speed of 40 per cent from no load to full load is not uncommon. Fig. 8 shows the speed variation of the Burgdorf motor compared with that of a standard continuous-current motor, firstly with constant load and varying grade; secondly, with level track and varying load. The polyphase motor maintains the speed at the expense of a corresponding amount of power, while the continuous-current motor economizes power at the expense of speed, as shown in Fig. 12.

In Fig. 14 is given the variation in speed from standstill to synchronism of a polyphase motor with different loads. Following the curve marked 1, it will be noticed that as the load increases the speed gradually decreases, until for a load of 300, for instance, the slip is 2 per cent. As the load still further increases, the speed falls

this disadvantage, in comparison, that it is not possible to couple two polyphase motors together in the way that two continuous-current motors can be coupled in the series-parallel method of control. The superiority of the continuous-current motor in this respect has, however, been somewhat overstated, seeing that it is only for speeds less than half of full speed that the motors can be put in series. This point is illustrated by Fig. 13, which gives the comparative efficiency at equal load and different speeds of a polyphase and continuous-current equipment. For heavier loads the advantage of the latter would be reduced.

The speed curve No. 1, in Fig. 14, is reproduced in Fig. 15, and continued in order to show the action of a polyphase motor when driven above synchronism, as, for instance, when a train is descending a grade. It will be seen that as the speed increases above synchronism a negative torque is applied, and the motor acts as a generator, returning current into the line, and thereby retarding the motion precisely as if mechanical brakes were being applied. The maximum torque that can be thus applied is greater than its breakdown torque as a motor, but the slip of the maximum torque is the same. This is a feature of great importance, for not only does the polyphase motor act as an efficient brake in descending a grade, but the energy of the descent is returned into the line and is available for driving other trains. Thus, on the Engelberg railway,

which is a mountain railway worked by polyphase motors, the trains descend a 25 per cent rack grade held only by the brake action of the motors, which keeps the speed at 4 per cent above synchronism; part of the current delivered into the line drives another train up a 5 per cent grade, the remainder being used up in a rheostat.

From Fig. 14 it will be seen that there is a certain rotor resistance corresponding to standstill with maximum torque, in this case 25 times as much as the resistance of the rotor itself. If the rotor resistance has this value at the moment when the motor is connected to the line it will start with its maximum torque. If the resistance is taken out of the circuit as the motor speeds up, the torque can be maintained constant and equal to the maximum starting value up to full speed for that load. In other words, the torque and therefore the acceleration can be maintained constant practically up to full speed. It follows that the speed curve of a train driven by polyphase motors shows uniform acceleration up to full speed.

DETAILS OF BURGDORF-THUN MOTORS.

The stator winding of the motors used on the Burgdorf-Thun line consists of 51 turns per phase, and is connected up in mesh. When hot, the short-circuited resistance of the winding per phase is 0.71 ohm. The rotor winding consists of eight turns per phase, and is connected up in star, the short-circuited resistance per phase being 0.0135 ohm, hot. The characteristic features of the motors are well shown by the curves given in Fig. 16. These were obtained by brake tests made with motors of the same type as those used on the Burgdorf railway, and differing from them only in the width of the clearance, which was 1.25 millimeters, as compared with 1.50 millimeters in the Burgdorf railway motors. Owing to the low internal resistance, the speed is very uniform, the slip at full load being only 1.8 per cent. For the same reason the efficiency at full load is high, namely, 92 per cent.

The large value of the apparent watts at no load indicates a large magnetizing current, amounting to 24 amperes, or 28 per cent of full load current. The good efficiency at full load, however, shows that the wattless component is a more important element in the magnetizing current than the hysteresis component; in other words, that the predominant factor in accounting for the large no-load current is the width of the clearance. This is further evidenced by the rapid rise of the efficiency curve, giving relatively good efficiencies at light loads. The large wattless component also influences the form of the power factor curve, making it rise very slowly at first, and reach its maximum at about full load. The wider clearance in the Burgdorf motors will, of course, influence the form of the power factor curve, lowering it throughout its length. Hence the values of the true watts obtained by taking the power factors given in the curve sheet will be too high. This must be borne in mind when the results of the tests are considered.

COASTING TESTS.

The data for some coasting tests are given in Table III. A single motor car was brought up to speed and allowed to coast with current cut-off before applying the brakes.

TABLE III. COASTING TESTS ON THE BURGDORF RAILWAY. ONE MOTOR CAR OF 32 TONS.

CURVE LETTER.	a.	b.	c.	d.
Starting time, min. sec.	0 00	0 00	0 00	0 00
Current switched off after, min. sec.	0 25	1 00	0 59	0 39
Stop, min. sec.	1 00	2 10	1 55	0 75
Distance traveled, meters.	500	1100	900	600
Gradients	1 in 113 up	level	1 in 113 up	level
Starting current for four motors in amperes per phase	240	240	240	250

CHICAGO GENERAL RY. TO BE REORGANIZED.

The stockholders of the Chicago General Railway Co. are endeavoring to arrange for a reorganization of the company, so as to avoid a sale under the receivership. Messrs. Joseph P. Mahoney, W. A. Goodman and Charles L. Bonney constitute a stockholders' committee and Messrs. J. P. Black, L. M. Paine and N. D. Lawton, a bondholders' committee. It is hoped that an amicable settlement with all parties can be effected.

GOLDSCHMIDT WELDING PROCESS.

The process of welding invented by Dr. Hans Goldschmidt, of Essen, Germany, is now attracting much attention by reason of the success that has attended its practical application in the welding of rail joints and pipes. More properly Dr. Goldschmidt's invention consists in the production of high temperatures by the ignition of a mixture of iron oxide and powdered aluminum, and welding is only one of the many applications. The iron oxide and aluminum are placed in a crucible and some more easily ignited substance added which is lighted by means of a match. The resulting chemical action renders the mixture liquid; a liquid corundum appears at the surface and a metal residue forms in the bottom of the crucible. The surfaces to be welded are cleaned and then two pieces are placed in a suitable clamp by means of which they can be pressed together; a sheet iron mold is then placed about the joint and the contents of the crucible poured into it.

The corundum solidifies at a temperature above that necessary for welding, and both the iron and the mold are protected by a film of the corundum forming on them before the heated metal from the crucible reaches them. After the joint has cooled the welding material can be easily knocked off with a hammer.

Papers and lectures descriptive of the process have been presented before the Saxon Association of Engineers at Leipzig and before the Association of German Engineers at Kiel. Tubes and rails were welded in the presence of the audience. The street railways in Essen and in Braunschweig have used the process for welding rail joints with success and it is to be tried at Berlin, Dresden and Hanover.

PRIVATE RIGHT OF WAY FOR SOUTHERN OHIO.

The street railway men of Cleveland are firm in the belief that a private right of way is most desirable for suburban and interurban electric lines. The advantages are that franchise questions are not so serious, better speed can be made because there is less interference by the other traffic, there is greater freedom from accident for the same reason, and undesirable curves and grades can in many cases be avoided if the highways be not followed. The expense is generally a minor item since if properly approached the owners of abutting property will usually donate a right of way or lease on nominal terms.

Mr. Will Christy, of Akron, president of the Southern Ohio Traction Co., states that the company is contemplating securing a private right of way for the Dayton end of its line.

UNION STREET RAILWAY AT ST. LOUIS.

August 10th, the Labor Union Street Railway Co., of St. Louis, was incorporated. The capital stock is \$5,000 and the officers: President, Thomas B. Edwards; vice-president, Simeon O. Collins; secretary, William D. Benson; treasurer, John A. Root, all prominent in the management of the late strike on the Transit lines. It is proposed that the company pay a percentage of its earnings to the city, that percentage of the earnings during the year 1902 shall be contributed to the world's fair fund, that the franchise shall contain an arbitration clause, that the city shall have the right to purchase the road and that the company be prohibited from consolidating with any other road. The stock is to be floated among the trades unions of St. Louis, Chicago, New York and other cities.

A RATE WAR.

It is announced that the Pontiac, Oxford & Northern R. R., a steam line, has made a traffic agreement with the Detroit & Pontiac Railway Co., an electric road, whereby commutation tickets will be sold at 50 cents one way from Detroit to Oxford. This is the result of the Detroit, Rochester, Romeo & Lake Orion Ry., another electric line, cutting into the business of the steam road. The fare by this route is 57 cents.

A severe wind-storm at Bridgeton, N. J., last month tore down so many of the street railway trolley wires that traffic had to be entirely suspended until repairs could be made.

TRAMWAY CONDITIONS AND OUTLOOK IN ENGLAND.

From report of Marshall Halstead, U. S. Consul at Birmingham.

In tramway matters, when a city corporation builds tramway lines, it simply takes to itself a business in which experience everywhere has shown there is an assured profit. It debars the capitalist from a voice in the management, but, as it must borrow the money necessary, invites him to advance the money, relieving him from all financial risk; so after all it really is not municipal ownership, but municipal leadership.

The Daily Express is responsible for the statement that electric street cars (the first in London proper) will probably be "erected" under the recommendation of the tram committee at a cost of £132,000 (\$642,378) on the Victoria embankment of the Thames from Blackfriars Bridge to new Battersea Bridge via Victoria St. and Buckingham Palace Road. Possibly also the county council will demand that the machinery, rails, trolley wires, cars, etc., be all of British manufacture. Some other British cities have done so.

For the construction of other new tramways of a length of 16½ miles, in the territory on the north side of the Thames, and for 12 miles on the south side, the council will be asked to sanction the expenditure, respectively, on the north of £469,700 (\$2,285,795.05) for works and £544,306 (\$2,649,127.94) for street widenings; on the south, of £374,500 (\$1,822,504.25) for construction and £449,000 (\$2,185,058.50) for street widenings.

It should be noticed that for these two tramways, the immediate use of electric power is not contemplated and the horse power will suffice; but, as pointed out by the Express, "the estimates provide for rails of sufficient weight to permit of their being used for electric traction when that system shall have been adopted by the council's tramways."

The electric street car or tramway situation here is an extremely interesting one at present, for there is an awakening in such things. If my information be correct, there are not in the whole of this great United Kingdom more than 300 miles of electric street railway in operation, not 300 more in course of construction, and hardly this amount in addition authorized for construction by cities and private companies combined. In other words, forty millions of people, restless, given to trade, with fair enough wages, have not in reality nor in immediate prospect 800 miles of electric railroad, urban, suburban, and cross-country combined.

To illustrate the situation, I give as follows the substance of an argumentative pamphlet recently published by the British Electric Traction Co., and select sentences and paragraphs from some tramway newspaper clippings I have on hand:

In these days of keen commercial competition between the nations of the world, a nation which wishes to keep in the forefront of progress can not afford to neglect any opportunity for improving its means of communication. England owes much to its splendid network of railways; but unless this is soon supplemented by an equally up-to-date network of light railways and tramways, other nations will gain upon us and pass us. Every day our big towns grow bigger, and the suburbs of the one town stretch out farther and farther towards the suburbs of the next, until in some parts of England, such as the far-famed "Black Country," a whole district threatens to become one huge forest of factories and houses. Wherever such a state of things as this obtains, it is obvious that some cheap and handy means of rapidly conveying the workman to and from his work is absolutely essential to the welfare and continued progress of the community.

What is that "Black Country" of which people talk so much and know so little? It is simply a vast industrial center lying between Wolverhampton and Birmingham, having a total area of some 80 square miles and a population of over 1,000,000. In this area, towns of ten thousand inhabitants are "as plentiful as blackberries in September," and towns of twenty, thirty, forty, and even sixty thousand inhabitants are also to be found, not to mention Birmingham with its round 500,000 and Wolverhampton with over 80,000 inhabitants. In addition to its varied manufactures and teeming population, South Staffordshire possesses vast mineral wealth; it is, in short, a district of unsurpassed industrial importance. Here, if anywhere in this busy old country of ours, one would naturally expect to find an up-to-date, progressive organization for supplying the artisan

and mining population with a means of rapidly and cheaply and conveniently going about its daily work.

But what do we find? An altogether inadequate tramway service—we will not so misuse the English language as to call it a tramway "system"—having a total (route) mileage of only 54 miles, rejoicing in two different gages, worked by three different methods, and owned by no less than five separate companies.

It may be asked, if one uniform, up-to-date system of tramways all over the Black Country would prove such a great boon, why did not the existing concerns combine? The answer is a simple one—the law prevented them. All tramways in England and Scotland are subject to the provisions of the tramways act, 1870. Under section 43 of this act, any local authority may purchase the tramways within its area at the end of 21 years, the price being "the then value" of the undertaking. This "then value" is simply the market value of the old rails and stock, and has been called "the old-iron price."

The result of this is twofold. Since even under the act of 1870 one can not force people to invest their savings in tramways, general tramway development in England has been greatly retarded for want of capital. Then, if a tramway company does manage to get enough money to make a start with, it finds it more and more difficult, as time goes on and the day of municipal purchase approaches, to induce investors to supply the necessary cash for any improvement, such as electric traction, for instance. This is very natural; who would pay a shilling for a pipe, if he had to sell it the next moment to a policeman for twopence? Since the law obliges a tramway company to sell its undertaking at the value of old iron, the tramway company naturally arranges matters so that at the end of 21 years it shall have nothing but old iron to sell.

The British Electric Traction Co., having made arrangements with all the existing tramway companies, comes before the local authorities with the following proposition: "We are willing to combine all the tramways in the Black Country into one great system, to be worked by electricity in the most modern and improved manner, if only the local authorities will postpone for a few years their right to buy the tramways at the price of old iron." The authorities can not agree, and this causes all the delay.

When the London County Council took over some of the tram lines last year, it at once set about making inquiries for possible improvements. It soon saw that the horse tram car is today as much an anachronism as flint and steel would be. * * * The uncomfortable and crawling cars are to give way to a host of palaces on wheels, furnished in princely fashion, lit like the halls of the sun, gliding swiftly through the streets with a quick, easy motion. To travel in them will be rest and recreation.* * * The change is going to revolutionize London. Months ago the Prince of Wales, with singular prescience, declared that the one way to solve the great slum problem was to make it easy and cheap for the poor to reach the suburbs. When the workman can get from Finsbury Park to Piccadilly in 20 minutes for a penny fare, he will no longer box himself in a fetid city slum. The health of London will improve, for the country will be at almost every man's door, so easy will it be for him to get there.

Much of the success or failure of the coming change will depend on the form of electric traction the London County Council adopts. There are dozens of methods of superseding horse traffic. Gas cars, oil cars, compressed air cars may have their advocates; but they are not yet sufficiently developed to demand serious consideration. * * * The choice of the London County Council is for all practical purposes limited to one of two systems—the conduit (underground trolley) or the trolley. * * * One of the objections continually raised against the trolley system is that overhead wires and the standards necessary to support them disfigure the streets. It is admittedly a cheap system, easily constructed, simple and adaptable, and involving very little disturbance of the roadways. The conduit system does away with the overhead wires, and in actual working conduit and trolley cost about the same to maintain; but the conduit is exceedingly expensive to construct. It involves considerable disturbance of the streets, and is more or less liable to stoppage from floods in certain districts. * * * In London, especially in the older districts, great lines of pipes cross the streets in every direction. These would all have to be cleared so as to go below, the conduit involving an entire relaying of water mains and gas mains throughout the districts.

A LARGE CONVERTIBLE CAR.

The accompanying engravings show two views of a double truck, 12-bench Brill convertible car which is one of a number recently built for the New Castle Traction Co., of New Castle, Pa., by the J. G. Brill Co., and is the largest of the kind yet made. The idea of the convertible car is receiving a great deal of attention from street railway men at the present time. The patrons of the street cars are everywhere, even in our northern cities, clamoring for an open car during the warmer weather. They are equally anxious

single equipment which could at all times give the railway manager the car he most needs at any time. Furthermore it provides a car which is entirely self contained and is at all times ready to be changed from one type to the other without going to the shops or car barns and without further labor than that which can be given by the motorman and conductor in a few minutes. With an equipment of this character the storage capacity of the car barns is reduced practically one half, with a corresponding diminution in the sizes of buildings, the quantity of land required, attendance necessary and the capital invested.

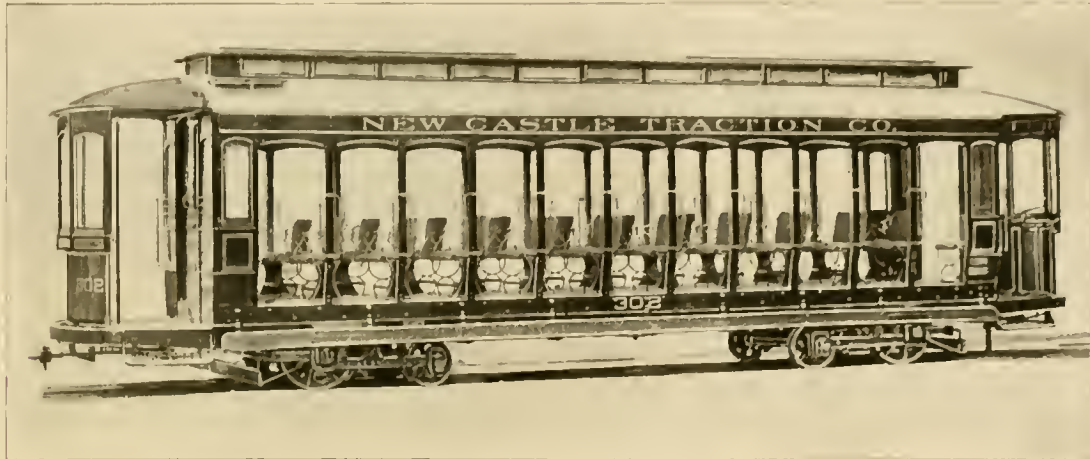


FIG. 1—BRILL CONVERTIBLE CAR, OPEN.

to have these cars taken off whenever a cold wave interrupts the pleasant weather and they object very rightly to the use of them during chilly weather, late in the fall or early in the spring, yet throughout the year even in winter there are days when the use of such cars materially increase the traffic of a street railroad. The boards of health in some cities where open cars are extensively used have found it necessary to interfere and demand that a certain proportion of closed cars be run the whole year round. The railway manager at the present time is confronted with the problem of a double equipment, half of which only can be used at any one time. This, of course, means double storage capacity with all the

How perfectly the Brill car has answered the requirements can be judged from the engravings and from the accompanying description. Fig. 1 shows the car open for summer use. It is in all respects a standard cross-seat, center aisle open car. From a layman's point of view it is identical with the usual type. The expert notices perhaps the panels in the corner and certain minor details of construction, as the form of grab handles and positions of the panels. Fig. 2 shows the car closed, and the steps folded up ready for winter use. It is practically a standard box car on double trucks. It is true there is a folding step, and grab handles are at each window post, but the arrangement of the windows and panels

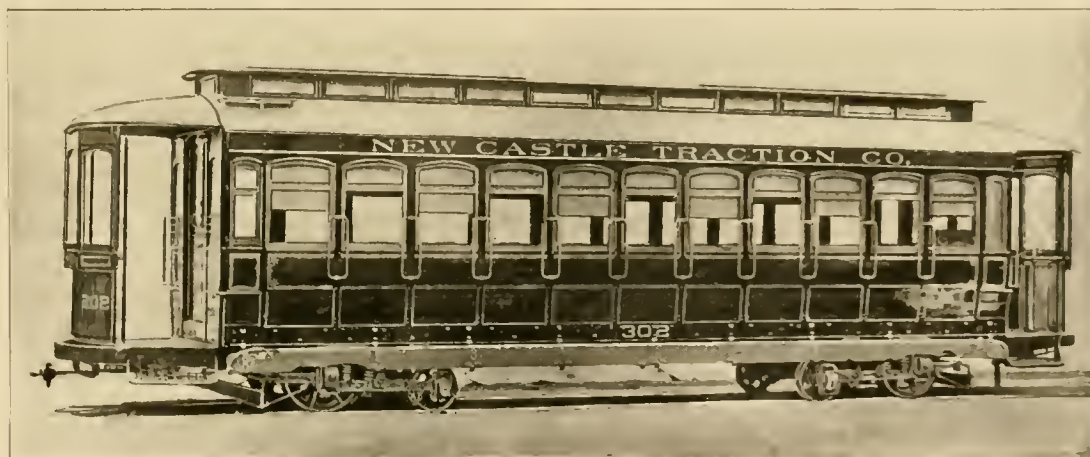


FIG. 2—BRILL CONVERTIBLE CAR, CLOSED.

attendant expenses, and it also means if the public is to be thoroughly accommodated the storage houses shall be arranged in such a manner as to make it possible to change from one to the other kind of car at the shortest possible notice. Actual practice only succeeds in using a double equipment and keeping the open car in service as long as possible. It is put on weeks before the proper time in the spring in order to take advantage of any stray warm days which might occur and it is kept on in the fall a month longer than is comfortable for the majority of the traveling public.

The aim in designing the Brill convertible car was to make a

is similar to that of the ordinary car. With the exception that the windows raise instead of drop, the car is as far as passengers are concerned the same in operation and arrangement as a closed car. The curtains operate in the same way; when closed they come to the window rail, when open they come all the way to the floor. These New Castle cars have 24 benches and seat 46 persons, one of the stationary seats at each end of the car accommodating one person only. The open car has the Brill round corner seat end panels which give great ease of entrance from the sides.

The cross seat car is being looked upon with more and more

favor by street railway men and several large companies are ordering them extensively. The idea is that there is a profit in carrying seated passengers and that people when seated are more comfortable if they face in the direction in which they are moving.

The following are the principal dimensions and details of these cars: Length over end panels 30 ft. 8 in.; length of platform 4 ft.; length over dasher 38 ft. 8 in.; width at the sills 6 ft. 8 $\frac{3}{4}$ in.; width over posts 7 ft. 5 $\frac{1}{2}$ in.; extreme width of the car when the steps are down, 8 ft. 8 in.; extreme width with steps raised, 7 ft. 8 in.; height of the platform steps above rail, 14 in.; riser of step, 13 in. The long step or running board is 19 in. from the track and 15 $\frac{1}{2}$ in. from the step to the floor of the car. The width of the car inside at the center is 8 ft. 2 $\frac{1}{2}$ in., and the body is 9 ft. 3 $\frac{1}{2}$ in. from the bottom of the sill over the trolley board. These cars are mounted on maximum traction trucks with driving wheels 33 in. in diameter, 2-in. tread and $\frac{5}{8}$ -in. flange. They are fitted with electric brakes, Brill angle iron buffers, Brill portable vestibule, radial draw-bars, two sand boxes and two Dedenda gongs. The General Electric Co. furnished cables, controllers and resistance. The side panels are of the new type having metal on both sides of the slats making a very warm car side, and being flexible fill the grooves completely. The interior of the car is so nearly identical with those ordinarily used that even an experienced railway man would not be likely to note anything unusual in the construction. The center of the car perhaps appears a little more lofty than usual, but the ventilators and monitor deck are the same. The construction of the roof is such as to give unusual stiffness and strength. The letter board and panels are made from a single piece which is halved upon the posts and carlines. The necessary interior furring strips also anchor each of the carlines, while the carlines being wider than usual at the foot and made up as part of the posts are much stronger than those of any ordinary car. This design has been in use long enough to have its weak points made apparent and corrected. Cars of this type have been in a number of accidents which have demonstrated their unusual strength and there is every reason to suppose that they will be as durable as the ordinary box car.

THE INIDIKIL SYSTEM.

Mr. A. Lincoln Hyde, of Cleveland, has developed a decimal system based on the inch instead of the meter, which he urges is much superior to both the metric and English systems of measurement. One inch is called an in, 10 inches an id, 100 inches an ik, and 1,000 inches an il. Similarly the squares of these for dimensions are respectively a sqin, a sqid, a sqik, and a sqil, while the cubes are to be known respectively as cubin, cubid, cubik, and cubil. The weight of one cubic inch of water is one an, 10 cubic inches one ad, 100 cubic inches one ak, 1,000 cubic inches one al. The unit of work is the in-al, which is equivalent to 36.1 inch-pounds, or the id-al, which is equivalent to 36.084 foot-pounds. As a substitute for the horse-power, 1,000 id-al per minute is suggested. A new heat unit based on the Centigrade thermometer would be equal to 1,668 id-al.

Mr. Hyde's paper which was read before the Civil Engineers Club of Cleveland, and published in "Journal of the Association of Engineering Societies" for July, is very interesting, but we doubt if the "Inidikil" system will be generally adopted. There are two objections to the metric system, first, that the units of length are not convenient, the meter being too large and the centimeter or millimeter too small, and, second, that it is a decimal system. Mr. Hyde's only objections to the metric system are that there are too many names and that the names are too cumbersome. The only argument he advances in favor of a decimal system is the following paragraph: "The advantage of a decimal system are too well known to require demonstration. A mental comparison of the monetary systems of Great Britain and the United States is sufficient to convince the average mind." This may be quite true as regards the average American mind, but the average British mind will hardly be convinced by so simple a process. One has but to look at the market reports to see that the decimal system is not used for all purposes of accounting even in the United States.

The author pokes fun at the imposing list of numbers representing the ratios of various English units to each other, which is as follows: 2, 3, 4, 5.5, 6, 7.92, 8, 9, 12, 14, 16, 16.5, 20, 22, 24, 24.75, 27, 28, 36, 40, 66, 80, 100, 112, 120, 128, 144, 160, 231, 437.5, 480,

1728, 2150.42, etc. It has been remarked by an advocate who held a brief for the other side of this question, that, if the number 10 is such a superior radix, it is very odd indeed that neither 10 nor any multiple of 10 that cannot be halved and quartered, appears in the list.

If surveyors find it more convenient to divide the foot into hundredths and thousandths, or if machinists for some purposes prefer to have the inch decimally divided, well and good, but that is no reason for forcing the decimal system on other users of weights and measures who do not find it convenient. Dr. Coleman Sellers, after long experience, is of the opinion that the decimal system is not a convenient one for shop sizes nor in the drafting room for making drawings to scale, which are two serious disadvantages.

ROCHESTER & SODUS BAY LINE OPENED.

"The Four Corners," which our readers will remember is the weekly paper published by the Rochester (N. Y.) Railway Co., in its issue of August 24th describes the formal opening on August 22d of the Rochester & Sodus Bay R. R., a 40-mile line from Rochester to Sodus Bay on Lake Ontario. This is known as the Royal Blue line.

The line was christened about 9 a. m. on the 22d when Illustrious Potentate George Loder of Damascus Temple of Mystic Shriners broke a bottle of champagne over the fender of the first one of the seven cars that carried the party over the line. The progress is described as a streak of enthusiasm; stops were made at all stations to give the people opportunity to tender their congratulations.

At Sodus Bay the excursionists had a genuine clambake in Margheretta Grove. The return trip was made in two hours and a half. On board the private car of the Rochester Ry. were Mr. T. J. Nicholl, president of the Rochester & Sodus Bay and vice-president and general manager of the Rochester Ry., and other officers of the companies and invited guests.

DULUTH-SUPERIOR TRACTION CO.

It was officially announced August 14th that the Duluth-Superior Traction Co., a Connecticut corporation, had been organized to take over the property of the Duluth (Minn.) Street Railway Co. and the West Superior (Wis.) Rapid Transit Railway Co. The new company was organized by Thomas Lowry, president of the Twin City Rapid Transit Co., of Minneapolis, and its president is C. G. Goodrich, vice-president and secretary of the Twin City. L. Mendenhall, receiver and president of the Duluth road, and S. T. Norvell, receiver and president of the West Superior company, will both have places in the directory of the new company. H. S. Warren, general manager of the old Duluth line, is general manager of the combined system. Mr. Lowry states that half a million dollars will be spent on improvements.

FAVORABLE DECISION AT SEATTLE.

On March 9th, last, the Seattle Electric Co., of Seattle, Wash., was granted franchises which would enable it to undertake extensive improvements and make a single system out of the various properties operated by it. Legal proceedings were at once begun, however, by taxpayers and the work has been stopped ever since. On August 20th the Supreme Court reversed an order for a temporary injunction granted by the lower court. It had been claimed that the council had violated the city charter in passing the ordinance. If no rehearing is asked the company hopes to begin work this fall. It will require a year to complete the new work.

The Lafayette (Ind.) street railway was turned over to a number of young women on August 9th, in the interest of St. Elizabeth's hospital.

The Chicago & Milwaukee Electric Ry. and the Chicago, Milwaukee & St. Paul have made an agreement for selling books of 10 tickets for \$1, good between Wilson Ave., the terminus of the Northwestern Elevated, and Waukegan. This gives a 15-cent fare from the city to Waukegan.

SOME DENVER CARS.

The Denver City Tramway Co. has recently built in its shops two 40-ft. flat cars for hauling supplies. It was the intention to use with these cars some McGuire maximum traction trucks forming part of the old equipment, but as these made the car higher than was

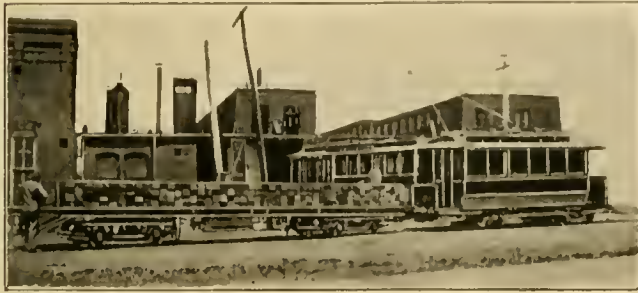


FIG. 1.

desired, the trucks were cut down and two pairs of the pony wheels used with each truck. One of these cars is shown in Fig. 1.

Fig. 2 is from a photograph of one of the combination cars which has been changed from the type formerly in use. The roof has been changed from "Bombay" to monitor deck to permit the use of a sign in the end deck light; the left hand step along the open portion



FIG. 2.

has been removed and rails permanently attached on that side (this car operates on a line with loops at the termini). At the front end are seen the canvas curtains used for closing the sides of the front platform in lieu of a complete vestibule. The curtains are provided with small glass windows. The practice of placing screens on the sides between the trucks of double truck cars has been abandoned.

DETERIORATION OF STEEL RAILS.

In May, 1896, the British Board of Trade appointed a committee "to inquire what extent of loss of strength in steel rails is produced by their prolonged use on railways under varying conditions, and what steps can be taken to prevent the risk of accidents through such loss of strength." The immediate reason of the inquiry was the collapse of two steel rails on the Great Northern Ry. at St. Neots, Dec. 24, 1895, causing an accident in which two persons were killed and many others seriously injured. One of these rails broke in 17 pieces, none longer than 22 in.

The committee, which comprised Lord Blythswood, Sir Benjamin Baker, Sir I. Lowthian Bell, Prof. Wyndham Dunstan, Prof. A. B. W. Kennedy, Major Marindin, Mr. E. P. Martin, Prof. W. C. Roberts-Austen, Dr. E. T. Thorpe, Prof. W. C. Unwin and Mr. E. Windsor Richards, has only recently completed its report. The report proper is very brief, but the members add lengthy subsidiary reports in an appendix. Professor Unwin reported on mechanical tests, Dr. Thorpe on chemical tests, Sir W. Roberts-Austen on photomicrographic examination, and Professor Dunstan on atmospheric corrosion tests.

The conclusions drawn from the chemical evidence by Sir W. Roberts-Austen and Dr. Thorpe are:

(a) The evidence before the committee indicates what the limiting proportions of carbon, sulphur, phosphorus, manganese and silicon should be. As regards the influence of phosphorus, it is pointed out that, in a broad sense, brittleness of steel does not depend on the total amount of phosphorus present, as that element may exist in steel in at least two different forms, one of which is comparatively innocuous; (b) it is very important that all who are responsible for the manufacture or use of steel rails should realize that steel is not the homogeneous mass it is often supposed to be, but possesses a complex structure. The nature of this structure will vary greatly with the mechanical and thermal treatment to which the metal has been subjected. The durability of the rail depends in no small measure on its structure, which may, if the specimens of steel have been suitably prepared, be revealed by the microscope. The peculiar structure of the St. Neots rail, for instance, can be exactly imitated.

The mechanical evidence was reported upon by Professor Unwin, Sir Benjamin Baker and Professor Kennedy. Their conclusions are as follows: (a) The preponderance of fractures near the ends of rails seems to show that the greater straining action due to discontinuity at the joint is a contributing cause of fracture; and this can be remedied by adopting rails of sufficient strength with webs of ample thickness and secure types of fastening, and by care that no looseness arises in service. (b) The fact that worn rails are improved in strength and ductility by annealing proves that part of the deterioration of rails in service is of the nature of what is sometimes termed "fatigue." (c) It appears certain that in some cases fractures of rails have been due to fissures formed during service. How far the minute transverse fissures, very often noticed in the running surface of old rails, give rise to these larger induced flaws requires further investigation. It is not likely that they usually spread into the substance of the rail, because they are common in old rails, and fractures would be more frequent than they are if that were the case. Also, the evidence as to the existence of visible flaws or defects in the fractured surface of rails is very conflicting. In some cases, undoubtedly, the combined effects of the weakening of a rail by wear and corrosion, possibly also increased straining action from defective packing of sleepers, and the presence of a flaw or fissure of not inconsiderable size have led to fracture of the rail. That such defects appear most commonly in the head of the rail is evidence to a certain extent that they are induced by the hammer hardening of the top surface. (d) It is very desirable that the mechanical tests to which rails are subjected should be, as far as possible, standardized in connection with (1) the weight; (2) the section; and (3) the chemical composition of the rail. With these conclusions the committee agree, and as regards chemical composition they do not think it desirable to insist upon too high a proportion of carbon, manganese or silicon in the steel, having regard to the ordinary contingencies of manufacture, and the greater susceptibility of high carbon steel to thermal influences.

Messrs. Richards and Martin recommend that, exclusive of iron, rails shall have the following ranges of composition in percentages:

	Minimum.	Maximum.
Carbon .....	.35	to .50
Silicon .....	.05	to .10
Sulphur .....	.04	to .08
Phosphorus .....	.00	to .08
Manganese .....	.75	to 1.00

ST. LOUIS DYNAMITERS IN CUSTODY.

Maurice Brennan and Fred Northway have been identified by employes of the St. Louis Transit Co. as men who placed explosives under the cars. They both claim to be members of the street railway union and expect assistance from that organization, though it declares the men were not in good standing in the union.

It is stated that enough is known at police headquarters to justify the statement that the dynamiting of cars of the Transit company has been done by members of a regularly organized committee, under plans formulated by councils held at fixed places by persons inimical to the company.

TELEPHONES ON INTERURBAN ROADS.

On interurban roads operating a number of cars it will at times be desirable to give orders to the crews while they are on the line, and it may be at the far end of the line. By placing a telephone system on such roads, delays to trains and other annoyances can be reduced to a minimum and the operation is rendered more secure against accidents.

Take for example a north and south road having three regular and four intermediate passing points. This would require nine instruments, exclusive of the one at the office, one at each turnout and one at each terminus. Starting at the north end, say, and number the termini and regular passing switches 1, 3, 5, 7, 9, and the intermediate switches 2, 4, 6, 8. Have a rule that crews are to report by telephone at odd-numbered stations. Now if car No. 1, leaving the north terminus on time and due to meet car No. 2 at switch 3 in 15 minutes, should arrive on time, and No. 2 fail to arrive at switch 3 or report from switch 4, the crew of No. 1 can be ordered to proceed and meet No. 2 at switch 4. In this way only one car is delayed. Of course it is necessary for the crew of No. 1 to keep a sharp look-out when proceeding from switch 3, the regular passing

Switch	Car No 1		Car No 2		Car No. 3		Car No 4	
	N	S	N	S	N	S	N	S
1	○	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○	○
3	○	A ●	B ●	○	○	○	○	○
4	○	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○	○
6	○	○	○	○	○	○	○	○
7	○	○	○	○	○	●	●	○
8	○	○	○	○	○	○	○	○
9	○	○	○	○	○	○	○	○

THE DISPATCHER'S BOARD.

point, to switch 4 as the accident to car No. 2 may have occurred in this section.

For roads operating four or more cars, a regular train dispatcher will more than save his salary in preventing delays and the repairs necessary from "cars bumping up on one another" on account of being off time.

For enabling persons connected with the road to locate the cars at all times a dispatcher's board can be arranged in a simple manner. A convenient plan is to place the switch numbers along the left hand edge and the car numbers along the top edge; under each car number are two columns, one marked "North" and one "South" indicating the direction they are running. Holes are bored to receive suitable plugs representing the cars. When car No. 1 leaves the northern terminus it is ordered to pass car No. 2 at switch 3, (No. 2 having left switch 5 with orders to meet No. 1 at switch 3); one plug inserted at the hole marked a in the diagram and another at hole marked b serve to locate the cars at the points where they will be next heard from.

Specials and work trains can be just as easily located.

Some managers have found what they consider an objection to block signal systems in the fact that when delay occurs which throws some of the cars off time the motormen have a tendency to race for the next switch, each trying to be first and by throwing the signal at the block ahead gain the distance of the next block. It takes but little of this racing, which does not occur with telephone dispatching, to disorganize the schedules. P.

A suit to declare a forfeiture of the right of way of the Suburban Railroad Co., of Chicago, through a tract of land in the western part of the city has been decided in favor of the company. The original grant was to the Southwestern Railroad Co. in 1890, and was coupled with a condition that three stations be erected and eight trains per day operated. The court held this was a condition subsequent and confirmed the title of the Suburban company.

TRADE PAPERS VERSUS CIRCULARS.

The tendency of manufacturers to use circular letters in place of space in trade papers is the result of a wrong idea of the value of a good name, says C. V. White, in the Northwestern Shoe and Leather Journal. The right kind of a trade paper is the adviser of its readers—it helps them over the hard places in business, it gives notice of new things and makes a relentless fight on fakes and fakirs. It is, first of all the friend of its readers. This kind of a paper will not accept the advertisement of any firm which is irresponsible or fakish; this gives an implied good name to every advertiser. The business relation between persons introduced by a mutual friend are more cordial than those who meet because of the forwardness of the one who has something to sell. The trade paper will introduce any manufacturer or jobber to the class of business men he wants to reach. The introduction coming in the nature of an advertisement does not materially lessen the value of the introduction. The reader knows that the firm is responsible or it would not be allowed to advertise in this particular publication.

If each advertisement is written in the nature of a direct bid for trade, the trade paper advertisement will bring larger results than a circular every time. The average manufacturer, however, puts a standing card in the trade paper space and then supplements this advertisement with circular letters, and because returns come in he thinks the letters are alone responsible. The results come because his trade paper advertising has established his good name. A business man nowadays who gets a circular letter from a strange firm has to be mighty interested before he will give it any consideration. There's too many good and reliable firms to experiment with strangers.

It is also a fact that the irresponsible manufacturer, driven out of trade papers, has to resort to circular letters. For the legitimate manufacturer or jobber to try to compete with this class of foolishness. It is foolish for two reasons: He simply injures himself every time he notices this class; second, it costs too much in proportion to what can be taken out of it. Advertising with circular letters is one of the most expensive kinds of advertising.

CHRISTENSEN AIR BRAKES FOR BOSTON ELEVATED.

After a series of exhaustive tests on air brakes the Boston Elevated Railway Co. has awarded the contract for air brakes for its elevated system to the Christensen Engineering Co., through its Eastern manager, Mr. F. C. Randall, No. 135 Broadway, New York. The Christensen Engineering Co. will furnish its automatic air brake system complete, including its No. 2 independent motor compressors and its patent triple and engineer's valves.

Our readers doubtless remember that for the tests made in the Boston Subway in April last, the Christensen Engineering Co. furnished automatic air brakes for four cars, the Westinghouse Air Brake Co. furnished brakes for four cars, and the New York Air Brake Co. equipped four cars with its apparatus excepting compressors which were made by the General Electric Co.

In awarding the brake contract the Boston Elevated is following in the footsteps of the other elevated electric roads in this country, as the South Side, the Lake Street, the Northwestern and the Metropolitan elevated roads of Chicago, the Kansas City (Mo.) Elevated Ry. and the Brooklyn (N. Y.) Elevated R. R. are all users of the Christensen brakes. The New York, New Haven & Hartford has also adopted Christensen air brakes for its electric lines. This list includes the majority of the heavy service electric roads.

NEW MASSACHUSETTS ROAD.

On August 13th the Lawrence & Reading Street R. R. was opened between Reading, Mass., and Academy Hill, Andover. Two special cars carried a party of guests over the line and after they had made the round trip the regular service was inaugurated. The officers of the company are: President, Charles F. Woodward; treasurer, M. J. Warner; clerk, S. T. Ley.

The breaking of a wheel flange on a car of the Taunton (Mass.) & Brockton Street Ry. caused the derailment of car. Twelve of the 30 passengers were slightly injured.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

NEED NOT BE LIMITED TO SAME SPEED AS OTHER RAILROADS.

Erb v. Morasch (U. S.), 20 S. C. Rep. 819. May 14, 1900.

The difference between a street railway and a steam railroad, even where the former is operated by steam, as by the use of dummy engines, or where it is operated by electricity, the supreme court of the United States holds warrants the exception of the street railway from the provisions of such an ordinance as one making it unlawful to run a railway engine or train of cars along any track in the city at a greater speed than six miles an hour.

TRIP SHEETS NOT ADMISSIBLE IN EVIDENCE.

West Chicago Street Railroad Co. v. Kromshinsky (Ill.), 56 N. E. Rep. 1110. Apr. 17, 1900.

A refusal of the trial court to admit in evidence, in this case, a trip sheet offered by the street railroad company, the latter assigned, on appeal, as reversible error. But with it the supreme court of Illinois does not agree. In regard to the trip sheet, the supreme court says that it was a mere memorandum made by the conductor. It was no record required by law to be kept. To this, the court adds that it was not even shown to have been made in the usual course of business. And it declares that it is aware of no rule under which it was admissible in evidence. But, if it was admissible, the court goes on to say, no harm was done by its rejection, as the conductor testified on the trial to all the facts disclosed by the paper, and his evidence was not contradicted.

NOT EXEMPTED FROM SPECIAL ASSESSMENTS FOR SEWERS.

Bickerdike v. City of Chicago (Ill.), 56 N. E. Rep. 1096. Apr. 17, 1900.

Besides other objections filed in this case, and participated in by other objectors, to the confirmation of a certain special assessment for the building of a sewer, the North Chicago Electric Railway Company and the Chicago Electric Transit Company further assigned as errors that their railroad rights of way could not be assessed for the sewer because of an ordinance requiring them to grade, pave, macadamize, plank, and repair a certain width in the streets and avenues occupied by them. Now, the proportionate share of said specified improvements to be borne by the companies, the supreme court of Illinois says, was fixed by the ordinances, and their acceptance by the companies. But it was insisted that such ordinances also provided an equivalent for special assessments for sewers. Not so, however, thinks the court. It holds that the commutation did not extend to other street improvements. A sewer, it holds, was not included in the agreement, which applied only to surface improvements of the street.

FAMILIARITY WITH SPEED OF WAGONS WARRANTS OPINION ON SPEED OF CARS.

Garduhn v. Union Railway Co. of New York City (N. Y.), 64 N. Y. Supp. 210. Apr. 14, 1900.

A witness, after testifying, in substance, that he had driven horses for over 20 years, and was familiar with the speed of wagons, was permitted to give his judgment as to the speed of a certain car at about the time it collided with a wagon. He did not say, in terms, that his experience in driving had given him knowledge of the speed of cars. Nevertheless, the appellate division, second department, of the supreme court of New York holds that the admission of his testimony was within the spirit of the adjudications. It holds that there can be no disqualifying difference in the exercise of judgment as applied to the two classes of vehicles or conveyances, and that experience in the speed of the one necessarily involves some judgment as to the speed of the other. But before a witness can be allowed to testify that a car was going fast or slow, it thinks that he should at least be able to say that he had noticed the speed, so that his answer will be evidence, and not a mere guess.

NEITHER ABUTTER NOR STEAM RAILROAD ENTITLED TO INJUNCTION FOR INJURY TO PROPERTY.

General Electric Railway Co. v. Chicago & Western Indiana Railroad Co. (Ill.), 56 N. E. Rep. 963. Feb. 19, 1900. Rehearing denied Apr. 17, 1900.

The allegation of an abutting property owner that the construction and operation of a street railway in front of his property will lessen its value, or injuriously affect it, or the allegation that the construction of a street railway in the street is illegal or unauthorized, the supreme court of Illinois holds, will not give such abutting property owner a standing in a court of equity to enjoin the construction of such railway.

Nor does the court consider that a steam railroad which has tracks laid in or across a street, although laid there under legal authority, has such a right in the street that it can enjoin the construction of a street car track along said street, or from crossing its track across such street.

Operating a street railway, the court adds, is a legitimate use of the street for expeditious travel thereon, and is not an additional burden thereto.

PASSENGER ALIGHTING ON TRENCH CANNOT SUE TRACTION AND GAS COMPANIES TOGETHER.

Howard v. Union Traction Co. and Philadelphia Suburban Gas Co. (Pa.), 45 Atl. Rep. 1076. Apr. 16, 1900.

A passenger, in alighting from a street car, was thrown by a block of wood which was placed across a trench that had recently been dug and filled up by a gas company. To recover for her injuries both the traction and gas companies were sued. But the supreme court of Pennsylvania holds that the statement of claim was demurrable in that it sought to hold the two companies liable as joint wrongdoers, while it in reality showed that there was no community of fault by the two companies in the act which occasioned the injuries. The statement of claim alleged that the injury was caused by the block of wood placed and maintained by the gas company in a defective and dangerous condition over a trench dug by that company. It is too plain for argument, says the court, that this was the sole fault of the gas company, according to the allegation. For that fault that company alone would be responsible, as no authority or control over the trench by the traction company was alleged in the statement. If the traction company directed the passenger to leave the car at a dangerous place, it would be in fault, and therefore liable for a breach of its duty as a carrier in that respect. But it cannot possibly be said, the court holds, that the fault of the two companies was one identical act or omission.

QUESTION AS TO SUFFICIENCY OF BRAKE THAT CANNOT BE DEPENDED ON WITH WET TRACK.

Chicago City Railway Co. v. Mager (Ill.), 56 N. E. Rep. 1058. Apr. 17, 1900.

The testimony of the motoneer called as a witness in this case was to the effect that when he saw the party, who was here seeking to recover damages for injuries in a collision, turn his horses' heads towards the track, he applied the brake, and, seeing that the brake was not going to do, he threw the brake off and reversed the current. But, taking all of his testimony together, he apparently did not mean to be understood that the brake was out of order, or in any way defective. In fact, he said that the brake was all right, but that the rails of the track of the road were wet with water from a sprinkling cart or from rain, and were for that reason so slippery that the brake could not be depended upon to stop the train in time to avoid striking the wagon. Under these circumstances, the company complained of the trial judge giving, on his motion, instructions which authorized the jury to consider as an element of the right of recovery whether the train was properly equipped with appliances for stopping it. But the supreme court of Illinois does not think that any error was committed. It holds that it remained a fair question of fact for the jury to determine whether a car sup-

plied with a brake which, though in perfect order, could not be depended upon to check and control the motion of the train under the circumstances, should be regarded as "reasonably equipped at the time as to its stopping appliances." Judgment against the company affirmed.

LIABILITY UNDER SPECIAL CONTRACT TO KEEP HIGHWAY SAFE.

Sullivan v. Staten Island Electric Railroad Co. (N. Y.), 64 N. Y. Supp. 91. Apr. 14, 1900.

Here a contract was made with the local authorities of a township in which a street railroad was to be constructed, whereby it was agreed, "during the continuance of such work of construction on said railroad tracks, roadbed, turn-out, switches, and connections, to so conduct said work as to at all times leave said streets, roads, and highways, and the sidewalks thereof in a safe and passable condition for vehicles and foot passengers, keep all dangerous or unsafe places lighted at night from sunset to sunrise, and properly guarded both by day and night." In construing this, the appellate division, second department, of the supreme court of New York holds that it was broad enough to cover the entire duty of the township, in so far as the condition of the highway was concerned, during the contract period. Consequently, it considers it broad enough to cover liability for an injury sustained by a pedestrian stepping into a hole near the foot of a telegraph, telephone, or other pole set in the highway. And there can be no doubt, the court declares, that contractors with the state or a municipal corporation who assume, for a consideration received from the granting power, by covenant, expressed or implied, to do certain things necessary for the safety or well-being of the public, are liable, in case of neglect to perform such covenant, to a private action at the suit of the party injured by such neglect, and such contract inures to the benefit of the individual who is interested in its performance. But the contract with the township, in this instance, being to keep the highways in a safe and passable condition during the time the work of construction was being carried on, the court holds that, in order to show any liability on the part of the company to the party injured as above stated, it was necessary to establish that the work of construction was still under way at the time of the accident. And this requirement the court holds was not met where the evidence on behalf of the company showed that the work of construction had been completed about six months when the accident occurred, and where the nearest time fixed at which the injured party swore to work of construction was some two months prior to the accident.

POWER OF STATE TO DIRECT CITY TO BUILD TUNNEL AND LET IT FOR STREET RAILWAY USE.

Browne v. Turner (Mass.), 56 N. E. Rep. 969. Mar. 28, 1900.

This was a suit brought to enjoin the construction of a tunnel and the issue of bonds by the city of Boston for the payment thereof. The occasion for it was alleged to be that the Boston transit commission proposed to obey section 17 of chapter 500 of the statutes of 1897, by constructing a tunnel from a point on or near Hanover street, in Boston proper, to a point at or near Maverick Square, in East Boston, and by executing a lease of the tunnel, when completed, to the Boston Elevated Railroad Company for 25 years from the date of that act at the rental specified in the same section. Besides, it was averred, the treasurer of the city proposed to obey section 18 of the act, by selling bonds and applying the proceeds to the payment of the cost of the tunnel. The injunction was sought largely on the ground that the requirements of these sections were unconstitutional, especially as calling for an unwarranted exercise of the power of taxation, and as taking the property of the city without reasonable compensation or due process of law when the lease should be executed. But no injunction was granted.

In view of its decisions as to the subway, the supreme judicial court of Massachusetts says that it does not appear to it to need further argument to show that the contemplated tunnel, even if permanently confined to street railway travel, was a public work for a public use, for building which the legislature could require the city to pay. Nor was it impressed with the distinctions which it says were suggested between the subway and the tunnel.

Then, it was argued that, because of the direction to let the tun-

nel, and because of the difference in the rental under the statute and that which would have been received under a certain contract, the real object of the statute was to throw upon the city the burden of constructing part of its roadbed for a private corporation, and to give it a lease on easier terms. But the court says that it cannot accept the suggestion. It did not appear that the statute would have either effect. But, if it would, so long as possible, the court is bound, it says, to assume that the legislature did its duty, meant what it said, and regarded the work as a public work really needed by the public, as it might be. The purpose of the act on its face was to create a lawful public improvement.

Again, it was contended that the compensation to the city was inadequate, and that the lease would be a taking of the city's property for a private corporation without paying for it. The answer of the court is that, with regard to the former proposition, if the legislature had the same power that it had with regard to other roads, the matter of compensation was wholly within its power. With regard to the latter branch of the objection, the court says that this was not a transfer, but only a quasi, or kind of, experimental lease for a not unreasonable time. The property of the city in the tunnel, assuming it to have a property, was not of a half-private sort, but was merely the control of a public agency.

Continuing, the court says that if the tunnel was to be built it was to be used, and naturally would not be used by the city directly. If the legislature could authorize it to be let on terms to be agreed upon, it could require it to be let on terms which the legislature thought just to a corporation selected by itself, engaged in a public work like that for which the tunnel was to be used. In fact, when once the power to require the tunnel to be built is conceded, the rest follows, the court holds, in the situation now existing in Boston. Assuming that the city is not to go into the transportation business further than it has gone, it adds, the use of the tunnel by the corporation which manages the consolidated street railways of the city is the alternative, and such use is not to be expected without a lease.

LIABILITY FOR TOLLS AFTER PURCHASE BY CITY OF ENTIRE STOCK OF BRIDGE COMPANY.

Monongahela Bridge Co. v. Pittsburgh & Birmingham Traction Co. (Pa.), 46 Atl. Rep. 99. May 7, 1900.

This was an action brought by a bridge company, in its corporate capacity, to recover tolls under a contract whereby the bridge company constructed an addition to its bridge for the special use of the traction company and for which the latter agreed to pay certain fixed sums for a period of 40 years. The traction company denied its liability to pay these tolls because the city of Pittsburgh had purchased the entire stock of the bridge company at public expense for public use, for a free bridge, and no toll had since been asked for its use by ordinary foot passengers, horse, wagon, and carriage traffic. But the bridge company got judgment, and the supreme court of Pennsylvania has affirmed the judgment.

First of all, the court holds that it did not follow, as alleged, that because the city purchased the entire stock of the bridge company it became the owner of the property of the company. To the contrary, it says that the principle is well established that the shares of the capital stock of a corporation are essentially distinct and different from the corporate property, and that the owner of all the stock of a corporation does not own the corporate property, or become entitled to manage or control it.

It is clear, therefore, the court holds, that the purchase of the stock of the bridge company by the city did not dissolve the corporation, or vest in the city the title to its corporate property, or give the city, as sole stockholder, the right to manage and control the bridge or other property of the corporation. To this it adds that so far as the effect of the purchase of the stock could be inquired into in this action, the city became a stockholder in the corporation, with rights and privileges as such, and nothing more or less.

Again, the court asserts that it is settled beyond all question, in Pennsylvania, that the existence of a corporation, or its right to exercise its corporate franchises, cannot be inquired into or attacked collaterally, which would prevent the traction company from interposing as a defense the nonexistence of the plaintiff corporation—the bridge company, and thereby prevent a recovery in this action.

The answer which the court makes to the contention that the city

had no right to purchase the stock of the bridge company, with the money of the city, and continue the corporate existence of the bridge company, is that the question it raised could not be adjudicated in this action. In other words, whatever might be the merits of such a defense, the court holds that the traction company was prevented from setting it up in this action. In a proper proceeding, it says, the matters suggested here to relieve the traction company from liability on its contract could be inquired into and determined, but in this action they could not be invoked to prevent a recovery. Until judicially determined in a proper proceeding, the corporate existence of the bridge company could not be denied, so as to prevent the corporation from exercising its franchises and enforcing its contracts.

"ACCIDENT ADJUSTER" NOT PUNISHABLE FOR CONTEMPT WHERE COMPANY WINS SUIT.

Noster v. Metropolitan Street Railway Co. (N. Y.), 63 N. Y. Supp. 501. Mar. 20, 1900.

While in the commonwealth of Pennsylvania the courts have thundered forth their condemnation of accident adjusters, runners, and lawyers, who, through their agency, foment litigations, in language too vigorous to be misunderstood, Mr. Justice McAdam says, at a trial term of the supreme court, in New York county, that the methods employed by these persons have become so common in New York, particularly in negligence cases, that they are tolerated complaisantly, and scarcely made the subject of comment. Moreover, it is held in this case that should an "accident adjuster" be guilty of such misconduct, as in preparing false typewritten statements of facts for witnesses to swear to, that, if the suit of which he has been the instigator and the procurer of evidence to maintain were won, it could be said that by his misconduct the rights of the defendant were defeated, impaired, and prejudiced, and hence that he was guilty of contempt, within section 14 of the New York Code of Civil Procedure, nevertheless no such right to punish him exists under the Code provision where the defendant succeeds at the trial.

WHERE CHILDREN APPEAR IN ROAD NEAR SCHOOL HOUSE.

Oster v. Schuylkill Traction Co. (Pa.), 45 Atl. Rep. 1006. Apr. 9, 1900.

This was an action for injury to a child. The motorman testified that when he was "fifty or sixty yards away, maybe more than that," he saw children in the road on both sides of the track, and only a few feet from it. He knew the school house was there, and seeing the children in the road, the supreme court of Pennsylvania holds, was notice to him that it was recess, or, at least, that the school was not in session. These circumstances, it adds, put on him the duty of at once getting his car under special control. Whether he did all that was reasonably proper for that purpose, it holds, was necessarily a question for the jury. The cases of this kind, where it is for the court to direct the verdict, the supreme court goes on to explain, are confined to those in which the uncontested evidence leads to the conclusion that the child ran in front of the car so quickly and under such circumstances that the driver or motorman had no reasonable ground to apprehend such action, and no time after it to avoid the collision. In such cases the direction by the court is based on the entire absence of any sufficient evidence of the company's negligence. Judgment in this case, for the plaintiff, affirmed.

TAXPAYER'S RIGHT TO CONTEST DISGUISED FRANCHISE GRANT.

State v. Judge of Division A, Civil District Court (La.), 27. So. Rep. 580. Mar. 10, 1900.

If it be true, says the supreme court of Louisiana, that under the guise of an ordinance to rearrange the street railway tracks on a certain street, the better to subserve the public safety and convenience, an attempt is made to donate valuable additional franchises to one of the companies maintaining a track on part of said street, and that what is thus sought to be done is in excess of the municipal powers of the municipal council, any citizen and tax-

payer has a standing in court to contest that part of the ordinance in which is included the alleged disguised franchise grant.

Whether it has a new grant, and, if so, whether the same is valid, the court holds, are matters of *de jure* more particularly to be urged by the street railway company asserting the same, and accordingly the bringing of the suit against it alone suffices.

Furthermore, a petition, duly verified by oath, containing averment of the unauthorized grant of a public franchise, and the *ultra vires*, or unauthorized, character of the ordinance under which the franchise is claimed, and alleging interest as taxpayer, and injury to the rights and holdings of the petitioner, the court holds, presents a sufficiently good *prima facie* case to warrant a preliminary injunction restraining the street railway company, its officers and agents, in the premises until the further orders of the court.

CARE REQUIRED IN OPERATING SWEEPER TO REMOVE SNOW

Conner v. Metropolitan Street Railway Co. (N. Y.), 63 N. Y. Supp. 509. Mar. 6, 1900.

In operating a sweeper, as for example during a snow storm to clear its track of snow, a street railway company, the appellate division, second department, of the supreme court of New York says, is to be held, of course, to the rule of reasonable care, in view of the dangers to be reasonably anticipated. But a liability based upon so unusual a circumstance as that of a piece of snow or ice going in an opposite direction from that designed, and without any apparent cause connected with the machinery itself or its mode of operation, it pronounces almost tantamount to holding the company to be an insurer of the safety of others who may be using the street at the same time. Hence, in the absence of proof that the snow or ice which the plaintiff alleged hit his horse, while he was driving on the adjoining track, and which he said came from the direction of the sweeper, did in fact come from the sweeper, and in the absence of proof that this was the result of negligence, and could have been averted by care in the speed or in the operations of the sweeper in some other definite respect, the court holds that the plaintiff failed to sustain the burden of proof, and that the company's motion for the direction of a verdict in its favor should have been granted.

PRESUMPTIONS FROM COLLISION OF CARS OF DIFFERENT COMPANIES.

Loudoun v. Eighth Avenue Railroad Co. and Third Avenue Railroad Co. (N. Y.), 56 N. E. Rep. 988. Mar. 27, 1900.

This action was brought to recover damages for injuries sustained by a passenger on a horse car that was struck by a cable car, the cars being owned by different companies, and both companies being sued. That the horse car was first on the crossing, the court of appeals of New York holds, did not conclusively show that it had the right of way. But, in the absence of any evidence showing the relative position or speed of the two as they approached the intersection, it holds that it did constitute evidence from which the jury might have inferred that the horse car was entitled to precedence. The cogency of the evidence, it remarks, would also depend on the part of the horse car that was struck by the cable car. And here it appeared that the horses and a great portion of the car itself had passed the crossing before the collision occurred. Yet the court does not say that on this proof the cable car company was negligent, as matter of law, but only that it was a question of fact for the jury. In other words, the court holds that, notwithstanding the details of the collision were meager, they required submission to the jury of the issue of negligence as to each company, and that a nonsuit as to either would have been improper. At the same time, it holds that there was error in instructions which substantially took away from the jury the issue of the companies' negligence, in that they stated that the accident raised a presumption of negligence, and that there was no testimony to overcome the presumption, thus substantially stating that the party suing had successfully borne the burden of proof resting on her to establish her case.

The court says that it agrees with the cable car company that the doctrine of *res ipsa loquitur*—the matter speaks for itself—did not apply to it, and that an instruction that the occurrence of the collision raised a presumption of negligence upon its part calling for

an explanation was erroneous. The cable car company, not being the carrier of the passenger suing, it holds, was bound only to the exercise of the ordinary care in the management of its cars. If one company had been in control and management of both the cars, a presumption of negligence on its part would have properly arisen. But here, the court goes on to explain, were two actors, and the collision might have been due entirely to the fault of one party, and not at all the fault of the other.

As to the horse car company, on whose car the party suing was a passenger, the court holds that a different rule obtained. While it was not a guarantor of the safety or security of its passenger, the court holds that it was bound to exercise a very high degree of care to accomplish that result. It adds that it is easy to imagine many injuries that might occur to passengers, from which no presumption of negligence would arise. But the danger of collision with other vehicles moving on the streets is always present, and the employe managing and controlling the car must be on the alert to avoid that danger. The danger is greater at the intersection of other railroads, and care must be used proportionate to the danger. And, the court holds, the horse car company could not insist upon or assert its right of way at the crossing as against the car of the other company, if there were reasonable grounds to apprehend that thereby it would endanger the safety of its passengers. Moreover, the management and control of the transportation of the passenger are wholly confided to the employes' operating the car; and the former cannot be expected to be on the watch either as to its management or that of other vehicles, or, if a collision takes place, be able to account for its occurrence. Therefore, when such a collision occurs, the court holds, there arises a presumption of negligence on the part of the carrier, which calls upon it for explanation.

But, though the occurrence of the accident called for an explanation by the horse car company, which was the carrier of the passenger, the court thinks that the trial judge erred in charging, as a matter of law, that no explanation had been furnished, and it recalls attention to the fact that the cable car struck the rear end of the horse car. How far this circumstance tended to show that the horse car had properly and carefully proceeded over the crossing and that this collision was due not to its fault, but to that of the other company, it adds was a question of fact for the jury, not of law for the court.

Again, the court holds that the question was not whether the collision could be attributed to the companies' negligence, but whether, as matter of fact, it was attributable to their negligence.

INJURY TO CONDUCTOR CAUSED BY STONE BEING PILED ALONG TRACK.

North Chicago Street Railroad Co. v. Dudgeon (Ill.), 56 N. E. Rep. 796. Feb. 19, 1900. Rehearing denied Apr. 5, 1900.

Where a company is exercising some chartered privilege or power which could not be exercised independently of its charter, there is an exception, the supreme court of Illinois holds, to the general rule that to cases of independent contractors the doctrine does not apply, which makes the superior answerable for whatever has been done. Wherefore, it holds a street railway company liable for injuries to a conductor caused by negligence in placing piles of stones along the sides of the track in repairing its roadbed and relaying its tracks, notwithstanding that it employed independent contractors to do the work, free from all control and supervision on its part. Nor does it consider it any defense that the authority and permit given to the company extended only to the relaying of the rails, and that neither the charter under which it was operating, nor the permit, covered the paving of the street or the removal of the stones therefrom.

Besides, it should not be forgotten, the supreme court says, that the law requires that the master shall provide a reasonably safe place for the servant to work, and, failing so to do, is answerable for resulting injuries, unless the dangers are such as are reasonably incident to his employment, or of which the servant has equal knowledge with the master, or where the danger is imminent. To this, the court adds that it cannot hold the danger resulting from such piling of stones along the side of the track to be an assumed risk. It also makes a point of the fact that the duties of a conductor being principally on the car, attending to the collection of fares, his knowledge of the condition of the track, or the street adjoining the same, might easily be very much less than that of an ordinary

passenger, who would have nothing else to occupy his mind except observation as the car proceeded.

WHERE A HORSE IS LEFT ALONE AND UNHITCHED AT NIGHT NEAR TRACK.

Hoffman v. Syracuse Rapid Transit Railway Co. (N. Y.), 63 N. Y. Supp. 442. Mar. 21, 1900.

A horse was left alone, untied, on a dark, stormy night, in a narrow space between a track and the street gutter, when cars were liable to come past at any moment, and at a place in the city where a 15-miles-an-hour ordinance applied, and where the driver was bound to assume a car might come down the track, out of the dark, at a rapid speed, with its headlight staring the horse in the face, and so close to him that the side of the car would almost touch his body. Under such a condition of facts, the appellate division, fourth department, of the supreme court of New York, says that it cannot agree that it should be found, even by a jury, that the driver of the horse was free from contributory negligence; and it holds that it was error not to grant a nonsuit.

Nor could it be claimed, the court holds, that it was the duty of the motorman, if he saw the horse, when some distance away, to slow down his car, and get it under such control that he could avoid a collision by stopping the car within a few feet, if the horse chanced suddenly to go upon the track. He had a right, the court maintains, to assume, until the contrary appeared, that the horse was gentle, and not afraid of street cars, and would remain standing when the car approached and passed him; otherwise, he would not have been left alone, unhitched, so near the tracks. He was only called upon to slow down, and get his car under control so as to be stopped quickly, when he was apprised by some action of the horse that he was likely to change his position of safety, and go upon the track, a place of danger.

SOME THINGS THOSE OPERATING STREET CARS BY ELECTRICITY MUST KNOW AND DO.

Owensboro City Railroad Co. v. Hill (Ky.), 56 S. W. Rep. 21. Mar. 17, 1900.

Those in charge of street cars operated by electricity along the public streets of a city, the court of appeals of Kentucky maintains, must know that they are operating dangerous machinery; that men, women, and children have the right to cross and be upon the streets, and that they will do so; that those in charge of the cars must keep a lookout, and take reasonable measures and care to avoid injury to those that may be upon the streets. It is the duty of a street car company which propels its cars by electricity to keep them under such reasonable control as will enable them to avoid injury to those who use the street. It would be gross negligence for one in charge of an electric car on the streets of a city to fail to give warning of its approach at street crossings.

This statement the court follows by the further one that if the jury believed the testimony to be true which tended to show that the car in question was running at an unusual rate of speed, and gave no warning of its approach to the crossing, then it was bound to reach the conclusion that the company was guilty of negligence. It also thinks that the jury was properly told that, if the servant of the company discovered, or could have discovered, this other party's danger, and failed to use reasonable efforts to avoid injuring her, her negligence, if any, would not prevent a recovery of damages. Railroad companies, it adds, owe that duty to trespassers. Street car companies owe it to everybody who may be found upon their tracks in cities.

This decision, it should perhaps be noted, is "Not to be officially reported."

London is not unanimous in approving the underground roads and one man is on record that he "better prefers traveling in God's own air than in a drain pipe."

It is announced that the officials of the United Traction Co., of Albany, N. Y., and the Schenectady Railway Co., of Schenectady, have reached an agreement whereby the latter company will be permitted to enter Albany over the local system if it builds an interurban line.

LAYING PIPE IN ENGLAND.

Our English contemporaries describe an amusing dispute between the town of Dudley (Eng.) and the British Electric Traction Co. over the laying of some underground feeder cables for the Dudley & Sedgley Tramway. The company wished to use cast iron pipes but the town preferred earthenware conduits. Notwithstanding the protests of the town officials, the company laid half a mile of the pipes. The police were asked to stop the work, but the men refused to desist; then the town provided a force of laborers, who filled the trench as fast as the company's men opened it. The company then provided carts and hauled the dirt away, but the town had other carts and hauled in ashes and refuse to fill the trench. At last by surrounding the trench with carts the company's men succeeded in installing some 50 yards of the pipe by the end of the second day. The town officials announced that application would be made for an injunction, but at last accounts the company was laying its mains.

All this reads as though it might have happened on this side of the Atlantic, except that there would have been a fight and at least two injunctions before the first day was over.

CINCINNATI, NEWPORT & COVINGTON.

The condensed statement of the Cincinnati, Newport & Covington Ry. for July, 1900, sent us by the president, Mr. J. C. Ernst, shows gross earnings, \$72,704; operating expenses, \$31,135; net earnings, \$41,569; tolls, taxes and damages, \$12,479; net profit, \$29,090. This is an increase in gross earnings of \$4,000, an increase in operating expenses of \$6,931, and a decrease in net profit of \$3,347, as compared with July, 1899.

For the first seven months of the year compared with the corresponding period of 1899, the increase in net profit is \$22,449. The ratio of expense to earnings is .53 with tolls and .41 without tolls, as against .55 and .42 for the corresponding period of 1899.

TO PRESERVE WOODEN POLES.

The following method is suggested for preserving wooden trolley poles from decay due to moisture or boring insects.

First char the pole for from four to six feet on the butt end, about 1/4 in. deep from the surface. Then apply the following preparation; 1 gallon of 25 per cent crude carbolic acid, mixed with 5 gallons of coal tar, putting on one or two coats after the pole is thoroughly dried; the composition should not be applied while the pole is green. It is said this mixture will kill all eggs or worms that may be in the pole and will prevent others from being deposited.

BRIDGES CLOSED UNTIL REPAIRS ARE MADE.

The city of Tacoma, Wash., has notified the Tacoma Railway & Power Co. that five bridges over which car tracks are laid are defective, and that an "element of danger" exists in operating cars over them. The city demands that the railway company repair the bridges, and as the company has refused to do so the bridges have been closed to street car traffic. The repairs in question consist in placing new post feet, caps and stringers, and the estimated cost for the five bridges is about \$1,200. The company will take the matter into court.

TO PREVENT COUNTERFEITING TRANSFERS.

Some Philadelphia firms have had tickets printed for advertising purposes which are similar in style and color to the regular transfer slips used by the Union Traction Co., and the latter finds that many of its conductors have been imposed upon by passengers who tendered the imitation checks. To stop the fraud the company has had new transfers printed on paper with the watermark "U. T. C." so that by holding the ticket to the light the conductor can easily tell whether it is genuine.

The Warren, Brookfield & Spencer Street Railway Co., of Brookfield, Mass., has had each of its conductors appointed a special policeman.

ELMIRA & SENECA LAKE RY.

The line of the Elmira & Seneca Lake Railway Co., which was opened for operation on June 19, 1900, extends from Horseheads, N. Y., to Seneca Lake. Horseheads is the terminus of the Elmira & Horseheads Ry., over which the cars of the Elmira & Seneca Falls company will enter and leave Elmira. The route is on Main St., in Horseheads, until the Chemung Canal is reached; this canal was abandoned as a waterway some years ago, and the towpath is now owned by the railway company as its right of way. The line passes



FIG. 1 TYPE OF BRIDGE.

through a well-settled country and the villages of Pine Valley, Millport, and Croton, and leaves the private right of way on reaching the town of Montour Falls; thence it proceeds through the main streets of Montour Falls, and along the Watkins public road to Watkins, and through Watkins to the northern terminus at the lake. The road passes through two counties, Chemung and Schuyler, and directly to the entrances of the world-famous Watkins Glen at Watkins and Havana Glen at Montour. The terminus at Watkins is on the shore of Seneca Lake adjacent to the depot of the Northern Central Railroad Co., and connects with the steam-



FIG. 2 EXTERIOR OF POWER HOUSE.

boat lines of the Seneca Lake Transportation Co. Seneca Lake is a fine body of water about forty miles long, and there are a number of summer resorts and cottages along its shores reached by the steamboats.

When this route was projected it was with many doubts as to the ultimate completion of the road, but the officials of the railway company after thoroughly examining the field decided to award the contract for designing, constructing and equipping the road

to the American Engineering Co., of Philadelphia, which immediately prepared plans and specifications and commenced grading for the roadbed. The cuts were 10 ft. wide at grade line with side slopes of $1\frac{1}{2}$ to 1 and ditches for drainage at the base of the slope; the fills were made 10 ft. at the grade line after being allowed to settle along the private right of way. It was necessary to change the course of the Catharine River at four different points and wherever the river was adjacent to the fills they were protected from washing by oak piles driven 5 ft. apart parallel with the river, with willow mattresses placed between and behind the piling and backed by stone riprap work.

Wherever the line of road crossed the stream there were erected plate girder or through span steel bridges, similar to the one shown in Fig. 1, which were furnished by the Berlin Bridge Co. and the Havana Bridge Co. The bridges were set on foundations of cut stone laid in portland cement, none but dimension stones being placed in the faces of the walls. The track over all bridges has inside guard rails of the same section as the running rails, laid parallel to and 4 in. from them. The bridges have fender pieces with notches on the underside to receive the ties; the fender pieces are held in place by bolts with washers on each end. Exposed parts of ties and also the notches were treated with two coats of red lead to prevent absorption of moisture.

The rails are a 56-lb. T-section rolled by the Carnegie company. They are laid on ties 6 x 8 in. x 8 ft., of hewn oak and chestnut, spaced 18 in. on centers except at joints, where they are spaced 14 in.; the joints are suspended. The track is surfaced on a bed of 12 in. of creek gravel; stone ballast is filled in level with the tops of the ties, having the natural slope from the ends of the ties. The track is bonded with No. 0000 Morris protected stranded copper bonds, and cross bonded every 200 ft. Ground plates are buried in the stream wherever a crossing is made and connected to the



FIG. 3—MONTOUR FALLS.

track circuit by four No. 00 wires; four wires are used to guard against breakage.

The overhead construction is with side poles except through the towns and villages, where the span construction is used. Side poles are 30 ft. in length, 7 in. at the top, with seamless steel bracket arms supporting clips for suspension wire, having the overhead wire supported from an eyebolt attached to the top of the pole. All suspension and pull-off wire is stranded galvanized iron. The

trolley wire is No. 00 grooved section, hung on insulators with the General Electric Co.'s special mechanical clip for this pattern of wire.

The feeder system consists of 15 miles of No. 0000 solid copper wire, insulated in the towns and bare on the private way. It is hung on glass insulators supported by cross arms on the side poles.



FIG. 4—ENTRANCE TO WATKINS GLEN.

Lightning arresters are placed every 1,000 ft. and grounded on to track circuit.

The telephone signal system was furnished by the Novelty Electric Co., and consists of a telephone at each of the sidings and terminals. There are also instruments at the power house and office so that a car at any siding can communicate with the power house or office, and with another car through the office, or the office can reach any car on the lines by ringing bells which are placed along the line, bridged in circuit, which notify the car that is wanted. Each telephone is numbered the same as the siding at which it is located, and the system is found to work very satisfactorily.

The road is fenced for its entire length over the private right of way, nearly 12 miles, with galvanized wire. The fencing is supported on iron posts every 10 ft. and has wooden end and brace posts; the grade crossings are protected by cattle guards made of triangular oak pieces. All farm crossings are put below grade through special cattle passes.

The power house, which is shown in Fig. 2, is a brick building on a stone foundation laid in cement mortar. The roof is carried on steel trusses and covered with slate, with red tile trimmings. The floors of both engine and boiler rooms are of cement.

The engine room equipment comprises one 350-h. p. engine driving a 325-kw. generator and one 250-h. p. engine driving a 225-kw. generator; the two generators are Westinghouse. Both of these engines, Fig. 6, were made by the Harrisburg Foundry & Machine Works, of Harrisburg, Pa., and are of the type known as the Harrisburg four-valve self-oiling simple engine. This type is one of a complete series made by the company and has been specially designed to give satisfactory and efficient service under the following conditions: Steady, or if required, varying load; belted or direct connected to the generators; exhaust either free to atmosphere, or, if unavoidable, subjected to back pressure; steam pressure from

70 to 100 lb.; low-priced attendants; units of from 75 to 700 h. p.; compact floor space; quiet operation; a water rate of from 25 to 28 lb. per hour. The four valves are cylindrical in form and perfectly balanced under all conditions; the two steam valves have removable bushings which render repairs positively reliable. There are two eccentrics, one actuating the two steam valves and one the two exhaust valves, the motion being transmitted to wrist plates by independent rocker arms; this design is justified because the arrangement permits a rapid acceleration of the valve gear and secures sharp cut-off and release. The valve gear is made as simple as possible and close adjustment can be secured so that in operation there is no clattering or noisy vibration. The wrist plates and the wrist plate pin are made of a special steel, the pin being fitted with adjustable sections of phosphor bronze. Lubrication of the pins is accomplished by means of compression grease cups on the outside end of each pin thus allowing the operator to force the lubricant into use without exposing himself in the least to the mechanism.

The switchboard is of white marble equipped with Keystone and Weston instruments. A detector bell is provided which rings when a circuit breaker opens and continues sounding until the circuit is closed. All wiring from the generators to the switchboard is carried under the engine room floor.

Adjoining the switchboard is the telephone booth and near it are a tool room, a dressing room and the office for the engineers.

The steam piping, which was completed under the direction of Mr. A. C. Thompson, consists of a main header with a branch for each engine turned from it, and a Bundy automatic trap for returning hot water drippings to the boilers.

In the boiler room are two 300-h. p. boilers, an American feed-water heater and two Snow pumps. Coal storage pockets are directly in front of the boilers, and coal is deposited in the pockets through a steel-lined chute leading from a railroad siding parallel

company's property, it will be used as a resort for picnicking in summer and skating in winter.

The car barn is located parallel to the railway near the power house. It is 250 x 50 ft., and contains four tracks with a shop and employes' room in the end nearest the power house; the



FIG. 5 ENTRANCE TO HAVANA GLEN.

building and pits are heated with exhaust steam from the power house, which is piped underground from the latter. The building and special work leading from it are lighted with enclosed arc lights; the pits and rooms are lighted with incandescence lamps. The sides of the pits are of brick and are built 2 ft. outside of and

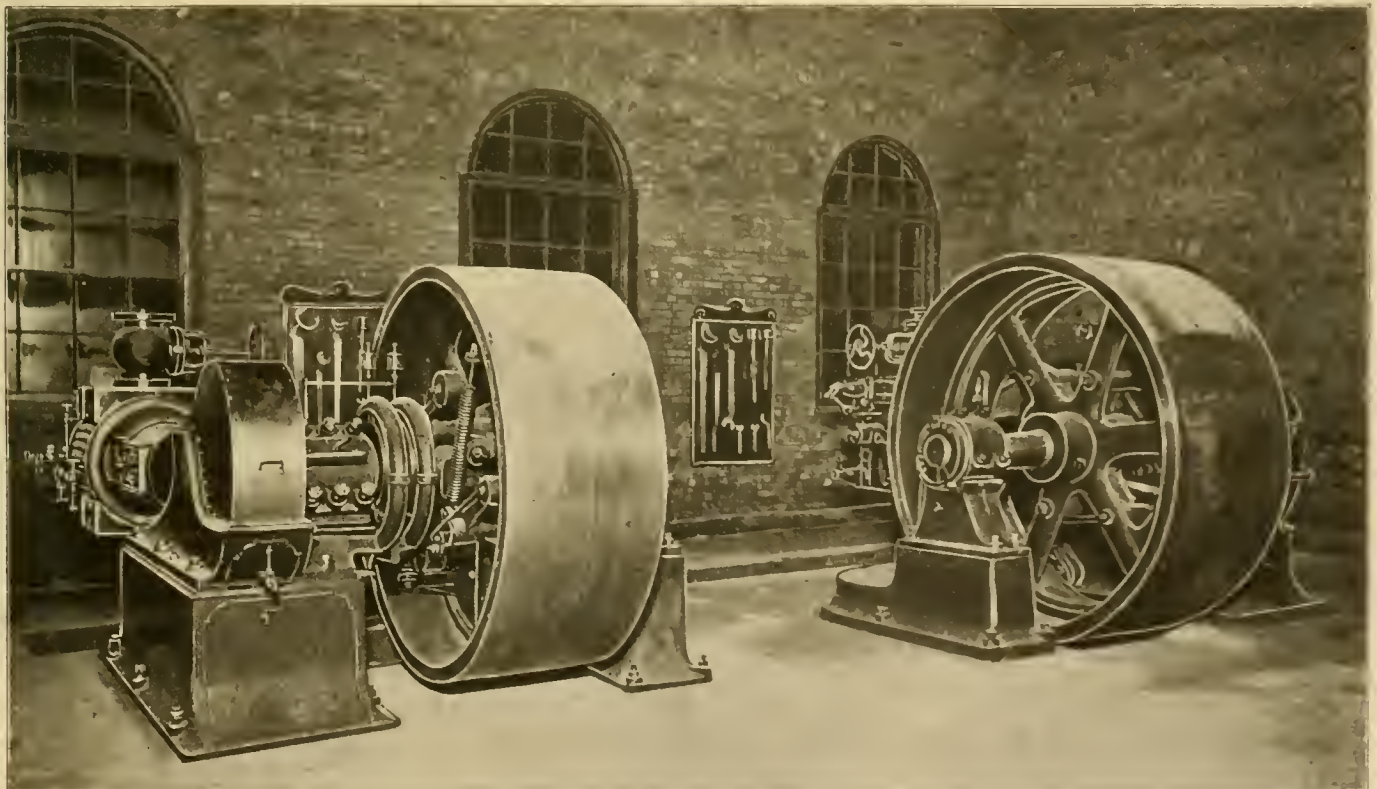


FIG. 6 HARRISBURG 4-VALVE ENGINES IN POWER HOUSE.

to the building and some 45 ft. above the pockets. Coal is thus unloaded into the storage pockets without cost for handling. The stack is 125 ft. high; it is of steel, brick lined, and fitted with lightning rods.

Water for the plant was secured by damming a branch of Catharine River and laying a pipe with natural gravity flow to a well in the boiler room. Analysis of the water showed it to be first-class for steaming purposes. The water dammed back being on the

parallel to the tracks. The tracks are carried over the pits on trestles to allow space at the sides for light and ventilation.

The car equipment consists of 12 cars; four are similar to that shown in Fig. 8. Two of these four have smoking compartments, the other two having both baggage and smoking compartments. They are equipped with four G. E. 1,000 motors, K 11 controllers, Christensen automatic air brakes, and Wagenhals arc headlights. The interior is finished in cherry and mahogany; the seats are

of the walkover pattern, covered with rattan. They are lighted with four five-light clusters of handsome design; these cars are fitted with electric push buttons. Of the other eight cars, six are open 15-bench cars and two closed 28-ft. cars; they are equipped with Westinghouse motors and G. E. K-11 controllers, and have Syra-

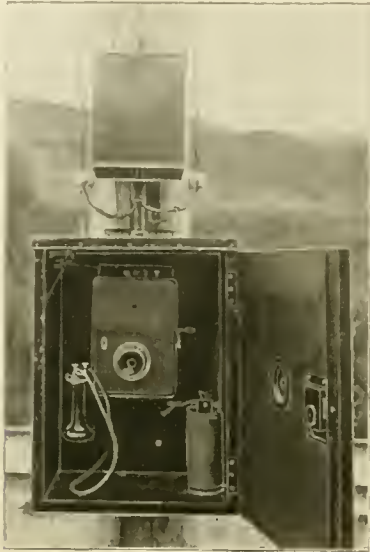


FIG. 7 TELEPHONE ON POLE.

cuse changeable headlights. The cars are painted Pullman green with gold striping and each has the name of one of the towns on the route as well as the number. All cars have a tool box containing pliers, wrench, and trolley wire pickup for use in case of emergency repairs, or picking up broken trolley wire.

After the inspection and opening trip those present enjoyed an elaborate banquet at the Rathbun House, Elmira, as guests of the American Engineering Co.

The people along the line of route have shown their appreciation by their generous patronage, the present equipment being taxed to its utmost capacity since the opening of the road. Figs. 3, 4 and 5 show three of the most picturesque attractions along the route, Montour Falls at the end of Main St., in the village of that name, Watkins Glen, and Havana Glen.

The officers of the Elmira & Seneca Lake Railway Co. are: President, Gen. John E. Mulford, Montour Falls, N. Y.; vice-president, John Blair MacAfee, Philadelphia; secretary and treasurer, C. L. Hathaway, Horseheads; superintendent, C. F. Baldwin, Montour Falls; assistant superintendent, C. I. Furbay, Montour Falls.

The employes of the company are uniformed in cadet gray; conductors' uniforms are trimmed with gold, the motormen's with silver and other employes' with black. All have cap badges with name of occupation and number in enamel.

The fare for the trip from Elmira to Watkins is 35 cents one way; no reduction is made for the round trip.

We are indebted to Mr. D. A. Hegarty, general superintendent of the Railways Company General, of Philadelphia, for this article and the photographs from which the illustrations were made.

FORT WORTH-DALLAS ROAD.

We are advised by Col. J. T. Voss, president and manager of the Glenwood & Polytechnic College Street Railway Co., of Fort Worth, Tex., that the results of a survey made for an interurban line to connect Fort Worth and Dallas are quite satisfactory. From the terminus of the Glenwood & Polytechnic line to the end of the Dallas line at Oak Cliff is 26 miles. The route is tolerably close to the Texas & Pacific R. R. and to the Trinity River. There are no grades of more than 3 per cent and much of the way is almost level. The estimated cost, including provision for 24 cars, is \$425,000. Orders for machinery and cars will have to be



FIG. 8—FIRST CAR OVER THE ELMIRA & SENECA LAKE RY.

There are also four side-dump dirt cars and two center-dump dirt cars for construction purposes, also a hand-pump velocipede car with collapsing ladders for emergency work, as fixing line, etc.

Fig. 8 shows the first car to reach the terminus in Watkins; it carried invited guests, including prominent citizens of the towns along the route and officials of the railway, of the Elmira street railways and of the American Engineering Co.

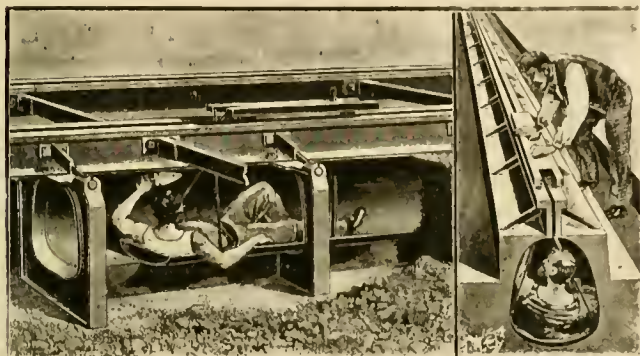
placed at least four months in advance, but it is hoped that rails can be obtained much sooner.

The Consolidated Traction Co., of Pittsburg, makes a report for July showing gross earnings from operation of \$254,973; operating expenses of \$122,873; surplus of \$14,588 after deducting interest and dividends on preferred stock.

CONDUIT CONSTRUCTION IN PARIS.

The French Thomson-Houston Co. which has some important street railway concessions in Paris has recently constructed the roadbed for two underground conduit lines; one is from the Porte d'Asnières to the Ecole Militaire, and the other from the Porte l'Etoile to the Montparnasse Station. A third section will be built from the Montparnasse Station to the Bastille. With the completion of this last section there will be $7\frac{1}{4}$ miles of the conduit line serving the outer boulevards and some 80 cars will be run.

An interesting feature of the construction work is shown in the accompanying illustration which is taken from *La Nature*. The skeleton of the conduit consists of cast iron rings to which the slot



CRADLE AND CAR USED IN CONDUIT CONSTRUCTION.

rails are bolted; these rings are oval in section on the interior, with the major axis of $17\frac{3}{4}$ in. vertical; the minor axis is $13\frac{3}{4}$ in. After a number of the rings are in place sheet steel shields are placed inside and cement concrete poured about them. Manholes are placed at intervals of about 14 ft. After the steel forming sheets have been removed a man is introduced to do the necessary pointing and smoothing of the interior and as the space is quite confined the ingenious device shown in the illustration is used. A steel tray is hung, by cords passing through the slot, to a two-wheeled carriage riding on the slot rails, and the workman having taken his place on the tray is pushed along as he may direct.

ABOUT CRICKETS.

A newspaper story from Mishawaka, Ind., under date of August 18th reads as follows:

"Flying crickets, a species never seen in this locality before, struck the city tonight in myriads, filling the air and making life a burden for humanity. Concerts were discontinued, summer vaudeville performances abandoned, and mercantile establishments were forced to close. Thousands settling upon trolley wires broke the electric current for street cars."

When we asked Mr. J. McM. Smith, general manager of the Indiana Railway Co. which operates the electric line in Mishawaka for confirmation on the foregoing, he replied:

"This is simply another evidence of the fertility of the St. Joseph valley. I know of people who claim to have seen trolley cars stopped by blue monkeys and pink toads and vaudeville performances have been discontinued on account of flying high balls; but the crickets are new to me. I shall place this article in the hands of the society for the prevention of cruelty to bugs and let them work on the cheerful liar."

RUNNING A TRAMWAY.

Mr. R. C. Quin, borough electrical and tramway engineer for Blackpool, Eng., thus classifies the maintenance of an electric tramway system: 1. The maintenance of generating machinery. 2. The maintenance of cables. 3. The maintenance of overhead lines and poles. 4. The maintenance of track. 5. The maintenance of cars and motors. 6. The cleansing of cars. 7. The regulation of traffic. 8. The collection of fares.

The first five of these are within the province of the engineer.

EMPLOYEES' ASSOCIATION AT AUGUSTA, GA.

The employes of the Augusta (Ga.) Railway & Electric Co. on July 21st organized the Augusta Railway Athlete & Benefit Association. At the organization meeting 23 were enrolled, which number was within two weeks increased to 64; membership is limited to the Caucasian race. The officers are: President, J. H. Adams; secretary, J. S. Campbell; treasurer, C. O. Simpson, auditor of the company. The managing board consists of the officers and J. L. Lyen and Joseph Trommerhauser.

On August 10th a meeting of the association was held at which papers were read by Mr. Bagley, a motorman, and J. S. Campbell; both discussed the conductor and his duties. Following the regular business the prize fight bulletins were read. The association has a baseball team, which played a series of games for the benefit of the association on August 20th, 22d and 24th.

EASY MONEY EXPECTED.

The Wall Street Daily News quotes the president of a large Boston bank as follows:

"I do not see anything but easy money ahead, and one of the largest banking interests in New York, for whose judgment I have the highest respect, is of the same opinion. The New York banks are bound to further increase their surplus reserve through the redemption of the continued 2 per cent bonds. The great factor, however, making for easy money is the increased bank circulation. When the Government reduced its tax on circulation, based on the new 2 per cent bonds, $\frac{1}{2}$ per cent, and allowed circulation up to par of the bonds, the conditions making for easy money were at once evident to every student of the situation."

RECOGNITION OF BRILL AT PARIS.

Naturally the attention of all makers and users of manufactured products throughout the world is now directed toward Paris, where close competition upon merit is taking place, and they will be interested in the following announcements:

The Department of Civil Engineering and Transportation of the Paris Exposition has awarded the grand prize for the convertible open and closed car to the J. G. Brill Co., of Philadelphia, also a grand prize for the complete system of electric trucks made by the same company. The J. G. Brill Co. is noted in the United States and abroad for the excellence of its work, so that the awarding of these prizes by the committee of transportation was not unexpected. Such awards, however, again attest the appreciation of the Brill products in foreign fields.

It is interesting to note in this connection that at the International Tramway & Light Railway Exhibition in London, in June last, the Brill convertible car intended for the Leeds Corporation Tramways was considered the most remarkable of the entire exhibit and said to be the most complete convertible car ever made.

PECULIAR ACCIDENT.

Charles Sanders, a motorman on the Waukesha Line of the Milwaukee Electric Railway & Light Co., suffered an odd accident as a result of wearing celluloid. He reached over his front dashboard to throw the switch on, when an electric spark from the controller flashed on his celluloid collar and set it on fire. The inflammable material of which the collar was made blazed up instantly and Sanders' hands were badly burned in his attempts to tear the collar from about his neck. On each side of his face there is a line of burned flesh three inches in width and reaching half way round his throat. The collar had almost been reduced to ashes before he succeeded in getting it from off his neck. The injuries are painful but not considered dangerous. This accident gave rise to a report that the company would forbid the men to wear celluloid collars; Mr. T. E. Mitten, general superintendent, advises that this report is incorrect, however.

The Wilmington (Del.) & New Castle Electric Ry. last month began running cars to a new resort known as Riverside Park, two miles from New Castle.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

The commonly accepted idea is that the efficiency of a steam boiler is seriously affected by an accumulation of scale. Perhaps the most often quoted estimate is that the presence of 1-16 in. of scale causes a loss of 13 per cent of the fuel burned, $\frac{1}{4}$ in. 38 per cent and $\frac{1}{2}$ in. 60 per cent. Recently we have seen published statements tending to show that the loss of efficiency due to scale has been greatly over-estimated.

Prof. R. C. Carpenter, of Cornell University, writing in the *American Electrician*, says that so far as he is able to determine by tests a lime scale, even of great thickness, has no appreciable effect on the efficiency of a boiler. A test which he conducted when the boiler was thickly covered with lime scale showed practically as good results as when it was perfectly clean. The explanation is that the heating capacity is affected principally by the rapidity with which the heated gases will surrender heat, as the water and metal have capacities for absorbing heat more than a hundred times faster than the air will surrender heat. Any deposit which curtails slightly the capacity of absorbing heat on the water side has very little effect either on total capacity or efficiency. A thin film of grease, however, being impermeable to water, keeps the latter from the metal and generally produces disastrous results.

Mr. Walter M. McFarland, formerly an engineer officer in the United States Navy, in the course of a lecture at Sibley College, Cornell University, stated his experience had been that a considerable thickness of clean uniform scale made apparently little difference in the efficiency of the boiler. On the U. S. S. *Vandalia* there were two boilers used for distilling water, and the water evaporated per pound of coal was no more when the boilers were clean than after three months when the scale was nearly $\frac{1}{4}$ in. thick.

On the other hand, there are recent tests showing that scale does reduce the efficiency. In May and June, 1898, Prof. L. P. Breckenridge, of the University of Illinois, made tests on a locomotive boiler before and after cleaning it of scale and found that the loss due to the scale was 9.55 per cent. The average thickness of this scale was 3-64 in.; analyses of samples taken from different points in the boiler showed from 20 to 67 per cent calcium carbonate and from 4 to 40 per cent calcium sulphate.

Also, copies of reports of tests sent us by the Union Boiler Tube Cleaner Co., of Pittsburg, show that there is a marked increase in the efficiency of the boilers after the scale has been removed. In one case the gain was 16.3 per cent and in another 24.8 per cent; the thickness of the scale was not stated.

In the eighth edition of "Helios," published by the Heine Safety Boiler Co., is an illustration of a boiler sheet that has been bagged by the use of oil in the boiler. The pocket formed was 4 ft. lengthwise of the boiler, 3 ft. girtwise and 9 in. deep. The boiler was nearly new and of good mild steel, as was shown by the 5-16-in. sheet stretching into the pocket which at the apex was only $\frac{1}{8}$ in. thick without any indication of fracture.

The inspector who examined the boiler said concerning it: "I found the boiler had been cleaned from preceding Sunday, and at that time a gallon or more of black oil had been thrown into it. Monday morning the boiler was fired up and was run through the day at a pressure of 90 lb. per sq. in. As six o'clock Monday night the engine was stopped, the drafts were closed, and no more firing was done until nine o'clock. Upon going to fire up at this time, the bulge was observed. From six to nine o'clock a pressure of only 40 lb. was carried. Upon examination I found the entire boiler saturated with this oil."

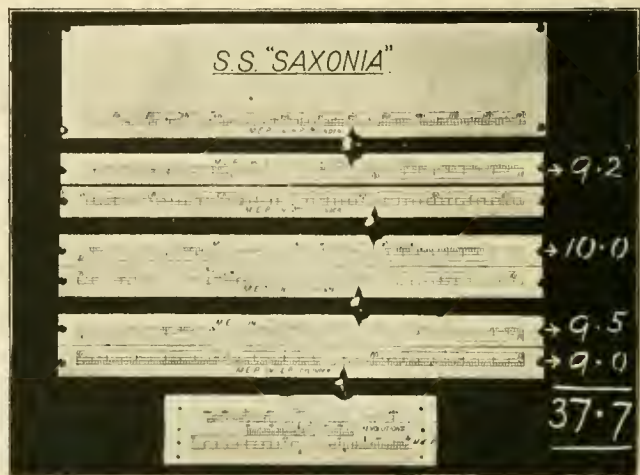
The action of grease or animal oil in a boiler is to form itself into drops which are carried about with the circulating water. After boiling for some time these drops become sticky and adhere to the metal of the boiler when they come in contact with it. Only a very

thin coating of grease is necessary to keep the water away from the heating surface with the result of bagging plates and leaking seams.

A mineral oil such as petroleum does not have this effect. Petroleum is extensively used to soften scale, but it is claimed that all volatile oils will corrode the boiler, engine and piping, with which they come in contact.

RECORDING STEAM ENGINE PERFORMANCE.

In our issue for February, 1900, page 72, we published an abstract of a paper by Prof. William Ripper, head of the technical department and professor of engineering at the University College, Sheffield, Eng., describing a continuous mean pressure indicator for steam engines invented by him. This indicator consists of an arrangement of valves and gages connected so that the pressure from the steam end of the cylinder acts on one gage and the pressure from the exhaust end of the cylinder acts on the other. By two throttling cocks the range of movement of the pointers on the gages is reduced to a small amount, without affecting, however, the accuracy of the indication. Thus the difference between the readings of the two gages is the mean effective pressure on the piston measured on a time basis. The ordinary indicator gives the mean pressure on a distance basis but Professor Ripper found that a constant correction factor would in most cases bring the mean pres-



POWER BOARD OF "SAXONIA."

sure as shown on his recording gage into substantial agreement with the indicator.

Professor Ripper has further developed his method and in the current number of the *Engineering Magazine* describes the practical application of the instruments in the engine room of the steamship *Saxonia*. This ship has quadruple expansion engines and each cylinder has a pressure instrument attached. For reducing the several mean pressures to the equivalent mean pressure on the low pressure cylinder several scales are arranged on what is called a "power board" with grooves and sliding buttons, each having two pointers, so that when set with one pointer at the mean effective pressure as indicated by the instrument, the other pointer marks on a parallel scale the equivalent pressure on the low pressure piston. Thus the distribution of work among the several cylinders of the engine can be noted at a glance. On the same board

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION	MONTH, 1900.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lb. Water per Lb. Coal.	Lb. Fuel per k.w.h.	Price of Fuel per Ton of 2,000 Lb.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	May.	2,054,368	.337	.131	.037	.028	.037	.570	2.79	.993	11.3	2.36	\$2.86	Bituminous
1.....	June.	1,901,552	.340	.145	.032	.028	.037	.582	3.43	1.09	11.2	2.43	2.80	"
5 Metropolitan Elevated, Chicago....	May.	1,276,496	.499	.212	.022	.021	.034	.788	3.20	1.80	6.05	5.16	1.93	"
5	June.	1,171,353	.406	.221	.024	.024	.037	.712	3.60	1.82	6.53	4.54	1.79	"

is also mounted a slide rule for quickly computing the indicated horse power.

Professor Ripper also states that as in all throttling engines and in the low pressure cylinders of practically all types of condensing engines the mean pressure on the driving side of the piston is found to be directly proportional to the terminal pressure in the low pressure cylinder, and as the steam used per stroke (neglecting cylinder condensation) is proportional to the terminal pressure, the reading of the mean forward pressure gage on the low pressure cylinder is a very useful approximate indication of the weight of water used per stroke.

Concerning the limitations of the method it is said that all instruments should be standardized by comparison with an ordinary steam engine indicator at light, medium and heavy loads. For mill engines no correction is necessary for the low pressure cylinder, but in the high pressure cylinder when there is a good compression the readings are 5 per cent high at .2 cut-off, varying to 2½ per cent low at .7 cut-off.

On locomotive engines and compound non-condensing engines, which types have a large compression, it is necessary to standardize the instrument for light loads.

and can be taken to pieces and overhauled. Unexpected and rapid overloads must be able to be supported by the traction plant, which is not generally the case in lighting. In a traction station it will be seen that a far greater figure is cut by the cost of generation pure and simple than in a lighting station, and that the question of interest on capital expenditure and sinking fund is relatively smaller in the former than in the latter. The following figures, which are the result of actual experience, may be of interest, and show the influence of continuous running on the cost of production:

	Cost in pence per Board of Trade unit.			
	Lighting.		Traction.	
	d.	d.	d.	d.
Fuel	0.3	to 2.2	0.09	to 0.5
Oil, waste and stores.....	0.05	to 0.38	0.005	to 0.2
Wages and salaries.....	0.28	to 1.60	0.03	to 0.4
Maintenance	0.054	to 0.6	0.0025	to 0.06
Total	0.684	to 4.78	0.1275	to 1.16

SOME GENERAL CONDITIONS GOVERNING POWER STATION DESIGN.

From a paper by Philip Dawson read before the Light Railway and Tramway Conference, London.

Where a lighting station is already in operation it is not desirable to combine with it a traction plant, but if a new station is to be built, and is designed by experienced traction engineers for combined traction and lighting, good results may be expected. It may be of interest to consider what are the differences between a station designed for lighting and one designed for traction and power transmission. The average number of hours per annum during which a lighting station will be running full load will probably never be equivalent to more than three months' continuous running per annum, that is to say, taking the Board of Trade units (kilowatt-hours) generated in one year and seeing how long the plant under consideration would have to run its full capacity continuously to generate this amount, this time would probably never exceed three months. Taking a representative traction station, the time of continuous running would probably be at least nine, and in some cases ten and even eleven months. A lighting plant must in three months earn enough money to pay working expenses and to pay interest and allow for depreciation and sinking fund for a whole year, whereas a traction plant has nine to eleven months in which to do the same thing. A lighting plant is on an average practically at a standstill 18 hours a day, while a traction plant is running 18 to 20 hours a day. Economical boilers, engines, and electrical generating and transmission devices are therefore far more important in a traction than a lighting plant, because it is well known that running at very light loads and keeping the fires banked and the boilers, steam pipes, engines, etc., hot, uses very nearly as much fuel as running at full load. Furthermore, whereas in a lighting plant there is ample time to overhaul the plant and execute necessary repairs, the men during the day have little or nothing to do and can easily do this work, in a traction plant there is little or no time to do this. The conditions are quite as, if not more, arduous than on a ship. There at least every few days or few weeks the whole plant is shut down for several days,

The difference which exists between a plant working practically continuously and only intermittently is at once seen in the average amount of coal consumed per unit generated. The type of engine used must, however, also be taken into consideration. Thus, taking the published results of British electric light plants, we find that the cost of coal per unit generated varies approximately between 0.3d. and 2.2d. Comparing this with traction plants, we find the cost of coal varying between 0.09d. and 0.50d. per unit generated. Again, considering the item of wages and salaries in a lighting station, we have 0.3d. to 1.6d.; in the case of traction this is 0.03d. to 0.40d. per unit. Comparing the total cost of production of one Board of Trade unit generated in a lighting station and in a traction station, interest and sinking fund excluded, in the former the unit varies from 1.00d. to 4.00d. as compared with 0.25d. to 1.00d. for traction purposes. The cost of power when generated for traction and power purposes is one-quarter of that when generated for lighting only. The amount to be added for interest and sinking fund of course depends on the length of the concession, on the terms of final purchase, and on the life of the machinery employed. The cost of producing power varies with the amount to be produced, decreasing as the amount increases. This shows the advisability of concentrating as much power as possible in one station, and reducing the number of units. In considering the various items which go to make a complete power or traction installation, including the system of feeders, distributors, track and overhead line, the cost of the power station is but a comparatively small item. The saving which can be effected by a properly designed station is very great, and a little extra capital expenditure is in many cases well justified. The total cost of running an electric tramway or railway varies between 2.50d. and 8.00d. per car-mile, according to circumstances: the electrical energy at the power station required varying from 0.49 units to 1.4 units per car-mile, according to the profile of the line and the weight and speed of the cars. The cost of power varies between 10 and 30 per cent of the total working expenses, all charges included, and if it can be reduced by 3½d. to 1d. per unit, or we may say per car-mile, as one unit at the switchboard is a fair estimate of the average power requisite at the switchboard per car mile, it is well worth doing. In the early days, before polyphase high-tension currents were known, the situation of the central station was practically imposed, very little latitude being possible owing to the maximum

distance of economical transmission being limited. Electricity works being most required in crowded centers, it was not only difficult to obtain a site at all, but the cost of the ground was very great, hence the necessity of crowding the greatest amount of power into the smallest possible space. The plants being mostly used for lighting, and only running a few hours each day, highly economical engines and boilers and labor-saving appliances were of but little advantage. At present, circumstances have altered; electricity can economically be transmitted to any distance, and is utilized—and will be more and more so every day—first for power purposes, and secondly for lighting purposes. The initial cost of a plant may be roughly divided into four parts—land and buildings, plant, including machinery in station, mains, feeders and distributors, miscellaneous, which includes such things as meters, instruments, cost of Provisional Order, and such like. According to Mr. Emile Garcke's figures in the "Manual of Electrical Undertakings," the average cost of existing British plants expressed in percentage of total capital expenditure is approximately as follows:

	Per cent.
Land and buildings.....	19 to 23
Machinery and plant.....	35 to 37
Various remaining items.....	4 to 14

As regards the first item, the above average includes several old lighting stations, and there is little doubt that if a new plant were installed the cost of land could be materially reduced. The question of system of generation, whether in several large stations generating continuous current or in one large station generating either continuous or polyphase current, is of great moment. As stated previously, in a traction station much greater capital expenditure is justified, and coal handling appliances can be installed which enable one or two men to look after the largest boiler room. Automatic lubricating systems and ash conveyors, etc., enable one or two men to be sufficient in the largest engine room. It will be evident that the item wages and salaries will be far greater in several than in one station. The waste of coal, etc., also will be far greater. From a careful study it is nearly certain that for anything above 5,000 kw. capacity, one polyphase station, operating rotary converter sub-stations is the best. Large units are also always advisable. It interests me to see that the sizes of units which I recommended several years ago are generally being adopted. For reference it may perhaps be advisable to append this table:

SIZES OF ENGINES RECOMMENDED FOR USE IN POWER STATIONS.

Maximum power required.		Number of engines.		Power of each engine.
L.H.P.				L.H.P.
200	....	2	....	200
400	....	3	....	200
600	....	3	....	300
1,000	....	3	....	500
1,500	....	4	....	500
2,000	....	4	....	750
5,000	....	6	....	1,000
10,000	....	6	....	2,000
20,000	....	6	....	4,000
40,000	....	9	....	5,000
60,000	....	11	....	6,000
90,000	....	10	....	10,000

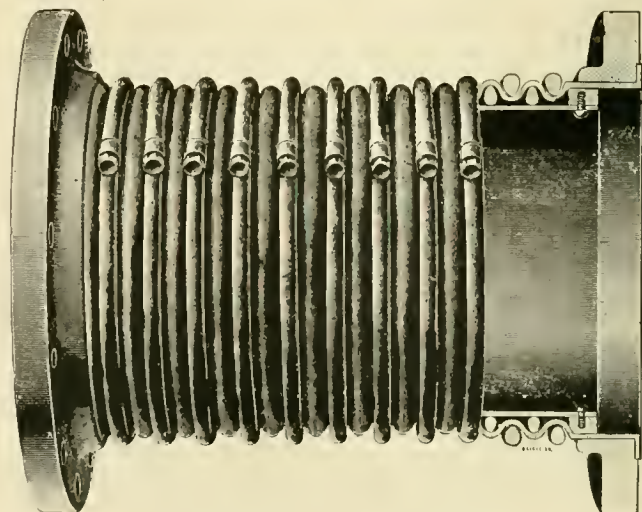
All engine builders who have had experience in tramway work now make an entirely different kind of engine for traction from that which they supply for lighting stations. The conditions under which a tramway engine works are, if anything, more onerous than those of a rolling mill engine. A slight variation, either in number of revolutions per minute or in angular velocity per revolution, is of the greatest importance in a traction station, whereas it is of small importance in a rolling mill. A uniform speed is especially important where compound wound generators are run in parallel direct on to the line. If the momentary difference in speed between two engines exceeds very narrow limits, the voltages of the machines differ, and cause very heavy currents in the equalizing bars, and largely increased core losses, hence great waste. If the difference becomes too great, one of the generators may even be reversed. Where multiphase machines run in parallel, constant speed is of even greater importance to keep the machines in step. In cases where shunt wound generators with heavy batteries of accumulators run in parallel on the line, the question of engine regulation is not so important. A traction

station where compound wound dynamos are used should be so arranged that if the normal load be suddenly thrown on or off an engine, the speed shall not vary more than 2 per cent either way. In some cases a maximum variation of 1½ and 1¼ per cent is all that is allowed. Where polyphase currents are used, constant speed is of even greater importance, and a guarantee should be required that under no circumstances shall the angular velocity during one revolution vary more than 1 per cent, and in some cases not more than half of 1 per cent. With heavy fly-wheels and governors properly designed for tramway work, it is quite practicable to fulfill the above conditions. Or, expressed in a different way, in polyphase work the engine should not produce by variation of angular velocity a phase displacement of more than 5 degrees per half-cycle. From careful comparison of many existing systems it may be taken that the total cost of power, all fixed charges included, for one large station as compared with that for two or more smaller stations together equal in power to the larger one is from 30 to 75 per cent lower.

WAINWRIGHT EXPANSION JOINTS.

Expansion joints may be divided into two classes. One class comprises all joints which have bearing or rubbing surfaces which slide one upon the other; this class includes ordinary slip joints, all forms of ball and socket joints, finished slip joints with steam engine stuffing-box fit, and balanced joints. In the other class are the expansion joints which depend upon the bending of metal for their action, and in this class are copper bends and various forms of the Wainwright expansion joint.

The construction of the Wainwright joint is very well shown in the illustration. There are two heavy end flanges to which are fastened the flanged ends of a corrugated tube of soft copper. Inside of the corrugated tube is a straight tube of hard copper fastened to brass rings at its ends, and on this are carried the inside equalizing rings which are of cast iron. Outside the corrugated tube are other rings, made of cast iron on large joints and brass on the smaller sizes. The Wainwright joint depends for its action on the bending of the copper in the corrugations and the equalizing rings ensure



WAINWRIGHT EXPANSION JOINT.

that no one corrugation shall do more than its share of the bending, so that when once properly installed the joint will last a long time. It requires absolutely no attention when once put in position.

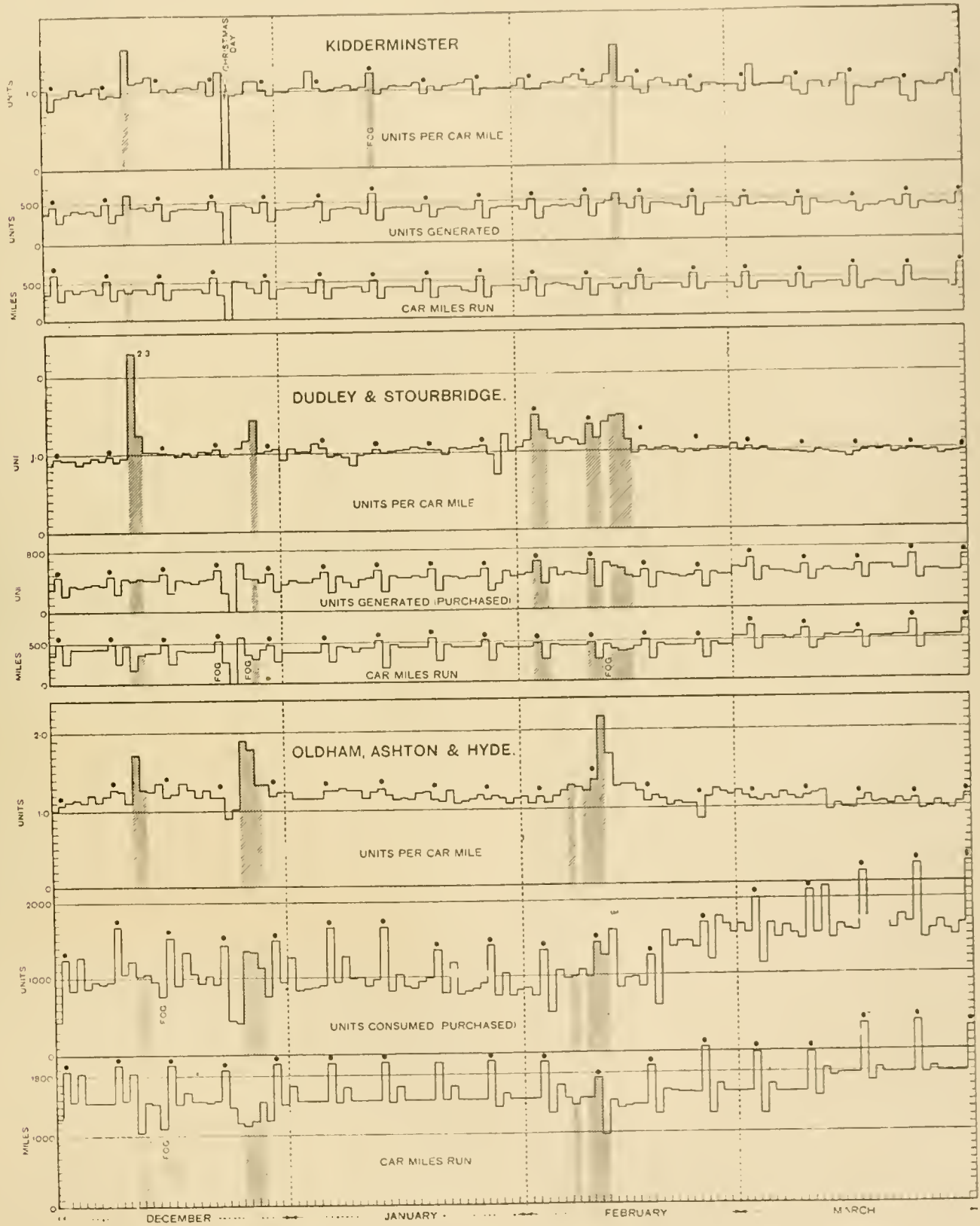
Each corrugation will provide for 3-16 in. motion, or ¼ in. under favorable circumstances if occasion require. The regular sizes vary from 12 to 30 in. in length and arc for pipes from 1½ to 16 in. in diameter; one joint will take care of the expansion in 100 ft. of steam pipe under ordinary variations of temperature.

Mr. Wm. R. Billings, treasurer of the Taunton Locomotive Manufacturing Co., Taunton, Mass., to whom we are indebted for the data, writes us that the business in these joints has increased very rapidly since the improvements found in the equalizing rings and slip tube were applied. The largest joints the company has ever made of this pattern are of a nominal diameter of 30 in., and were made from 32-in. seamless drawn copper tubes, for use in the power station of the Metropolitan Street Railway Co., of New York City.

SOME ENGLISH POWER RECORDS.

We have received from the British Electric Traction Co. the accompanying diagram showing the Board of Trade units, or kilowatt-hours, generated, the car miles run and the kilowatt hours per

The effect of the Saturday half-holiday in increasing traffic is very marked on the Oldham, Ashton & Hyde line; on the others the fact that the service is so fully occupied during the week is believed to make the relative increase on Saturdays small. The effect of snow in increasing the current consumption per car mile is two



POWER HOUSE DIAGRAMS FROM THREE ENGLISH RAILWAYS.

car-mile for each day from Dec. 1, 1899, to Mar. 31, 1900, on three of the electric railways operated by that company. The total units generated includes the current used about the power house and the car-mileage is the paying mileage only. Snow days are indicated by the oblique shading, foggy days by the word "Fog" and Saturdays by black dots.

fold, the resistance offered to the cars is greater and the mileage of snow plows not being counted further increases the current per paying car. Fog also increases the current consumption probably because of the cautious operation necessary. The low average for the Kidderminster line is believed to be due to it having fewer curves and easier grades than the others.

Electric Traction on Main Railways.

A Portion of the Report Made to the International Tramway Congress at Paris in 1900.

By N. H. HEFT.

Col. N. H. Heft is well known to American street railway men by virtue of the work he has done as chief of the electrical department of the New York, New Haven & Hartford, R. R., and as president of the Meriden Electric Railroad Co., of Meriden, Conn., and no one is better qualified than he to prepare a report on the subject assigned to him. His subject was "Electric Traction: A. On Main Railways. B. On Light Railways." At this time we give only the first portion of the report. Our readers will of course recognize the term light railway as synonymous with street or interurban railway.

Experiments with electric traction on main lines of steam railroads in the United States were begun in the early part of the year 1895. The managers of steam railroads were forced to take up these experiments on their systems, owing to the great inroads made in their passenger receipts, due to competition of the light electric railways, which, in some localities, amounted to 80 per cent. These light railways brought a new factor into the transportation problem, and one with which the steam railroad managers were wholly inexperienced.

With their tracks laid in the public streets of cities and extending to suburban and even interurban districts over public highways and private right of way, and, owing to their close proximity to homes and places of business, with frequent service and cheap fares, they had demonstrated that such a system of transportation was much more attractive to the traveling public than the one furnished by the steam railroads, and not only seriously affected the regular passenger business of the steam railroads, but created a pleasure traffic wholly their own. This convinced the steam railroad managers that they must turn to electric traction in order to retain their passenger traffic, and compete with the light railways. A second method of dealing with this new factor has been to purchase the control of certain light railways which were likely to form part of an extensive parallel line. This has been done by several steam railroad companies.

Charles P. Clark, president of the New York, New Haven & Hartford Railroad Co., was fully convinced, as early as 1891, as shown by his report of that year to the stockholders, that the only effective way of checking this competition was to equip the lines affected with electric traction. He advocated equipping a branch line, to demonstrate what could be done with electric traction on a standard steam railroad, with a standard steam railroad equipment, operated under standard steam railroad rules. This makes him the pioneer in electric traction as applied to steam railroads.

The New Haven system differs from every other important railroad property in this country, (a) in the immense volume of its passenger traffic, (b) in the large percentage of passenger revenue to total revenue, (c) in the large percentage of local revenue to total passenger revenue, (d) in the density of population in the territory served by its lines and (e) in the small area of that territory as compared with the mileage of the system. The company carried nearly 61,000,000 passengers in the year ending June 30, 1898, and the revenue amounted to over \$17,000,000 from its passenger department, equivalent to over 51 per cent of the revenue from all sources. The system provides regular transportation facilities for about 6,000,000 people, and the density of population in Massachusetts, Rhode Island and Connecticut, in which nearly all its mileage is located, is 260 inhabitants per square mile—greater than that of any other state or section in this country. In spite of the fact that it controls nearly 3,000 miles of track, the system, from New York to Boston, can be travelled in five hours.

Within its territory are found the two great cities of New York and Boston, with rich suburban residential areas tributary to their business centers, five other important cities with suburbs, and no less than 65 independent cities and towns of greater or less importance for manufacturing or residential reasons.

Owing to the close proximity of the cities and towns in its territory, the New Haven system had been seriously affected by this competition. The gravity of the situation was such that, in November, 1894, the management of the New Haven road authorized the introduction of electric traction on the Nantasket Beach branch, the first installation of electric traction on a standard steam railroad. This was completed May 20, 1895.

At this time the Pennsylvania Railroad Co. felt the effects of similar competition, and, in 1895, authorized Pres. George B. Rob-

erts to introduce electric traction on the Bordentown and Mt. Holly Branch of its Amboy Division. This installation was completed in July of the same year.

In the same year the Baltimore & Ohio Railroad Co. had completed its tunnel under the city of Baltimore, and, in order to avoid the objectionable smoke and gases inseparable from service with steam locomotives, it decided to introduce electric traction on its belt and tunnel lines in the city of Baltimore.

In considering the application of electric traction to main lines, railway managers are confronted with the following questions, to which your reporter appends answers, based on the experience of various roads on which electric traction has been introduced:

1. Can electricity be substituted for steam as a motive power on main lines of steam railroads?

Yes. But the value of electric traction on main line steam railroads is wholly dependent on the style of equipment, manner operated, location of power station, method of power distribution and train service, and distribution of population in territory covered.

2. Can a main line so equipped be operated under the same rules as govern on standard steam roads?

Yes. The New York, New Haven & Hartford is operating by electric traction 6.95 miles of double track, overhead trolley, from Nantasket Junction to Pemberton, 11.51 miles of double track third rail from Braintree to Cohasset, 3 miles of double track third rail from Berlin to New Britain, 18.6 miles of single track third rail from Hartford to Bristol and 8 miles of single track, overhead trolley, from Stamford to New Canaan.

The Pennsylvania Railroad Co. is operating 8 miles of double track, overhead trolley, from Bordentown to Mt. Holly.

The Baltimore & Ohio Railroad Co. is operating 4 miles of double track, overhead trolley, in the city of Baltimore.

All the lines named above are operated under the same rules as govern the operation of steam trains on the other portions of the systems.

a. Schedule speed has been maintained during times of heavy travel and frequent service.

b. Train service has been reliable, and to a certain extent trains have been able to make up time.

3. Can same weight of train be operated?

Yes. Trains of the same weight have been operated by the three following methods:

a. By using specially designed locomotives, as is done by the Baltimore & Ohio. This method has the disadvantages of great concentration of weight on roadway, and low efficiency when operating light trains. Where the service is infrequent or largely of freight, or where it covers a section of main trunk line through service, such as that on the Baltimore & Ohio R. R., then this equipment is the most desirable.

b. By equipping standard passenger coaches with motors on one or both trucks and using these cars as locomotives to haul passenger trains. This style of equipment is used on the Highland, Hartford and Plymouth Divisions, and New Canaan branch of the New York, New Haven & Hartford; also on the Bordentown and Mount Holly branch, Amboy Division of the Pennsylvania. Where the service is frequent and light, schedule speed moderate, and station intervals sufficient to allow trains to reach full acceleration, it has been demonstrated that this service can be operated satisfactorily. The simplicity and low first cost makes this equipment desirable for this service.

c. By equipping all or part of the coaches with motors mounted on motor trucks, and operating them in trains controlled from the first, or any of the motor cars, as is done on the South Side Elevated R. R., of Chicago. Where the conditions of operation require the maintenance of high schedule speed with frequent stops,

the problem resolves itself into one of acceleration and braking. These conditions are found mostly on the elevated railways of our large cities.

4. Can existing train schedules be maintained?

Yes. The service operated by electric motors on the Nantasket Beach Branch of the New York, New Haven & Hartford during the summer of 1897, was the fastest ever operated over this branch, and one that could not have been operated with steam locomotives, as was frequently demonstrated during that year. This service is shown by the following official schedule.

	Distance.	Sta- tions.	Schedule time.	Average speed.
Steam, 1894 . .	6.95 miles.	10	25 to 35 minutes.	16.7 to 11 m.p.h.
Electric, 1897. .	6.95 —	16	21 —	19.8 m. p. h.

5. Can stations be added without loss of schedule speed? Yes.
6. Can a train of a given weight be accelerated more rapidly?

Yes. Owing to the steady torque of electric motors, at least 15 per cent of the weight on drivers is available for starting effort.

The tests of the Baltimore & Ohio electric locomotives, which weigh 96 tons each, have shown a draw bar pull of 60,000 lb. on a dry rail, corresponding to a traction coefficient of over 30 per cent. Tests on a steam freight locomotive with 146,000 lb. on drivers show a maximum draw bar pull of 30,000 lb., corresponding to a traction coefficient of 20 per cent or two thirds of that developed by the electric locomotives.

A standard combination coach on the Plymouth Division of the New York, New Haven & Hartford, equipped with four motors of 175 h. p. each, aggregating 700 h. p. and weighing complete 50 tons, developed 12,000 lb. with an over load on the motors of only 25 per cent. Allowing a starting effort of 300 lb. per ton weight of train, such a car could accelerate to a speed of 30 miles per hour in 10 seconds, or allowing 90 lb. per ton weight of train, could accelerate a train of 130 tons to a speed of 30 miles per hour in 30 seconds.

A train of individual coaches each completely equipped with motors on all axles, operated from one control, would give the maximum acceleration possible, i. e., that of a single unit with all its weight on the drivers.

7. Can an effective system of brakes be applied?

Yes. The Pennsylvania Railroad Co. uses the full Westinghouse air brake equipment; the Baltimore & Ohio Railroad Co. uses the Westinghouse; the New York, New Haven & Hartford Railroad Co. uses the Westinghouse and the Christensen brake with satisfactory results.

8. How will the electric air compressor compare in reliability and economy with the steam air compressor?

The Westinghouse, General Electric Company and Christensen air compressor have all proved reliable and fully as economical. The compressor, when using motors under car bodies, is placed on the platform of the open, in the baggage compartment of the combination and suspended under the closed coach, thereby allowing the motor car to be operated either as a single car or as a locomotive for drawing trains.

9. Can trains be provided with equally satisfactory train signals?

Yes. Whistles of the same power are blown from the air-braking reservoirs, and have proved satisfactory. Locomotive bells or heavy gongs are placed on cars and run either by foot or hand-power.

10. Can motor cars be equipped with pilots and headlights, complying with the statutory rules and regulations governing railroads?

Yes. The pilots can be attached to truck or coach body. Both electric and oil headlights are used, and are satisfactory. The New York, New Haven & Hartford uses oil in place of electric lights, owing to the loss of current when passing over grade crossings, where the third rail conductor is cut out.

11. Can trains be operated over third rail during snow and ice storms?

Yes. The operation of the third rail section of the Highland Division of the New York, New Haven & Hartford during the last two winters has proved that passenger coaches equipped as electric locomotives, with nose plows and brushes, can handle snow as efficiently as steam locomotives with plows. The third rail is kept clear of snow by steel brushes mounted on the trucks ahead of the contact shoes. Ice, which gathers on the third rail during sleet storms, has proved more difficult to handle. Experience on this same division has shown that the use of a zero oil sprinkled on the

third rail from the trams, prevents the ice from freezing to the rail, so that it can be removed by the stiff steel brushes.

12. How will cost of operation be affected by more frequent service of lighter trams?

The service on the Highland Division of the New York, New Haven & Hartford is frequent, with light trams, while the service on the Berlin Branch is not so frequent and with heavier trams. A fair answer to this question will be a comparison of the train miles run on each Branch and the cost per train mile.

Daily train miles, Berlin Branch = 66.

Daily train miles, Highland Division = 737

Cost per train mile, Berlin Branch = 30.0 cent.

Cost per train mile, Highland Division = 12.5 cents.

13. How will cost of operation be affected by the form of power transmission? a. By overhead or underground trolley? b. By simple or sectional third rail? c. By direct or alternating current? d. By static or rotary transformers? e. By direct or alternating current motors?

The local conditions govern the form of power transmission.

a. The overhead trolley form has proved to cost more to install and maintain than the simple third rail, and to be less economical to operate. The first cost of the underground trolley and the difficulties encountered in drawing make its use prohibitive on main railways.

b. As the simple third rail, charged throughout its length, has been the only form in use on main lines, no data as to the economy of the sectional or safety third rail can be obtained.

c. On main railways, where the distribution of power does not exceed a distance of ten to fifteen miles, the direct current has proved economical. In lines where power must be transmitted over a greater distance than 10 to 15 miles, the alternating current should be used.

d. When alternating current motors can be designed to give a satisfactory starting torque, then alternating currents may be transmitted from the central stations through static transformers direct to the motors. At present transmission with alternating currents requires the use of rotary converters for conversion to direct current when delivered to the working conductors.

e. When the development of the alternating current motor shall enable it to compete with the direct current, then there will certainly be a large saving for transmission over long distances, and the equipping of main trunk lines will follow.

14. How will cost of motive power per train mile with motor cars compare with steam locomotives?

A comparison of the figures obtained from the operation of the several power stations, and from the performance sheets of steam locomotives of the New York, New Haven & Hartford shows the cost of motive power per train mile to be as follows: Steam locomotives equals \$0.10 to \$0.24. Highland Division equals \$0.064. Nantasket Beach Branch equals \$0.1441. New Canaan Branch equals \$0.0783. Berlin Branch equals \$0.1406.

The cost of electric motive power, shown above, includes the operation and maintenance of power stations, the maintenance of motors and other equipment on the cars, oil, grease and waste used on the cars, and the wages of the motormen who operate the cars. The cost of steam motive power includes fuel, oil and waste, maintenance of locomotives and the wages paid the men who operate the locomotives.

15. How will cost of operation per train mile with motor cars compare with steam locomotives?

The total cost of operation per train mile with electric motor cars (excluding interest and depreciation), on the New York, New Haven & Hartford is as follows. Berlin Branch equals \$0.3032. Highland Division equals \$0.1255. Nantasket Beach Branch equals \$0.2925. New Canaan Branch equals \$0.1754. Figures for operation with steam cannot be obtained.

16. How will cost of tram labor compare?

Cost of tram labor per train mile as shown from operation with electric traction on lines of the New York, New Haven & Hartford is as follows: Berlin Branch equals .18. Highland Division equals .027. Nantasket Beach Branch equals .0829. New Canaan Branch equals .063. With steam, per train mile, about .12

17. Can trains be shifted at stations and yards as quickly?

Yes. When operated by third rail, motor cars can be run around train without turntable or other delay. When operated by overhead

trolley a slight delay is caused by the necessary shifting of the trolley.

18. Can trams be run over frogs and through yards at same speed?

Yes, when operated with third rail system. With overhead trolley system, provided the trolley is looked after and kept on the wire when passing through overhead frogs.

18. Can coaches be economically heated, and how would cost compare?

No. Experience has shown in the New England States, during the average winter weather, that a coach 60 ft. in length will require from 6 to 12 kilowatts, and figured at the rate of one cent per kilowatt-hour, costs from 6 to 12 cents per hour. With the temperature at zero, the cost would be 18 cents per hour. From the best data received, the cost of heating the same coach with steam from locomotive in ordinary weather would be 2 cents per hour; zero weather, 3 cents per hour.

19. Can coaches be satisfactorily lighted, and how would cost compare with oil or gas?

Yes. The New York, New Haven & Hartford places 30 lamps of 16 candle power in a 60-ft. coach. These lamps would consume 1,500 watt-hours. At one cent per kilowatt hour the cost would be 1½ cent per hour, and, taking into consideration the cost of necessary attention, with oil or gas, would be fully as economical and more desirable.

20. Will the use of electric traction increase or decrease wear on tracks per train-mile run.

With electric locomotives or motor cars of equal weight, the wear on service rails would be less, due partly to the rotary application of the power, and partly to the fact that with the electric motors no dead weight need be carried outside of weight on driving wheels necessary for traction.

21. How will passenger receipts be affected by more frequent service of lighter trains?

The receipts will be increased, as shown by a comparison of the number of passengers carried by the New York, New Haven & Hartford on the Nantasket Beach, Highland, Berlin and New Canaan Branches, with steam trains, and electric trains with more frequent service.

	Steam.	Electric.
Nantasket Beach	304,292	702,419
Highland Division	387,695	1,060,617
Berlin Branch	267,936	241,207
New Canaan Branch	98,302	184,728

22. What kind of coach will be most satisfactory to the traveling public?

The local conditions govern as to the most desirable coach.

For summer travel the open car is most desirable, provided speed does not exceed 20 miles per hour.

For spring, fall and winter travel the closed coach with cross seats, center aisle, toilet room and water coolers.

On lines traversing the sea shore the open coach is most desirable. The ideal coach is one that can be changed at will from an open to a closed coach. To meet the views of President Clark, who has long been a believer in the use of coaches of less weight for suburban and branch lines, and of such a design as would make the same available for both summer and winter service, the New York, New Haven & Hartford has designed such a coach for service on its Providence, Warren & Bristol Branch, now being equipped for electric traction.

23. Maximum speed at which to run open cars?

Not to exceed a train schedule of 14 to 15 miles, including stops, with a maximum speed of 20 miles per hour between stations.

24. Will electric traction on main lines between towns and cities, with frequent service, higher speed, and equal fare, be more attractive than the light railways which parallel the steam lines, cover the same terminals, take up and leave passengers at their own doors, but consume more time?

Yes. Experience on two main steam railroads shows that after the substitution of electric traction, they have not only regained the lost travel, but have made monthly gains during the last two years; showing that the passenger will travel by the shortest route, even when other conditions are not equal.

25. What is the maximum distance that power can be transmitted economically by direct current?

Ten to 15 miles under ordinary conditions on main lines.

26. What is the maximum voltage allowable in the working conductor when using direct current?

Experience with third rail systems has demonstrated that 700 volts can be maintained on the working conductor without giving trouble. With voltage exceeding 700, arcs and short circuits are hard to prevent. Owing to difficulties of motor insulation and commutation with voltages much higher than 700, the same limit may be taken for all forms of working conductors.

27. Can freight trains be operated?

Yes. The Baltimore & Ohio Railroad operates all passenger and freight trains passing east and west through the city of Baltimore over the main trunk line, and your reporter is advised that the service operated is satisfactory from every standpoint.

The Erie Railroad Co. leased its branch line between Buffalo and Lockport to the Buffalo & Niagara Falls Electric Railway Co., which has been operating a freight service with special electric locomotives. The management reports that this service is operated, in connection with passenger, mail and express, most satisfactorily.

There are several other railways operating a freight service with equal success.

Trains of 15 to 20 cars, each loaded with 30,000 pounds of freight, are operated on the Buffalo & Lockport line.

28. What should be the location and equipment of motor car house?

The motor car houses should be located at the most central point, preferably close to the power station; this will allow the use of either steam or electricity for power required in the maintenance of motors and cars. The design should provide for the repair shop being placed under house tracks, provided with power hoists, so arranged that motor cars can be run over them. Power jacks should be provided to lift coach body from trucks, to permit cable and brakes to be quickly disconnected and allow the dropping of the trucks into the repair room below. The motors and trucks being interchangeable, this arrangement allows the replacing of motors or trucks with a minimum loss of time. The repair shop should be provided with tools for making repairs only, it having been found to be in the line of economy to purchase repair parts from the manufacturers.

29. Are motors satisfactory?

Experience in the use of heavy railway motors is limited to the past five years, and there are but few distinct types. The first motors followed the light railway practice by the adoption of four poles instead of two. These motors were so wound as to produce two salient and two consequent poles. The motor frame completely enclosed the armature, and no provision was made for ventilation. The bearings were insufficient in size, the journal brasses or linings were badly designed, and the methods of lubrication were crude. The air gap, or distance between the armature and the pole faces, was so small that a slight wear on the armature-bearing brasses was sufficient to allow the former to drop down and come in contact with the lower pole face, which immediately disabled the motor by burning out the armature. The experience of the railway managements, operating these motors, quickly developed the above defects, and their demands upon the manufacturers resulted in the design of a motor with increased power, with four salient poles, a much larger air gap, greatly improved journal boxes, and a method of lubrication which is satisfactory. In the method of ventilation, and the general design of the gear cases, there is room for radical improvement. These motors are geared to the axles by a single pair of gears, but in the heaviest type of electric locomotives the armatures are mounted directly upon the axle.

The experience gained in the operation of heavy electric railway motors shows that the work that they are called upon to perform is even more severe than that required of steam locomotives. They are required to attain an equal if not greater schedule speed. The number of miles run per day is from 200 to 400, which is much more than is required of any steam locomotive in regular service. With such conditions existing, it is evident that the strictest care must be exercised in the design of the mechanical details of motors and in their maintenance.

30. Are motor trucks satisfactory?

In the design of a motor truck, special attention should be paid to strength of frame, size and composition of wheels, dimensions of axles, springs, brakes and the motor suspension. A motor truck carrying two heavy motors in some cases weighs 25,000 lb.

The wheels should be standard, with steel tires. It should not be

forgotten that, as these trucks are to do the work of steam locomotive, the axles should be of proportional strength. Experience on the New York, New Haven & Hartford with light axles, considered to be of ample dimensions for the required service, demonstrated to the management that the motor axles must be increased in size. The standard axle adopted by this company for motor trucks is 8 in. in diameter at gear wheel hub, and $6\frac{1}{2}$ in. at motor bearing and wheel fit with journals $5\frac{1}{2}$ x 9 in. These axles are oil tempered and have a $\frac{1}{2}$ -in. hole through the center.

The brakes should be arranged without a brake beam, for convenience in inspecting motors.

The form of motor suspension is of great importance. The ordinary method used on heavy roads is to hang the rear end of the motors in journals on the axles, while the front end is supported by springs attached to the bolster of the truck. This method has serious disadvantages. The truck springs, having to support half the weight of the motors, as well as the coach body, are necessarily made larger and heavier than usual. The uneven strain on these springs, in addition to their being unnecessarily heavy for the coach body, produces a rigidity, causing the coach to ride with discomfort when partly loaded. The motor suspension now used by the New York, New Haven & Hartford differs from the above in that the motors are supported entirely by the axles, no part of their weight being carried by the truck frame or the springs supporting the coach body. This is accomplished by the use of two equalizing suspension bars which extend from one axle to the other beneath, and on each side of, the motors. These bars are supported at their ends by links, which are held by lugs cast on the motor frames, directly under the motor axle bearings.

With the present railway motors, it has been demonstrated that either heavy or light trains can be operated over the same tracks, and can perform any service required of the steam locomotive. These motors can be mounted on trucks, with either one or two motors on each truck. The coach then becomes the locomotive. Its whole weight is available for traction, and, in addition, it has a seating capacity equal to any coach operated with the steam locomotive. A coach such as is used on the Highland Division of the New York, New Haven & Hartford, having a seating capacity of 70 passengers, equipped with two motors on one truck placed under one end, and using a standard passenger truck on the other end, can be used as a single car during the hours when travel is light, with trail coaches added as required during the hours of heavy travel. Two coaches in addition to motor car are used on this line, making a train weighing 161,000 lb. and operating a train schedule of 30 miles per hour, including stops. The seating capacity of such a train is 174 passengers. With two motors on each truck placed under such a coach, we have a locomotive with 100,000 pounds on drivers, and a total weight, including passengers, of 110,500 pounds available for traction, when carrying 70 passengers.

A comparison with a standard steam locomotive designed for suburban service is of interest. It shows the total weight to be 166,000 lb., with 72,000 lb. on drivers, leaving 94,000 lb. as dead weight, and not providing any passenger seating capacity.

The results obtained with electric traction on main line railroads demonstrate that the present application of this power is no longer experimental; that it will rapidly supersede steam on lines where travel is heavy and congested, and where, for economy in operation and increased passenger receipts, a frequent service is necessary.

This mysterious and silent power will undoubtedly continue to grow in popularity, taking an advanced position among the known motive powers of the world.

NEW TRAMWAYS FOR LONDON.

The London County Council proposes to promote a bill at the next session of Parliament to authorize the building of $28\frac{1}{2}$ miles of electric tramways. All of the proposed lines which will be connected with the present system of the Council are to be operated electrically; on the other lines which connect with the road leased to North Metropolitan Tramways Co. horses will be used.

The rail breaking machine designed by Mr. George W. Baumhoff, general manager of the St. Louis Transit Co., is now being used in tearing up the Broadway cable line. This machine was illustrated in the "Review" for January last, page 39.

NEW TYPE OF LIGHTNING ARRESTER.

The accompanying illustration shows the several parts of a new type of lightning arrester which is known as the Wood's arrester and is made by the Central Union Brass Co., of St. Louis, for which the Central Electric Co., Chicago, is general selling agent. The arrangement of the parts when assembled will be readily understood from the description. The shell is of seamless drawn brass tubing and at the bottom of this shell is placed the porcelain piece shown in the center of the cut. The socket with two set screws, on the right of the cut, is then placed through the porcelain plate and on top of this the composition rod. On top of the rod is placed a porcelain cup with corrugated edge, next is the small porcelain button seen in the upper corner of the illustration. The cap with a



WOOD'S LIGHTNING ARRESTER.

corrugated cup inside is screwed down on the shell holding all the parts firmly in position.

There are no coils, hence the arrester is non-inductive. There are no moving parts and it is claimed for the arrester that it requires no attention after being installed. It can be made for protecting telephone lines by merely changing the resistance of the composition rod.

In order to compare the action of the Wood's arrester with other types, a portion of the casing was cut away and a section of mica put in its place. The Wood's arrester was then put on the line with several others of different types, the experiment being conducted in a high altitude where static discharges are more frequent than in other places. The result was that the Wood's arrester was found to be taking care of heavy discharges while the others indicated no action, thus showing its lower resistance.

SALE OF WEST END, PITTSBURG.

Mr. M. K. McMullin, one of the directors of the Consolidated Traction Co., of Pittsburg, and intimately associated with Messrs. Given, Jones, Widener, Elkins and Magee in the organization of the Union Traction Co., of Pittsburg, on August 17th acquired the franchises and property of the West End Traction Co. It is understood that par was paid for the \$2,500,000 of preferred stock and 80 per cent of the face value for the \$2,500,000 common stock. The West End Traction Co. was chartered in 1897 as a consolidation of the Pittsburg & West End Passenger Ry., the Pittsburg, Crafton & Mansfield Street Ry., the Pittsburg, Neville Island & Coraopolis Ry., the West End, Mt. Washington & Banksville Ry., and the Carnegie, Heidelberg & Bridgeville Street Ry. It has $45\frac{1}{2}$ miles of track. This property will be turned over to the Southern Traction Co., a new corporation now being formed in which Senators C. L. Magee and William Flinn, T. H. Given, J. D. Calley, ex-Judge James H. Reed and Joshua Rhodes are interested. It is stated that the Southern Traction will ultimately merge all the lines south of the Monongahela River.

President Divine, of the Chattanooga (Tenn.) Rapid Transit Co. has made the necessary arrangements for building a power house to replace the one destroyed by fire, and hopes to have the electric system in operation in time for the reunion at Chickamauga Park, in October.

SOME INTERESTING EUROPEAN VIEWS.

The accompanying illustrations are reproduced from the 1900 edition of "Electric Tramways," which is issued by the Allgemeine Elektrizitäts Gesellschaft (General Electric Co.), of Berlin.

Figs. 1 and 2, respectively, are views of the Burgthor (castle gate) in Luebeck and the Weisser Thurm (white tower) in Nuernburg.



FIG. 1 BURGTHOR, LUEBECK.



FIG. 2 WEISSER THURM; NUERNBURG.

and the effect of the old and the new when thus contrasted is very striking. Figs. 3 and 4 are two views of a draw-bridge at Duisburg occupied by the electric railway, and show the method of supporting the trolley wires. As will be noted in Fig. 4, when the arch to which the wires are fastened is lifted, the wires are

allowed to depend from the two supports in a broad sag; this method has great simplicity to recommend it, and while it looks dangerous, the wire does not hang low enough to strike a pedestrian or a horse.

Fig. 5 shows the two entrances to the Sant Ugo tunnel in Genoa, which is one of the most remarkable pieces of strictly street railway construction ever built. The topography about Genoa is very unfavorable to railway construction; until 1890 there was but one line in the city, but with the development of electric traction it became practicable to build other lines. Three companies have concessions, the Societa di Ferrovie Elettriche e Funicolari has the lines in the center of the city, the Societa dei Tramways Orientali the eastern lines, and the Unione Italiana Tramways Elettrici the western lines. All the roads were built by the Allgemeine Elek-

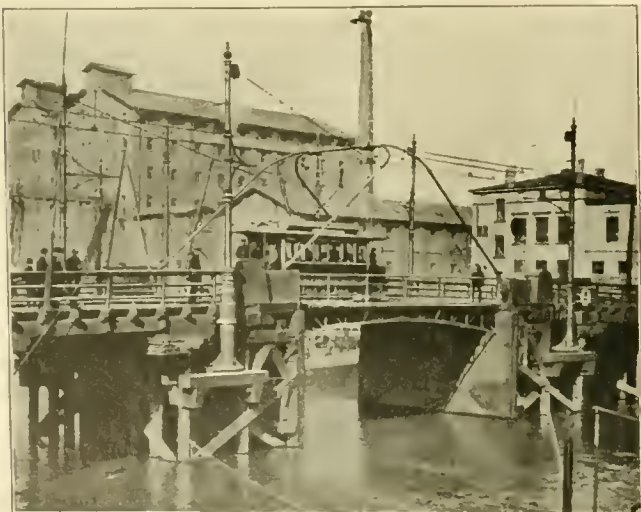


FIG. 3 DUISBURG BRIDGE CLOSED.

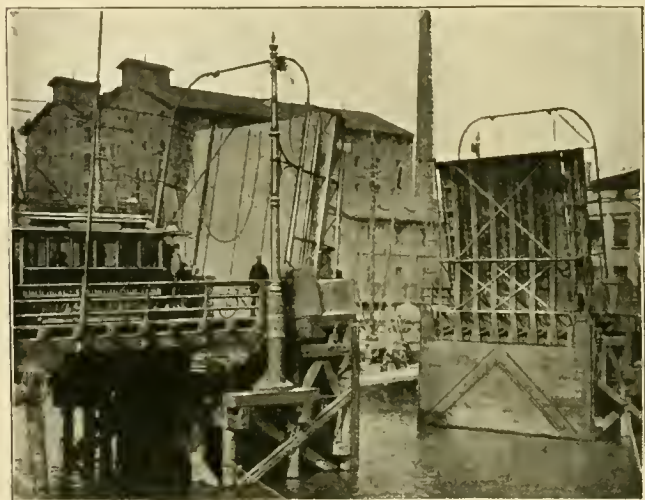


FIG. 4 - DUISBURG BRIDGE OPEN.

tricitacts Gesellschaft, and they are now operated under a uniform fixed system. The total length of track is 60 miles and several of the routes are long, one being 18 miles; in many places there are steep grades and sharp curves. A cable auxiliary is used on some lines.

In certain cases it was necessary to build special tunnels running under heavy buildings, and to reconstruct streets and squares. The tunnel illustrated in Fig. 5 was built to surmount a rise of nearly 40 ft. In plan this tunnel is a loop with reverse curves at the entrances; the radius varies from 65 to 85 ft.

"Electric Tramways" is the most elaborate publication of its kind that we have ever seen. The book contains 400 pages, 10 x 13 in., and is most profusely illustrated with half-tone engravings, maps, profiles and plans. The text is printed in three languages, German, French and English, arranged in parallel columns.

After a few pages devoted to illustrations of the company's works, there are fifty pages discussing electric tramways in general; next



FIG. 5 ENTRANCE TO TUNNEL, GENOA.

follow brief descriptions of all the lines using the company's system. From the concluding table we learn that the number of completed lines is 38, with an aggregate of 485 miles of track, and that the number in course of construction is 27 with an aggregate length of track of 300 miles. At the beginning of the year there were over 30 other projected lines under consideration.

NEW TEXAS INTERURBAN LINE.

The Denison & Sherman Railway Co. which is to build a 10-mile electric line between these two towns has let the contract for construction to the Electrical Installation Co., of Chicago. Mr. Fred. H. Fitch will have charge of the construction work.

A 30-minute service is contemplated, the fare one way being 15 cents. The power house, car barn, etc. will be located midway on the line. It is the intention of the company to establish a park to contain about 75 acres at some point between the two towns. This park will be improved on an elaborate scale, making it a resort for the people of Denison and Sherman, and also one that can be used for large gatherings from all over North Texas. A fine pavilion will be erected which can be used for a dance hall, public speaking or large gatherings of any kind. An artificial lake of good dimensions will also be constructed so that boating can be enjoyed.

PREMIUMS FOR NOT HAVING ACCIDENTS.

On May 1, 1900, the Washington Water Power Co., which operates the electric light, power and street railway plants of Spokane, Wash., put in effect a system of reward for freedom from accidents and obedience to rules. The plan is described as follows, the premiums for May 1 to Dec. 31, 1900, being payable on the first pay day of January, 1901.

"An account of the hours worked by each motorman and conductor will be kept monthly by the superintendent. A premium of one-half cent per hour, over and above the regular pay of his grade, will be allowed each motorman and conductor for freedom from accidents and obedience to the company's rules. An account will also be kept of all accidents and infractions of rules, and fines will be imposed by the superintendent, against the premiums hereinbefore mentioned, for such accidents and infraction of rules. At the end of the year, such premiums as carmen have earned, less such fines as have been imposed, as before mentioned, will be paid in cash to the carmen earning such premiums.

"In addition to this, all fines that have been imposed during the period, will be distributed among those receiving premiums, pro rata, in the proportion that the premiums earned bear to the total amount of fines.

"It should be distinctly understood, among the carmen, that the fines imposed do not return to the company's treasury but are distributed among the premium earners, pro rata to the amount of premiums. The fines mentioned herein are not taxed against the regular pay of the grade but against the premium of $\frac{1}{2}$ cent per hour. Any man discharged or leaving the company's employ, will lose all interest in the premiums and all pro rata interest in the fines, and the amount thus released will be added to the amount to be distributed among the men.

"The following examples will tend to explain the practical working of the plan: Supposing that during the year, a total of 250,000 hours are worked by carmen, then a sum equal to $\frac{1}{2}$ cent per hour or \$1,250 would be set aside and become divisible among the carmen. Supposing that, in the same period, a man worked 3,500 hours and had had no accidents and broken no rules, he would then have a premium of \$17.50 due him, in addition to his proportion of the fines that had been imposed during the same period. Assuming that the total fines, for the same period, amounted to \$250, then his premium would be increased in the proportion that \$250 (total fines) bears to \$1,000 (unfined premiums) or $\frac{1}{4}$; therefore, his total premium and share of fines would be \$17.50 plus \$4.37 or \$21.87.

"Supposing that, during the year, a man had been fined \$10, his premiums then, proceeding as above, would be \$17.50 minus \$10 or \$7.50, and his share in the fines would be $\frac{1}{4}$ of \$7.50 or \$1.80, making a total of \$9.37.

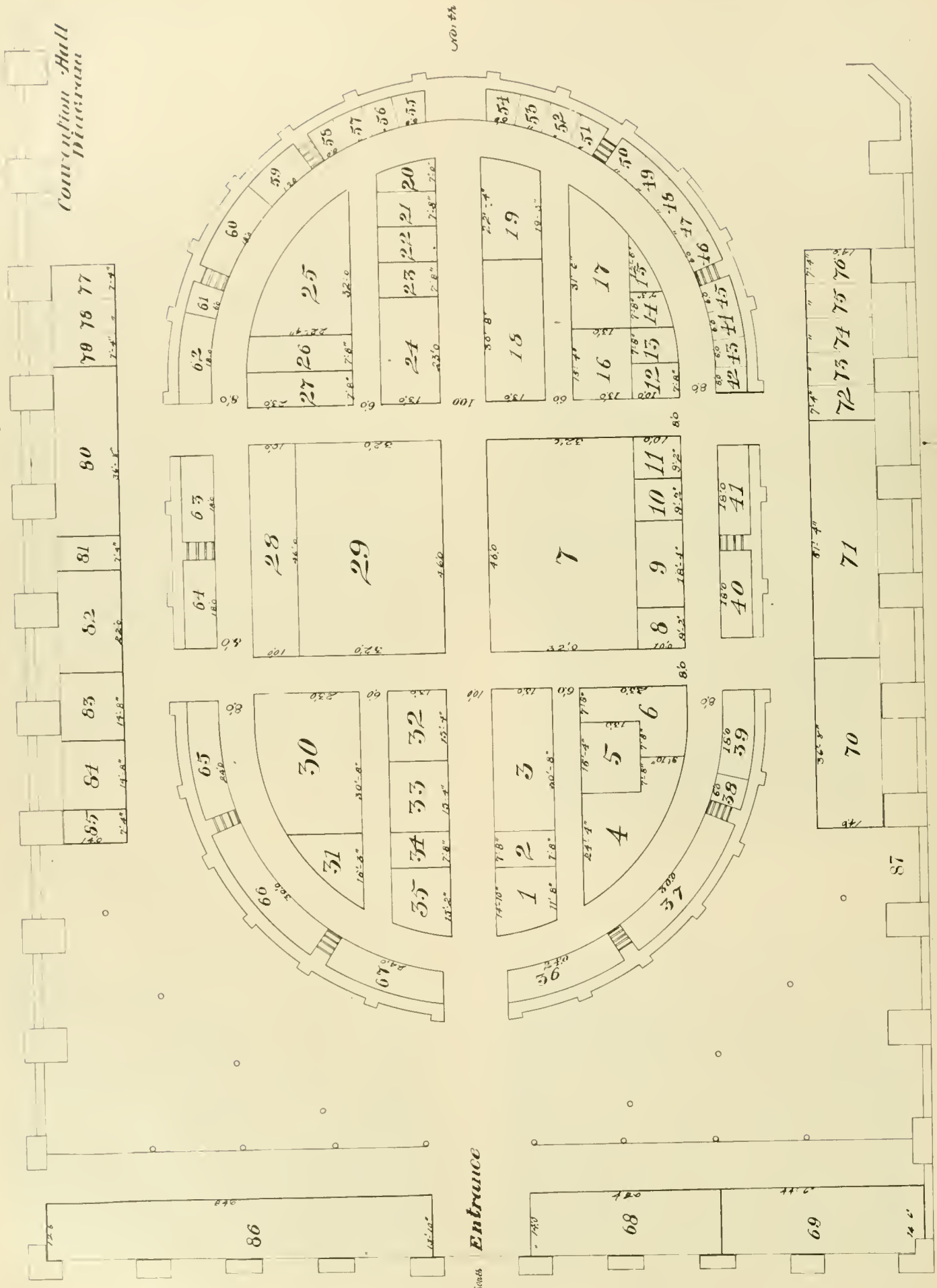
"The foregoing plan is the result of much consideration, it being the desire of the company to so arrange that each carman may have an opportunity to earn a premium above his regular pay, for especially meritorious services. During the present year the plan will, necessarily be more or less of an experiment and will be subject to such changes, after Jan. 1, 1901, as the experience of 1900 may suggest."

Mr. D. L. Huntington, general manager of the Washington Power Co., who furnished us with the foregoing facts, states that while the period the system has been in operation is too short to justify any final conclusions as to its success he believes that the effect has been to lessen the number of accidents.

FINED FOR NOT MAKING REPAIRS.

The Rangoon (India) Tramway Co. was recently prosecuted by the city for failing to keep its line in good condition and repair, and the magistrate found that the company had neglected the most ordinary precautions and had failed to store a sufficient stock of rails for maintenance and repair. He imposed a fine of 100 rupees. The company has paid no dividends for 10 years and as the franchises have only 3 $\frac{1}{2}$ years to run it is scarcely probable that it can afford to put its lines in the good condition demanded by the city.

The state tax commission of Wisconsin arranged for a hearing September 4th to discuss the methods of taxing street railways.



PLAN OF EXHIBIT HALL, AMERICAN STREET RAILWAY CONVENTION.

THE ANNUAL CONVENTIONS.

Secretary Penington announces the subjects on which papers will be read at the coming convention of the American Street Railway Association in Kansas City, October 16th-19th, as follows:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions." By N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

"Comparisons of the Various Systems of Electrical Distribution for Street Railways." By C. F. Bancroft, electrical engineer Massachusetts Electric Companies, Boston, Mass.

"Consolidations of Street Railways and Their Effect Upon the Public." By Daniel B. Holmes, counsel Metropolitan Street Railway Co., Kansas City, Mo.

"The Storeroom and Storeroom Accounts." By N. S. Hill, jr., general manager Charleston Consolidated Railway, Gas & Electric Co., Charleston, S. C.

"Painting, Repainting and Maintenance of Car Bodies." By F. T. C. Brydges, superintendent of car shops, Chicago Union Traction Co., Chicago, Ill.

Friday, October 19th, has been set apart as a day for examination of the exhibits. No session of the Association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held at the Coates House, Friday evening, when the officers elect will be installed.

The headquarters of the Association will be at the Midland Hotel.

The following hotels are first class and not far from convention hall, the Coates and Baltimore being the nearer. October being always a busy month with Kansas City hotels, reservations for rooms should be made at once:

Midland—American, \$3.00 to \$6.00 per day; European, \$1.00 to \$5.00 per day.

New Coates—American, \$3.00 per day and up; European, \$1.00 per day and up.

Savoy—American, \$2.50 to \$6.00 per day; European, \$1.50 to \$3.50 per day.

Baltimore—American, \$3.00 to \$5.00 per day; European, \$1.50 to \$3.00 per day.

The passenger associations have made the usual reduced rate of a fare and one-third for the round trip.

ACCOUNTANT'S ASSOCIATION.

The program of the Street Railway Accountants' Association aside from the routine business of the meeting includes the following papers and reports:

"What Does the General Manager Want to Know from the Accounting Department?" By C. D. Wyman, Boston, Mass., lately general manager of the New Orleans City Railroad Co.

Report of the Standing Committee on a Standard System of Street Railway Accounting. By the chairman, C. N. Duffy, auditor Chicago City Railway Co., Chicago, Ill.

"The Routine of a Street Railway, Electric and Gas Lighting Company." By C. O. Simpson, auditor Augusta Railway & Electric Co., Augusta, Ga.

Report of Committee: "Is a Standard Unit of Comparison Practicable?" By the chairman, H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

"Department Accounts." By H. L. Wilson, auditor Boston Elevated Railway Co., Boston Mass.

"Material and Supply Accounts." By W. M. Barnaby, accountant Brooklyn Rapid Transit Co., Brooklyn, N. Y.

The plan of the convention provides for three half-day sessions allowing the whole of the fourth day for the examination of exhibits, and in the case of this association this includes the exhibition of blanks and forms. Secretary Brockway announces that there have been important additions made to the collection of blanks which will undoubtedly continue the interest aroused at the convention in Chicago. This exhibit gives one an understanding of the part taken by blanks and forms in the construction and operation of railway properties, a knowledge of which is so important to the successful financial, operating or accounting officer.

Formal notice is given that a change is proposed in Article VII of the By-Laws. This article provides that the annual meeting of the association shall be held at the same time and place as that of the American Street Railway Association, and the proposed

change will undoubtedly be made the subject of earnest discussion.

The headquarters of the Accountants Association will be at the Midland Hotel.

EXHIBITS.

The display of exhibits will be fine, the hall being admirably adapted for that purpose. The diagram of the convention hall is shown on page 530 and the following list gives the assignments of space that have already been made.

Applications for space should be made to the chairman of the committee on exhibits, W. A. Satterlee, general superintendent Metropolitan Street Railway Co., Kansas City, Mo.

No. of Space.	Name of Exhibitor and P. O. Address.	No. of Sq. Ft.
1	Street Railway Review, Chicago.....	200
2	Western Electrician, Chicago.....	100
3	Griffin Wheel Works, Chicago.....	400
4	Ohio Brass Co., Mansfield, O.....	400
5	Adams & Westlake Co., Chicago.....	200
6	Curtain Supply Co., Chicago.....	300
7	Westinghouse Electric & Manufacturing Co., Pittsburg.....	1,500
8	Pantasote Co., New York.....	100
9	Carl Electric Co., Akron, O.....	200
10	Bierbaum & Merrick Metal Co., Buffalo.....	100
11	Standard Underground Cable Co., Chicago.....	100
12	Diamond State Steel Co., Wilmington, Del.....	100
13	American Brake Shoe Co., Chicago.....	100
14	Weber Rail Joint Co., Chicago.....	100
15	Continuous Rail-Joint Co., Newark, N. J.....	50
16	Atlas Railway Supply Co., Chicago.....	200
17	Chisholm & Moore Manufacturing Co., Cleveland.....	400
18	Harold P. Brown, New York.....	400
19	Gold Street Car Heating Co., New York.....	300
20	A. Leschen Sons Rope Co., St. Louis.....	100
21	Standard Paint Co., New York.....	100
22	American Railway Supply Co., New York.....	100
23	National Lead Co., St. Louis.....	100
24	McGill, Porter & Berg, Chicago.....	300
25 & 26	Hipwood-Barrett Car Fender Co., New York.....	620
27	Manville Covering Co., Chicago.....	200
28	American Car & Foundry Co., St. Louis.....	500
29	General Electric Co., Schenectady, N. Y.....	1,500
30	Christensen Engineering Co., Milwaukee.....	800
31	Cutler Hammer Manufacturing Co., Milwaukee.....	150
32	Consolidated Car Heating Co., Albany.....	200
33	Garton-Daniels Co., Keokuk, Ia.....	200
34	Electrical Review Publishing Co., New York.....	100
35	Street Railway Journal, New York.....	200
36	John T. McRoy, Chicago.....	160
37	Joseph Dixon Crucible Co., Jersey City, N. J.....	200
39	Trojan Button Fastener Co., Troy, N. Y.....	120
40	Frank Ridlon Co., Boston.....	120
41	Chas. N. Wood, Boston.....	120
51, 52 & 53	Dearborn Drug & Chemical Works, Chicago.....	120
54	Spiral Journal Bearing Co., St. Louis.....	40
55, 56 & 57	Partridge Carbon Works, Sandusky, O.....	120
58	International Specialty Co., Detroit.....	40
59	Pomeroy & Fisher, New York.....	80
61	Winne & Kellog, Chicago.....	40
62	Chicago Mica Co., Valparaiso, Ind.....	120
63	B. R. Electric Co., Kansas City.....	120
64	Scott Spring Co., Philadelphia.....	120
65	New Haven Car Register Co., New Haven.....	160
66	International Register Co., Chicago.....	200
67	Pittsburg Reduction Co., Pittsburg.....	160
68 & 69	Peckham Truck Co., Kingston, N. Y.....	1,000
70	Taylor Electric Truck Co., Troy, N. Y.....	500
77 & 78	Ohmer Car Register Co., Dayton, O.....	200
79	Paige Iron Works, Chicago.....	100
80	Compressed Air Co., New York.....	500
81	Wheel-Truing Brake Shoe Co., Detroit.....	100
82	Wm. Wharton, Jr., & Co., Philadelphia.....	300
83	Merritt Electric Air Brake Co., New York.....	200
84	Craghead Engineering Co., Cincinnati.....	200
85	Magann, G. P., Air Brake Co., Detroit.....	100
86	Lorain Steel Co., Lorain, O.....	1,000
87	McCardle, J. R., & Co., Trenton, N. J.....	120

Convention Hall is at the corner of 13th and Central Sts., reached by either the Broadway or Wyandotte electric lines. It is well lighted and ventilated and there will be no trouble to secure current for power purposes, but all electrical connections for power and extra lights must be made at the expense of the exhibitor. The floor is hard cement which will necessitate the laying of wooden floors or at least wooden foundations where the exhibits are of such a nature as to require fastening down, as permission can not be obtained for making holes in the cement. If it is desired to show an exhibit on tracks, the rails will have to be laid on stringers. The local committee has made arrangements with W. A. Kelly, carpenter and builder, 947 New York Life Building, Kansas City, Mo., for doing all carpenter work required at reasonable prices. He will also supply all lumber and remove it after the convention. His representative will be in constant attendance at the hall after Sunday morning, October 14th.

All articles intended for the exhibition must be delivered at the building by the agent or owner and at his expense. An agreement has been made with the Kansas City Transfer Co. to haul and deliver all shipments to and from the building at 6 cents per 100 lb. for pieces weighing less than 2,000 lb., and 10 cents per 100 lb. for pieces weighing more than 2,000 lb. Goods should be marked with the owner's name, Convention Hall, Kansas City, Mo., in care of Kansas City Transfer Co., and if the exhibit space number is also added, the articles will be delivered on the proper space. Send the transfer company the bill of lading or a letter of advice at the same time the shipment is made.

There are several wide doors at the front and side of the convention building so that trucks, cars and other large exhibits can be taken inside the hall without difficulty.

The meetings of both the American Street Railway Association and the Accountants' Association will be held in the upper gallery, reached by a stairway at the rear of the hall and all delegates and others in attendance will pass through the hall on their way to the meetings.

CANADIAN ELECTRICAL ASSOCIATION.

The 10th annual convention of the Canadian Electrical Association was held at Kingston, Ont., August 29th to 31st. Headquarters of the association were at the Hotel Frontenac; exhibit space was provided at the City Hall, where the business sessions were held.

The papers presented were:

"Use of Dynamo and Storage Battery in Telegraph Offices," W. J. Camp, Canadian Pacific Railroad Telegraph Co., Montreal.

"Utilizing the Available Central Station Capacity," Prof. R. B. Owens, McGill University, Montreal.

"Power Factor as Affecting Operations and Investment with Special Reference to Induction Motors and Enclosed Arc Lamps," F. H. Leonard, jr., Montreal.

"Conditions Affecting the Wave Form of Alternators," Prof. L. A. Herdt, McGill University, Montreal.

"Rotary Converters," A. Gordon Grier and J. C. Hyde, Montreal.

"Railway Subject, Giving Several Curves Showing Up the Average Power During a Day, and Maximum and Minimum Requirements for Power Called For on the Quebec System," D. E. Blair, Quebec Railway & Lighting Co., Quebec.

The social features included a search-light excursion among the Thousand Islands tendered by the mayor and citizens of Kingston, the annual banquet, various excursions to plants of interest to the members, and a spectacular concert by the 14th Regiment Band, with electrical effects and fireworks. The street railway company extended the courtesies of the road to the association.

NEW POWER HOUSE AT NEW ORLEANS.

The New Orleans City Railroad Co., of New Orleans, has retained Sargent & Lundy, consulting engineers, of Chicago, to design a new power house to be located near the company's old one. While the plans for the building are not yet completed a contract has been closed with the E. P. Allis Co., of Milwaukee, for a vertical cross-compound condensing engine with cylinders 32 and 68 x 60 in.; it is to run at 75 r. p. m. with 120 lb. steam pressure and will be direct connected to a 1,500-kw. generator.

A NEW FARE REGISTER.

We illustrate herewith a new fare register, recently placed on the market, which it is claimed has all the advantages of other registers and also some of its own. The greatest care has been exercised in designing the mechanism to secure certainty of action, and the ease to prevent tampering. There are some ingenious interlocking devices, and a flag and catch to prevent the alarm from ringing except when both the trip register and the totalizer register. This



MONARCH FARE REGISTER.

register is known as the "Monarch" and is made both single and double, the one we show being of the double type. The cases of both types are the same size. No seal is used on the case as the mechanical features are believed to be a sufficient guard. The "Monarch" registers are made by Neilson & Bentson, of New York, the senior member of which, Mr. A. E. Neilson, has had a long experience in this business. The Morris Electric Co., of 15 Cortlandt St., New York, controls the registers and is sole selling agent.

METHOD OF TAXING STREET RAILWAYS.

On September 4th the tax commissioners of Wisconsin heard arguments as to the best plan for taxing street railways. Henry C. Payne, vice-president of the Milwaukee Electric Railway & Light Co., was the principal speaker, though I. P. Lord, of the Waupaca & Chain o' Lakes Electric Ry.; E. L. Debell, secretary of the Sheboygan Light, Power & Railway Co.; B. E. Edwards, president of the Lacrosse City Railway Co., and F. W. Oakley, president of the Madison Electric Railway Co., were also present and took part in the discussion.

The speakers all agreed that the present system of a percentage tax on receipts was preferable to a tax on property and franchise, and claimed that their companies could not get justice from local assessors. Mr. Payne pointed out that the tax rate should be lower for street railways than for steam railroads because the latter have perpetual franchises; he also believed that the rate should be lower for smaller companies than for the larger ones.

ADDITIONS TO PROVIDENCE POWER STATION.

The Union Railroad Co., of Providence, R. I., is enlarging its power house capacity by adding two new Filer & Stowell engines of 1,600 h. p. each, these being duplicates of one already installed and which was described in the "Review" for May, 1900, page 278. The engines are direct coupled to two 1500-kw. alternating current dynamos, generating at 10,000 volts. New transformer stations will also be built.

It is proposed by Mr. Jacob G. Kasjens, an alderman of Peoria, Ill., to equip a flat car with fire apparatus; this car would be serviceable wherever steam or electric railway tracks are laid.

AN ATTRACTIVE ADVERTISEMENT.

The New Jersey & Hudson River Railway & Ferry Co. has recently issued a very artistic card advertising "the most picturesque trolley ride in America," which we reproduce. The original was printed on a card 14 x 18 in.

On the Hudson River line the regular schedule provides for cars at 30-minute intervals except on Sundays, holidays and Saturday afternoons, when they are run every 15 minutes. The running time from Hackensack to 130th St., New York, is 45 minutes. On small pocket cards issued by the company are given, in addition to its own time table, the time tables of the 9th Ave. and 3d Ave. Elevated express trains and the following summary of good points of the "Hudson River Line": Stone ballasted roadbed. Steel trestles and bridges. No railroad grade crossings. Commodious open

SUIT AGAINST SCHUYLKILL VALLEY CO.

Two stockholders of the Schuylkill Valley Traction Co., J. W. and D. B. Shepp, on September 6th began a suit against the company and the United Power & Transportation Co., of New Jersey, which owns a controlling interest in the Traction company stock. Messrs. Shepp seek to enjoin the Transportation company from continuing to control the Traction company and ask for a receiver; the action is based on a section of the constitution of Pennsylvania which forbids a transportation company to engage in business other than that of a common carrier, the United Power & Transportation Co. also controlling various lighting plants. The defense is that the Schuylkill Valley Traction Co. is managed by its own directors, and that the United Power & Transportation Co. merely owns stock of the Traction company.



NEW YORK TERMINUS
FORT LEE FERRY
FOOT W. 130th STREET

THE CLAREMONT

WANT & FOMB

TEACHERS' COLLEGE

COLUMBIA UNIVERSITY BUILDING

ST. LUKE'S HOSPITAL
ST. JOHN THE BAPTIST

PANORAMIC VIEW OF RIVERSIDE DRIVE, NEW YORK, FROM CAR DESCENDING THE PALISADES.

**TAKE ELECTRIC CARS TO
HACKENSACK & ENGLEWOOD *Via*
"HUDSON RIVER LINE"**

**New
Jersey
@
Hudson
River
Railway
@
Ferry
Co.**

FOR A delightfully cool and refreshing afternoon and evening outing. The most picturesque trolley-ride in America.

Take "125th St. Crosstown" or "Boulevard" cars to Fort Lee Ferry, foot W. 130th St. Boats 15 and 45 minutes past the hour.

summer cars. Electrically heated winter cars. Special accommodations for smokers. Powerful, speedy motors. Duplicate power and hand brakes. Arc searchlight headlights. All cars carry bicycles and tandems.

Mr. Frank R. Ford is second vice-president and general manager of the company, which has its office at No. 149 Broadway, New York.

The Hartford (Conn.), Manchester & Rockville Tramway Co. on August 7th announced that hereafter all employes who have been in the service more than five years are to wear a stripe on the coat sleeve. This decoration carries with it additional pay of 25 cents per day.

THE EFFECTS OF STREET CAR RIDING.

A Toledo professor announces that riding on electric cars destroys the nerves, but to offset this a prominent Louisville physician holds that trolley car riding is a most expeditious cure for insomnia, due to nervousness. We are inclined to favor the prominent physician's view, as the announcement of the Toledo professor is accompanied by the statement that he has a machine for counteracting this nerve-wrecking tendency, which he will sell for a consideration.

The Cleveland board of equalization has raised the assessment of the Cleveland City Railway Co. from \$336,000 to \$660,000.

PERSONAL.

MR. P. A. B. WIDENER of Philadelphia was in London last month.

MR. H. S. COOPER has resigned as general manager of the Ithaca (N. Y.) Street Ry.

MR. D. F. BURRITT has resigned as general manager of the Palmer (Mass.) & Monson Street Railway Co.

MR. S. G. DE COURCEY has succeeded Mr. A. A. McLeod as president of the American Railways Co., of Philadelphia.

MR. F. L. HART has tendered his resignation as general superintendent of the Washington (D. C.) Traction & Electric Co.

MR. A. H. WOODWARD, president of the International Register Co., is receiving congratulations on the arrival of a son.

MR. J. A. DAWSON, Montreal, who is establishing a Canadian agency for all kinds of street railway supplies, spent several days in Chicago last week.

MR. D. R. M'LAIN has resigned as assistant manager of the Huntsville (Ala.) Railway, Light & Power Co. to go with the Westinghouse company.

MR. THOMAS NEELY, formerly of Vicksburg, Miss., has accepted a position with the Meridian (Miss.) Street Railway & Power Co., as general superintendent.

MR. WILLIAM D. WEAVER, editor of the Electrical World and Engineer, of New York, was married in July, at Bremen, Germany, to Miss Mildred E. Niebuhr.

MR. GILES ALLISON, of New York, eastern representative of the St. Louis Register Co., stopped over in Chicago and visited his friends on his way East from St. Louis.

MR. A. B. DALBY, president of the Hipwood-Barrett Fender Co., New York, has returned from Europe where he has been introducing his fenders on several prominent tramways.

MR. J. E. WOODBRIDGE, formerly editor of the American Electrician, has left the field of journalism to enter the railway engineering department of the General Electric Co., at Schenectady.

MR. HENRY S. NEWTON has resigned as general manager of the Syracuse (N. Y.), Lakeside & Baldwinsville Railway Co. to become manager of the Beaver Valley Traction Co., Beaver Falls, Pa.

MR. HAROLD P. BROWN, 120 Liberty St., New York, has returned from a trip of two months' duration abroad, on which he conducted demonstrations of his plastic bonding system in London and Paris.

MR. H. W. WOLCOTT, general manager of the Kansas City-Leavenworth Ry., has returned from Cleveland and announces that all orders for material have been placed and that work on the extensions will be pushed as rapidly as possible.

MR. H. H. VREELAND, president of the Metropolitan Street Railway Co., of New York, on August 12th entertained a number of officials and employees of the company at a clambake at the Torietta Club, and later at his house at Brewsters.

MR. T. J. NICHOLL, vice-president and general manager of the Rochester (N. Y.) Railway Co. was one of the speakers at the second annual encampment of the Empire Organization of Veterans and Sons of Veterans held at Margheretta Grove, Sodus Bay, in August.

MR. A. M. CRANE, formerly general sales agent of the Illinois Steel Co., and more recently assistant chairman in the American

Steel & Wire Co., has formed a partnership with Mr. W. A. Green under the name of A. M. Crane & Co., dealers in pig iron, steel and railway supplies. An office has been opened in room 573 of the Rookery, Chicago. Prior to his association with Mr. Crane in their present business, Mr. Green was treasurer of the American Steel & Wire Co.

MR. J. C. BRACKENRIDGE, general manager of the Brooklyn Rapid Transit Co., was the guest of honor at a dinner given at Ulmer Park, Brooklyn, on August 31st, by about 50 of his friends representing the commercial, railroad, political and newspaper life of the boroughs of Brooklyn and Manhattan.

MESSRS. T. B. GOODYER, general traffic superintendent; H. M. Sayers, chief engineer, and J. A. Lycett, district superintendent of the British Electric Traction Co., of London, have been making a tour of the principal cities of the United States, inspecting the street railway systems and making notes on constructing and operating methods.

MR. J. D. HAWKS, president of the Detroit, Ypsilanti & Ann Arbor Ry., in company with several of his business associates, last month made a trip in carriages from Grand Rapids to Muskegon, Mich., to inspect the route of the proposed Grand Rapids, Grand Haven & Muskegon Rapid Ry., an electric railway enterprise in which they are interested.

MR. L. G. READE, general manager of the Abendroth & Root Manufacturing Co., New York, reports an improvement in the company's foreign trade, naming a number of recent shipments, including a large consignment of boilers for the Spanish market. The Abendroth & Root company has recently opened a branch office at No. 2 Jewry St., London.

MR. A. L. PARKER, who has been associated with Mr. John Winter, in a number of new electric railway projects near Detroit and in New York State, has been chosen second vice-president of the Detroit (Mich.), Rochester, Romeo & Lake Orien Ry., and will hereafter take an active part in the management of that road. His headquarters will be at Detroit.

MR. L. B. STILWELL has severed his connection with the Niagara Falls Power Co., to remove to New York City, where he will take an important position in connection with the electrical equipment of the Manhattan Elevated Ry. Mr. Stilwell aided in the installation of electrical machinery at the 50,000-h. p. station in Niagara Falls and has assisted in its management since 1897.

MR. CHARLES STEWART SMITH, a member of the New York Rapid Transit Commission, has been visiting London and Paris for the purpose of studying the ways in which rapid transit problems have been worked out in those cities. He states that what is called fast traveling in Europe would not satisfy the average American, and while the London and Paris underground roads are wonderful examples of engineering skill, they are not "rapid transit" lines, as the term is understood in this country.

MR. C. K. DURBIN resigned as general superintendent of the Denver City Tramway Co. on September 1st. We chronicle with a regret that will be shared by many, this announcement of his retirement from street railway work. The death of his brother last spring left an important business in Denver, which Mr. Durbin has had in charge since, and which not only demands his entire time, but more than warrants his leaving the company. He tendered his resignation several months ago, but was induced to remain until now he can no longer afford to do so. Under his management the physical condition of the road has been brought up to a highly creditable standard. The board of directors presented him with the finest watch procurable in Denver, and a set of very complimentary resolutions.

MR. RUSSELL WILEY, electrician of the Kankakee (Ill.) Electric Railway Co., died August 13th, after a long illness with typhoid fever. He was 36 years of age.

MECHANICAL DEPARTMENT

MORE MAIL CARS FOR CHICAGO.

The Chicago Union Traction Co. has recently put in service on its North Clark St. and Milwaukee Ave. lines five mail cars one of which is shown in the accompanying engravings. In addition to these one extra mail car is to be built. The cars were originally used on the Cicero & Proviso line and have been changed to meet



NEW MAIL CAR, CHICAGO UNION TRACTION CO.

the requirements of the postal service, by Mr. F. T. C. Brydges, superintendent of the shops. Doors were cut in the sides of the body and the platforms completely enclosed by providing doors for the left side of each. A sub-sill, 4 x 5 in., was placed under each side of the body. The body is 20 ft. long inside and the car 28 ft. 6 in. over all.

The cars are mounted on Peckham single trucks with two G. E. 52 motors and K 10 controllers. Folding fenders are carried on



INTERIOR OF CAR.

each end and headlights are mounted on top of the hood. In common with most all the cars used by the Chicago Union Traction Co., these cars have a wooden frame surrounding the wheels to serve as a guard and the illustration shows a simple addition to

the ordinary frame which has in several instances prevented persons falling under the car and being injured. This is a piece of 2½-in. rubber hose placed vertically just over the rail; it can be carried low and while stiff enough to brush an arm or leg from the track it is sufficiently flexible to do no harm if it comes in contact with the rail. We understand that the use of rubber hose in this manner was an idea of Mr. Yerkes.

The interior fittings include the regulation equipment of sack racks, pigeon holes and sorting and stamping board. The car is heated by Consolidated Car Heating Co's. electric heaters, and well lighted with 15 incandescence lamps; the lamps are placed 1 in each vestibule, a cluster of 3 at each end inside, 2 in the middle of the car, and 5 single lamps with downward reflecting shades over the pigeon holes and sorting board.

On September 1st these cars were put in service replacing the postal cars previously attached to cable trains on the two streets mentioned, North Clark and Milwaukee Ave. The cars of the "North Clark St. line" will run over Market and Sedgwick Sts., Lincoln Ave. and Halsted St. to the intersection of Halsted with North Clark St., beyond which point the latter street is equipped with the overhead trolley wires.

The down-town terminus of the mail routes will be changed to the corner of Washington and Clark Sts. for the Clark St. line and to a point on Lake St. for the Milwaukee Ave. line. This will obviate the delays now caused by the transfer of mails on the cable loop. While the new routes will make longer wagon hauls to some of the sub-stations, other hauls will be shortened, so that the average is about the same. Fourteen round trips per day are scheduled, three being made to Evanston.

The postoffice department hopes to eventually operate all the postal cars in the city over electric lines. The advantage lies in the fact that in case of a fire or other obstruction to the street an electric car can be switched on some parallel line and continue without loss of time. This was demonstrated one day last month, when the Wentworth Ave. car encountered a large frame house encamped on the track. The house was being moved across the street; some of the apparatus had broken and there was every prospect that the house would remain to block the thoroughfare for the rest of the day. The postoffice car was promptly backed to the switch and continued its trip downtown by a different route, arriving in time to make connections, according to schedule. A cable car in the same predicament must have waited till the house on the tracks had taken all day to "move on."

Next spring another railway postal route into the southwestern part of the city will be opened, making six in all. The business transacted over the street railway mail routes is reckoned principally by the sale of stamps at the various stations. From the two stations on North Clark St. the sale of stamps has averaged \$12,637 per month, and from the two stations on Milwaukee Ave., \$10,133. Since the North Clark St. route has been extended to include Edgewater, Rogers Park and Evanston the sales from the stations on the route will be increased to aggregate about \$15,190 per month, Edgewater, Rogers Park and Evanston selling a total of \$2,553.

EAVE TROUGHS FOR STREET CARS.

A number of open cars owned by the Hartford (Conn.) Street Railway Co. have been fitted with eave troughs to prevent rain water from the roof, from dripping on the passengers or on the ends of the seats. The troughs are of wood and run the length of the car on each side, just beneath the edge of the roof. The accumulated water finds its way to the street through 1-in. pipes at the corner posts.

SPLICED CARS AT ROCHESTER, N. Y.

The Rochester (N. Y.) Railway Co. has recently enlarged some of its vestibuled cars and mounted them on double instead of single trucks. The cars were cut in two and three new side posts inserted, thus increasing the length of the body over the corner posts from 18 ft. 8 $\frac{5}{8}$ in. to 27 ft. 9 $\frac{1}{8}$ in. Body bolsters were placed 13 ft. 7 $\frac{5}{8}$ in. between centers and two truss rods added on each side. One of these extends under the side sills between the bolsters



FIG. 1 INTERIOR OF CAR.

with a single strut in the center; the other is a $\frac{1}{2}$ x 2-in. bar extending to the ends of the body. Cross tie-rods, $\frac{5}{8}$ in. in diameter, are placed at each cross sill and three longitudinal tie rods run from the bolsters to the next outside cross sills.

The greatest difficulty in altering the car was to so locate the side sills that there would be space between to allow for the swing of the double trucks in taking curves, and thus avoid raising the car body so high as to require two steps.

The arrangement adopted was to bolt a block, marked "A" in Fig. 5 to the foot of each post and then mortise the block into the side sill; the blocks were properly grooved to fit the outside surfaces of the posts. The details of the block and the spacing of

the posts and sills in both the old and rebuilt cars are clearly shown in Fig. 5. It will be observed that the side sills of the rebuilt car are 5 $\frac{3}{4}$ x 7 $\frac{3}{4}$ in. instead of 3 $\frac{3}{4}$ x 4 $\frac{3}{4}$, as in the old one,



FIG. 2 SPLICED CAR, ROCHESTER, N. Y.

and the distance between them is 5 ft. 11 in., instead of 5 ft. 5 $\frac{1}{2}$ in. Peckham maximum traction trucks with 33-in. driving wheels are used; the motors are Westinghouse 49. In the plan view in Fig. 3

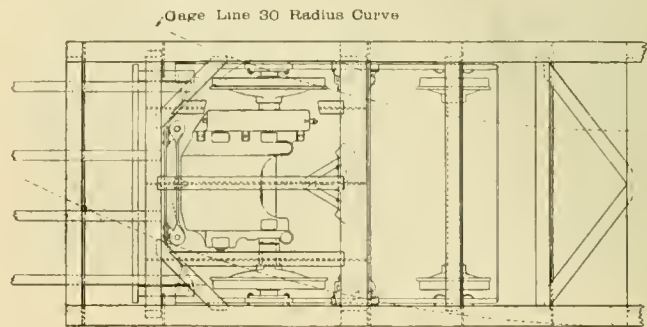


FIG. 3—TRUCK SHOWING CLEARANCE.

the truck wheels and axles are shown and the gage lines for a 30-ft. curve have been drawn in dotted lines and the point reached by the front edge of the driving wheel indicated.

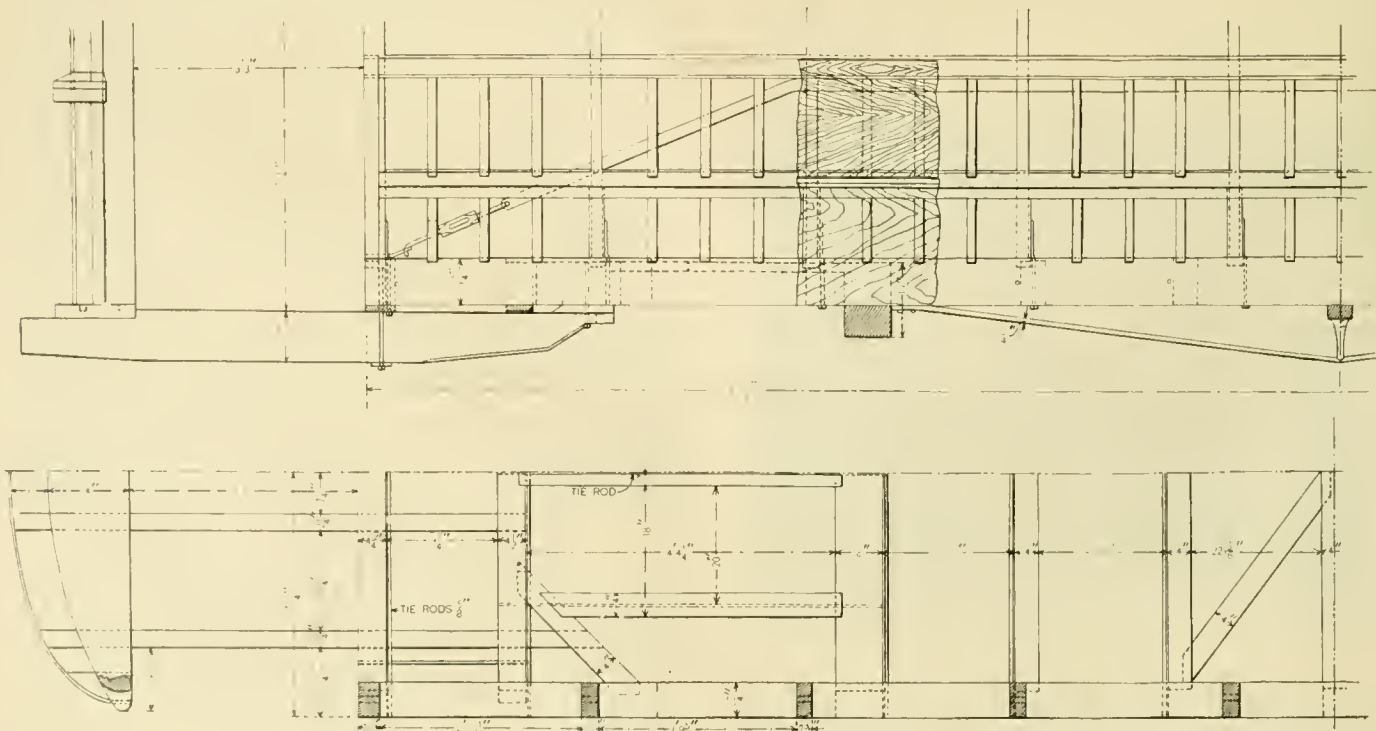


FIG. 4—HALF PLAN AND ELEVATION.

The half tone engravings, Figs. 1 and 2 show exterior and interior views of the altered car. We are indebted to Mr. T. J. Nicholl, vice-president and general

there is little doubt but the lines referred to will serve as important connections in the through electric road from Chicago to Green Bay, to which reference has been frequently made. The company

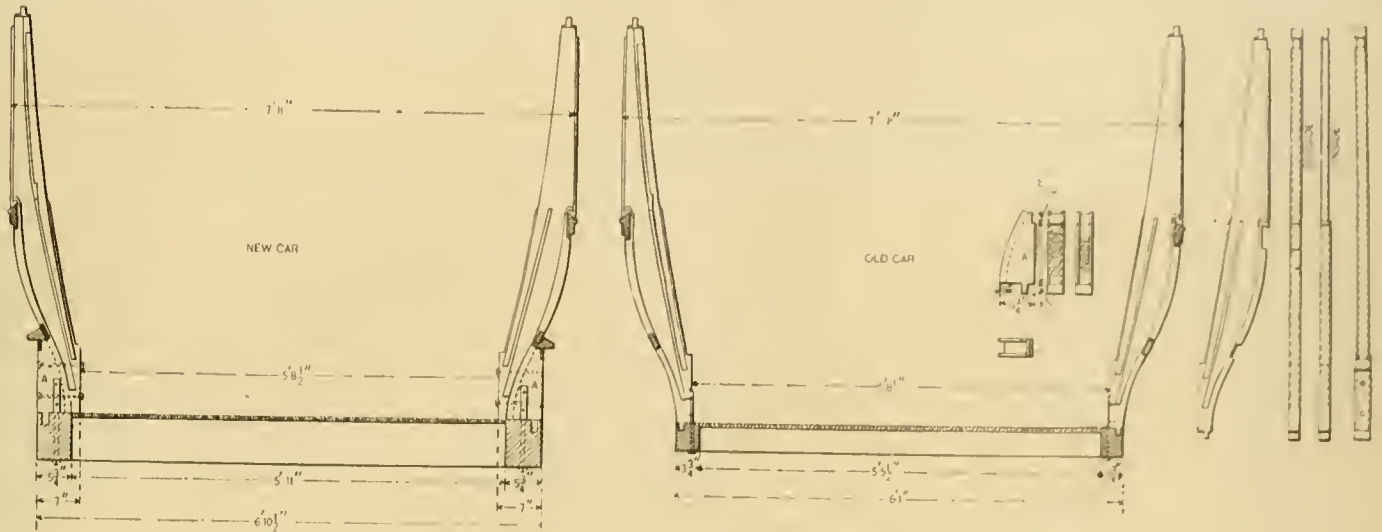


FIG. 5—SECTIONS OF NEW AND OLD CARS.

manager of the Rochester Railway Co., and to Mr. Alfred Green, master mechanic, for the data and illustrations.

is at present in every way distinct from the Milwaukee Electric Railway & Light Co., but the ultimate purpose is to bring the properties all under one head."

McGUIRE FACTORY IN ENGLAND.

Mr. W. A. McGuire, president of the McGuire Manufacturing Co., of Chicago, returned from Europe last week, and reports electric railway matters as exceedingly lively, both in England and on the continent. While the McGuire company has made no effort to do European business because of its geographical location, the number of inquiries for its work has induced it to institute a branch factory in England. Its present plans are to have the works running within six months, and it is the intention to make all such street railway equipment that is manufactured by the Chicago concern. In the meantime it has established an office at 5 Warwick Court, High Holborn, London, W. C., and is actively in the field for everything that is going. Until the factory is completed all orders will be filled from America. The McGuire company at the present time is exceedingly busy, especially in the truck and snow sweeper departments. The company sold 62 sweepers last fall and from present indications will exceed that number the coming season. We wish the company a prosperous career in Europe. If it repeat its American record, it will add a most creditable concern to the institutions of England.

LARGE ORDER FOR SPECIAL WORK.

The Falk Co., of Milwaukee, through its second vice-president, Mr. C. C. Smith, has closed a contract with the Metropolitan Street Railway Co., of Kansas City, Mo., for supplying and laying a number of pieces of special work in that city as follows:
 One branch off from Union Depot line into the post office with two special cross-overs.
 A three-part Y to connect with crossing now in place at 5th and Main Sts.
 Special layout at 5th and Delaware Sts., including connecting curves and switches at both ends.
 Double track three part Y at Summit St. and Southwest Boulevard, and a similar one at 25th St. and Southwest Boulevard.
 Six standard cross-overs.

AMERICAN ELECTRICAL WORKS' CLAM BAKE.

One of the pleasantest events of the year, and one that is eagerly looked forward to by several hundred members of the electrical fraternity, is the annual clam dinner given by Mr. Eugene F. Phillips, general manager of the American Electrical Works, of Providence, R. I. The bake was held this year on September 13th, at the Pomham Club as usual, and as usual the day was spent in renewing old acquaintances, in story telling and in doing justice to the bountiful refreshments provided, both solid and otherwise. Mr. Phillips was again voted the prince of entertainers.

IMPROVED CARBON BRUSH.

The desirable qualities in a carbon brush are that it shall be self-lubricating, of low resistance, and not blacken or gum the commutator. For the brush to be self-lubricating it is necessary that a fine grade of carbon be used, and it must be so treated as to close the pores and enable the brush to take a high polish. Further, the special treatment given it should not increase the electrical resistance of the brush.
 The Speer Carbon Co., of St. Marys, Pa., has recently put on the market a brush which it claims is superior to anything of the kind heretofore produced. The maker guarantees that these brushes will last many times longer than any other brush made; that they will take a high polish and constantly lubricate the commutator without gumming; that the electrical resistance is very low; that they will not crumble and chip, and that they will not cut the commutator. Samples will be supplied on request.

CHICAGO-MILWAUKEE ELECTRIC LINE.

On August 24th the Wisconsin Traction, Light, Heat & Power Co. was incorporated by H. C. Payne, John I. Beggs, Chas. F. Pfister and F. G. Bigelow, all officers of the Milwaukee Electric Railway & Light Co.
 "The object of the new corporation," explains Mr. Beggs, "is primarily the uniting and fostering of certain small properties in the Fox River valley, and that object for the present at least will be the sole one. The articles, however, provide for extensions, and

CONDUCTORLESS CARS FOR BOISE CITY.

The Boise City (Idaho) Rapid Transit Co. has decided it can give a better service if it does away with conductors and returns to the fare box system. The rear platforms of its cars will be entirely shut in by gates and passengers will be required to enter and leave by the front doors. They will deposit their fares in boxes within sight of the motorman, who will give change if necessary.
 The company promises to apply the saving thus effected toward running additional cars, giving a more frequent service.

FOREIGN FACTS.

The Chester (Eng.) tramway system is to be extended.

The Farnworth (Eng.) tramway has been changed from horse to electric traction.

The Newcastle (Eng.) Tramways Committee proposes to extend its electric lines into Benwell.

The city authorities of Munich are planning to build 30 new electric lines in and about the city.

Berne, Switzerland, is to spend nearly \$10,000 in improving the municipal street railway system.

The Oldham (Eng.) Corporation has applied for sanction to borrow £280,000 for electric tramways.

The Calcutta (India) Tramways Co. during its last fiscal years earned £68,719 gross and £8,030 net.

A municipal tramway scheme for Bath, Eng., is said to have the approval of every local authority interested.

The tramway committee of the Glasgow Corporation is advertising for bids for building several extensions.

In the District of Birkenhead, Eng., the work of constructing electric tramway is being carried on vigorously.

A tramways provisional order has been granted the Urban Electric Supply Co., of Glosop, Eng., by the town council.

Plans and estimates have been prepared for equipping the lines of the Morecambe (Eng.) Tramways Co. with electricity.

The Derby (Eng.) City Council is seeking powers to construct a system of electric tramways at an estimated cost of £200,000.

It is expected that the Compton tramway route at Plymouth, Eng., will be electrically equipped and ready for opening by March, 1901.

The lighting and traffic committee of the Newport (Eng.) Corporation has resolved to build a new power station for the tramways.

A scheme for electric tramways in Bowness, Eng., has been submitted by the British Electric Traction Co. and approved by the council.

It has been resolved by the Maidstone (Eng.) Corporation to apply for a provisional order for constructing and working electric tramways.

Electric traction is about to be applied to the lines of the Compagnie de l'Est Parisien, from Noisy, Fontenay, Raincy, Bondy and Pantin to Paris.

Concessions for five new electric lines in the Northwest section of Paris have been granted to the Compagnie des Tramways Mecaniques des Environs de Paris.

A committee has been appointed by the Bombay (India) municipality to report on the advisability of the city's purchasing the tramway lines of Bombay and equipping them with electricity.

An electric tramway at Lyndhurst in the New Forest, Eng., has been proposed. Mr. E. Kite of Lyndhurst, and Mr. C. J. Wharton, Palace Chambers, Westminster, London, are the promoters.

During the month of July, 1900, the value of electrical goods and apparatus imported into the United Kingdom was £129,022. The total for the seven months ending July 31, 1900, was £549,275.

La Capital Tramways Co., of Buenos Ayres, Argentine, has acquired the property of the New and the Grand National Tramways companies and both systems will be converted to electric traction.

Electric traction on the overhead system is fast superseding the old horse traction lines in Munich. A uniform charge of 10 pfennige is made for a journey of any length where no change of cars is involved.

The official opening of the Sunderland (Eng.) Corporation Electric Tramways took place last month. Luncheon was served at the town hall and several cars laden with visitors made the round trip over the line.

There are many indications that India within the next few years will become an important market for electrical tramway apparatus. The latest scheme proposed is an electric railway from Hyderabad to Secunderabad.

The tramway lines in Moscow, Russia, are about to be extended and will reach a total of 84 miles. At the same time the present horse lines will be equipped electrically, part with the overhead system, part with the surface-contact system and part with accumulators.

An agreement has been reached between the city of Birmingham, Eng., and the Birmingham City Tramways Co., relating to the erection of the overhead system in Bristol Road. The Tramway company will procure the necessary materials and proceed at once to convert the line.

English steam roads are beginning to feel the effects of electric tramway competition. The chairman of the Great Northern Ry., in his annual report stated there was a decrease last year in the Yorkshire district of more than 200,000 passengers carried due to the opening of parallel electric lines.

So satisfactory have been the results with electric traction as applied to the underground roads of London, that a committee consisting of three members has been appointed by both the Metropolitan and District companies to report upon the question of applying electricity to what is known as London's "Inner Circle" railways.

In the House of Commons the following bills have passed third reading: Wirral Ry., Croydon Tramways, Plymouth, Devonport & Stonehouse Tramways, Cork Electric Tramways, South Staffordshire Tramways, Aston Manor Tramways, Great Grimsby Street Tramways, Mersey Ry., Rawmarsh Urban District Council Tramways and Hastings Tramways.

Indian Engineering, published at Calcutta, says the superstition about the kidnapping of children to bury under the foundations of railway bridges, which has more than once caused trouble in India, is now widespread in China and seldom is a new bridge commenced without the disappearance of several children from the neighborhood.

The Board of Trade has confirmed the following light railway orders: Bexhill & St. Leonards Light Ry., to run from Bexhill to St. Leonards, in the county of Sussex, Eng.; Cheltenham & District Light Ry., from Cheltenham to Cleeve Hill, in the County of Gloucester, Eng.; Robertsbridge & Pevensey Light Ry., from Robertsbridge to Pevensey, in the county of East Sussex, Eng.

In the House of Lords the following bills have passed third reading: Bexhill & Rotherfield Ry., Vale of Rheidol Light Ry., Airdire & Coatbridge Tramways, Brighton Corporation Tramways, Reading Corporation Tramways, Wellingborough & District Tramroads, Nottingham Corporation Tramways, Bournemouth Corporation Tramways, Southeastern Metropolitan Tramways, Aberdeen Corporation Tramways, Blackpool, St. Anne's & Lytham Tramways, Bradford Corporation Tramways, Baker St., & Waterloo Ry. and Croydon Tramways.

HALF FARES.

The Los Angeles (Cal.) Railway Co. is fitting its cars with air brakes.

An eastern syndicate is seeking a franchise for a street railway in Corsicana, Texas.

The Chicago Union Traction last month earned \$10,700 more than in August, 1899.

A new interurban line between Kalamazoo and Battle Creek was opened last month.

The Toledo (O.), Fremont & Norwalk Electric Ry. began regular operation September 12th.

The Charlotte (N. C.) Electric Railway, Light & Power Co. is equipping its cars with air brakes.

Over 600 men are now at work building the Columbus (O.), London & Springfield Traction Co.

The Altoona & Logan Valley Electric Railway Co. has increased the wages of its trainmen 7 per cent.

It is announced that the proposed Jamesville (Wis.), Beloit & Rockford Electric Ry. will not be built.

Semi-annual dividend No. 1, of 2 $\frac{1}{4}$ per cent, was paid by the Boston Elevated Railway Co. August 15th.

Three New Yorkers recently made the trip to Boston by trolley and pronounced it a most agreeable excursion.

The Union Traction Co., of Anderson, Ind., has ordered a private car for the use of General Manager Henry.

The Penobscot Central Ry., of Bangor, Me., has completed the building for its new power station at Kenduskeag.

The employes of the Toronto (Ont.) Railway Co. have asked an increase in wages from 16-23 to 20 cents per hour.

The Union Traction Co., of Philadelphia, has effected large reductions in its fixed charges by refunding its bonds.

The South Jersey Electric Light & Traction Co. is reported to be anxious to build a 3-cent line in Camden, N. J.

The employes of the United Traction Co., of Pittsburg, held their annual picnic at Calhoun Park on September 4th.

Thirty-five persons were injured in a collision between a horse car and an electric car at Paris, France, on August 16th.

At Montgomery, Ala., the negroes express their disapproval of the separate seat ordinance by boycotting the street cars.

The Cincinnati Street Railway Co. has named its four new special outing cars, Manila, Santiago, Porto Rico and Honolulu.

The Citizens Railway Co., of Fort Scott, Kan., ceased operation of the road on August 31st, poor business being given as the cause.

The assessment of the Indianapolis (Ind.) Street Railway Co. has been increased from \$1,000,000 by the state tax commission to \$3,500,000.

The Consolidated Traction Co., of Pittsburg, has issued an order that trainmen must not indulge in the use of chewing tobacco when on duty.

The public of Santiago de Chile is greatly delighted with the new electric railway opened September 2d, in the presence of President Errazuriz.

Representatives of a number of street railway companies in Ontario met in Toledo a short time ago and formed an amusement circuit.

There is a report that the Lynn & Boston Street R. R. will have some of its cars lettered in Hebrew, but we have no confirmation as yet.

The employes of the Toledo (O.) Traction Co. in addition to their band have a baseball team that judging from the record thus far is a good one.

A new issue of 4 per cent bonds of the Hartford (Conn.) Street Railway Co. was allotted last month. They were all taken by the stockholders at 103.

The recent report of a street car hold-up at Racine, Wis., had its origin in the fact that two tramps boarded a car and solicited the passengers for money.

It is announced that the change from storage batteries to the overhead trolley system will be made by the Chicago Electric Traction on September 15th.

The Chicago street railways are engaged in fitting their winter cars with vestibules. The date when the vestibuled cars are required is November 1st.

Charles T. Davis, one of the men convicted of conspiracy to depreciate Brooklyn Rapid Transit stock, has been admitted to bail pending an appeal.

Two wire thieves, men 50 and 52 years of age respectively, were recently caught taking bond wires from the tracks of the Reading (Pa.) & Womelsdorf Ry.

The North Jersey Street Railway Co., of Jersey City, N. J., has announced that it will build a line over the Bergen Turnpike from Hoboken to Hackensack.

A car of the Omaha & Council Bluffs Railway & Bridge Co. was held up about midnight, August 14th, and his watch and money taken from the conductor.

The Richmond (Va.) Passenger Railway & Power Co. and the Richmond Traction Co. are endeavoring to arrange an agreement for the interchange of transfers.

It is stated that an agent of the shah of Persia is in this country examining trolley systems preparatory to building an electric railway from Teheran to the Caspian Sea.

Over 1,500 ft. of copper wire was taken from the poles of the Newtown (Pa.) Electric Ry. one morning last month by five men who were acting in the guise of inspectors.

August 14th the 16 year old daughter of a conductor of the St. Louis Transit Co. had her shirt waist torn off by a crowd of boys because she had been riding on her father's car.

The postmaster at Chattanooga will establish a sub-station, to be conducted in connection with the Chattanooga Electric Ry. The street cars will be equipped with mail boxes.

The Aurora & Geneva Street Railway Co. is negotiating with the Chicago & Northwestern Ry. for the building of a tunnel under the eight tracks of the latter company at Geneva.

The 36-miles electric line of the Quebec (Can.) Railway, Light & Power Co. to the Roman Catholic shrine of St. Anne de Beaupre was opened August 19th. About 60 cars are run daily.

The two injunctions issued August 19th, restraining the Columbus (O.), London & Springfield Traction Co. from building its terminal loop in Columbus were dissolved August 28th.

The joint committees on judiciary and railroads, of the Milwaukee council, have reported adversely on a proposed ordinance requiring the street railway company to use girder rails.

Wire thieves recently carried off 500 lb. of copper from the New York & North Shore road in Flushing, L. I., causing a delay of two hours in the traffic between Jamaica and Far Rockaway.

A car of the United Traction Co., of Pittsburg, was destroyed by fire while enroute to the barns, after having completed its last run. The cause is believed to have been defective wiring.

One Darlington Davis, of Evansburg, Pa., is now in jail at Norristown, Pa., in default of \$100 bail. He is charged with tampering with the brakes on a car of the Schuylkill Valley Traction Co.

Broken wires caused the underframing on two electric cars of the New York, New Haven & Hartford to take fire one day last month. Two or three passengers were injured by jumping from the car.

Last month work on the Seattle & Tacoma Electric Ry. was resumed, the company laying 1,500 ft. of track to enable materials to be transported for building the trestle work over the tide flats.

The Boston Elevated Ry. early in September put on a new line of cars and arranged the route so that the fare to Brighton, Medford, Charlestown, Malden and Somerville is now 5 cents instead of 8 cents.

A citizen of Racine, Wis., has petitioned the attorney-general to institute quo warranto proceedings to annul the street railway franchise granted by the Kenosha common council to P. F. Haynes and G. L. Clause.

The Metropolitan West Side Elevated Railway Co., of Chicago, declared its second dividend, of 2 per cent, payable August 31st. The first dividend was 2½ per cent paid Feb. 28, 1900, for the fiscal year ending that day.

Patrons of the Central London Ry., the recently completed underground line, find that a ride in the "tuppenny tube" is very agreeable on a hot day, the temperature being about 30 degrees below that of the street.

Olcott Beach Park, a new pleasure resort of the International Traction Co., of Buffalo, was opened on August 29th, the new 12-mile line between Lockport and Lake Ontario being formally dedicated at the same time.

The Atlanta (Ga.) Rapid Transit Co. has leased three miles of track from the Seaboard Air Line and is building the necessary tracks in Atlanta so as to make connection and give an interurban line from Atlanta to Decatur.

An inclined elevator has been built as an experiment at the Third Ave. and 50th St. station of the Manhattan Elevated Ry., New York City. It is operated by electricity and has a capacity of 3,000 passengers per hour.

The Metropolitan Band, composed of employes of the Metropolitan Elevated road, Chicago, gave its second annual excursion and dance on September 2d; two special trains carried the party to one of the summer gardens.

The Brooklyn Rapid Transit Co. is seeking to redeem the property of the old Brighton Beach R. R., which was sold for taxes in 1895. The property is now part of the Brooklyn Union Elevated road controlled by the Transit company.

The San Francisco (Cal.) & San Mateo Electric Ry. with 28.3 miles of track reports gross earnings for the last fiscal year of \$224,425 as against \$204,440 for the preceding year. The figures for expenses of operation are \$189,715 and \$187,448.

A petition has been filed asking to have a receiver appointed for the Columbia (Pa.), Ironville & Mt. Joy Street Railway Co., a

corporation chartered five years ago to build a road through the cities indicated in title. This line was never built.

Preliminary arrangements have been concluded with the North Jersey Street Ry. and the Jersey City, Hoboken & Paterson Street Ry. for a pouch mail service between Jersey City and the Hudson County towns reached by the lines of these companies.

The court has dissolved the injunction which has heretofore prevented the Harrisburg (Pa.) & Mechanicsburg Electric Railway Co. from building a trolley line down the Cumberland Valley. It is announced the extension will be completed at once.

The city of Grand Rapids, Mich., has sued the Grand Rapids Railway Co. to recover some \$3,000, alleged to be due for maintaining patrolmen at certain street crossings. The time covered by these amounts is from Sept. 25, 1899, to Aug. 1, 1900.

Miscreants at Richmond, Ind., on September 2d smeared soap on the street railway tracks of the Earlham division and as a result there were two collisions, the men being unable to stop their cars. One motorman and two passengers were slightly injured.

The boycott of the Montgomery, Ala., street cars by the negroes has proved to be a very good thing for the company. The greater use of the cars by the white people has increased the receipts of the belt line 20 per cent over the highest earnings heretofore.

A 7-year-old Chicago boy tried the old experiment of tying a cord around his waist and dropping the other end in the cable slot to get quick action. The end caught, but fortunately the cord was cut through by rubbing on the slot rails after the boy had been dragged 50 ft. He was bruised and cut, but not fatally injured.

Reports as to the traffic on the Central London Ry., the underground electric line from Shepherd's Bush to the Bank, recently opened, are very gratifying to the management. On the opening day 83,000 passengers were carried; the number rose to 91,600 on the second day, to 93,000 on the fourth, and has been steadily increasing.

The strike and boycott against the East St. Louis (Ill.) Electric Street R. R. have been formally raised, all the striking employes having secured employment elsewhere. None of the old men is seeking employment of the railway company, but it was believed that the matter being ended practically it would be well to end it theoretically.

Engineers are at work preparing plans for a 12-mile extension for the Detroit, Plymouth and Northville electric line, reaching from Wayne to the city limits of Detroit. Secretary Russel reports that the financial arrangements from the extension have all been completed and that some work will be done yet this fall, although no effort will be made to place the extension in operation until early spring. Ashwell & Co., Detroit, will have charge of the engineering.

The Inland Traction Co., of Souderton, Pa., is meeting with serious opposition to its proposed extension from Lonsdale to Chestnut Hill. The points of objection are that the turnpike which it will occupy is too narrow; that it will endanger the lives of children going to Sunday school and annoy church congregations; that it will depreciate the value of farm lands; that compensation is not offered for land taken, and that cheap fares will bring tramps and thieves to the neighborhood.

The Detroit city council has passed an ordinance requiring all street cars operated within the city to be equipped with air or electric brakes. The companies have until next spring to comply with the ordinance. General Manager du Pont will give the matter his personal attention as soon as the busy summer season is over. His plan is to equip cars of the same type with the various new and old brakes and give all a trial under the same circumstances and conditions. There will be about 700 cars to be equipped.

RAIL AND TIE QUOTATIONS.

The expected slump in the iron and steel markets has not yet occurred, prices remaining as they have been for the past two or three months. It is still confidently predicted, however, by those who claim to know, that present quotations cannot hold and there will be a big drop as soon as the scramble for orders begins. Heavy T rails are \$35 to \$37; girder sections, \$40 to \$44.

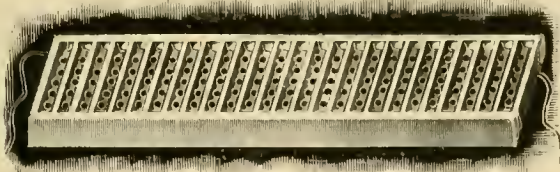
Cedar and yellow pine ties can be purchased at same prices as given on page 478 of our last issue.

MR. YERKES IN LONDON.

Dispatches from London under date of September 11th say that Mr. Charles T. Yerkes has organized a syndicate which is about to acquire control of the Metropolitan District Ry., and has purchased the franchise of the Charing Cross, Eaton & Hampstead company which is to build a tunnel road $4\frac{1}{2}$ miles long. The business associates of Mr. Yerkes in Chicago state that they have no knowledge of his reported plans.

NATIONAL ELECTRIC HEATERS.

The accompanying illustration shows the type of plate for electric car heaters which is made by the National Electrical Manufacturing Co. The plate is of sheet iron, corrugated and then heavily coated with white enamel which insures perfect insulation and at the same time prevents deterioration. The heating resistance is also imbedded in enamel and thus protected against cor-



rosion, or against a break that would ground the heater. The wires are so placed as to be free from mechanical strains and as the heater cools slowly when current is shut off, the wires are subjected to an annealing process each time. The form of heater plate is such as to give a large radiating surface for a small space. The company also makes a regulating switch which carries 25 amperes at 650 volts and can be arranged for three degrees of heat; a lock prevents the degree being changed until the main switch is opened. Both these devices are placed on the market by the Morris Electric Company of New York.

KODAKS IN YELLOWSTONE PARK.

The widespread use of small cameras, of one sort and another by travelers, has led to a great development of amateur photography. Yellowstone Park is by far the most prolific spot in this country for the gratification of this calling or amusement, particularly for those interested in prize contests. To photograph the soaring geyser; the eagles on their nests; the numberless cascades and waterfalls; the beautiful springs, or the Golden Gate and the Grand Canyon, is to obtain a noted collection of pictures.

But the park is also the only place where wild animals, as they live in nature, can now be easily caught with the camera. The elk, deer, antelope, bears, coyotes, buffalo, etc., that, while wild, have not the timidity of hunted game, make it comparatively easy to photograph them there. The bears especially are easily found.

When riding on the stage coaches, if cameras are kept in readiness, opportunities sometimes occur for snap shots at elk and deer drinking from the streams or crossing the roads. By exploring the forests and parks a little remote from the hotels, the animals can be found with little difficulty.

"Wonderland, 1900," a finely illustrated book published by the Northern Pacific Railway, has a chapter on Yellowstone Park and the animals there, and will be sent by Charles S. Fee, General Passenger Agent, St. Paul, Minn., upon receipt of six cents.

For rates, etc., address F. H. Fogarty, General Agent, 208 South Clark St., Chicago.

NOTICE CONCERNING TRUCK PATENTS.

The Peckham Truck Co. advises us that the recent decision on street railway truck patents rendered by Judge Shipman in a suit for infringement brought against the Third Avenue Railroad Co., of New York City, does not at all affect the validity of the patents granted to Mr. Peckham for certain combinations of elliptical and helical springs used in the Peckham truck. Elsewhere in this issue is a notice to the trade prepared by the Peckham company, and to which it particularly directs the attention of all who are interested in this subject.

NEW YORK MEETING.

The 18th annual meeting of the Street Railway Association of the State of New York will be held at the Iroquois Hotel, Buffalo, on Tuesday and Wednesday, September 18th and 19th. The papers include the following: "Rotary Transformers," "Power Distribution in Buffalo," "Use of Storage Batteries on Small Roads," "Electrically Welded Joints in Actual Operation," "Practical Experience in the Operation of Combined Public Franchises by One Company, and the Advantages to the Public and the Corporation."

The entertainments include excursions over several divisions of the International Traction Co's. system and over the Great Gorge Route, visits to the parks, the annual dinner at the Iroquois Hotel and a luncheon at the Dufferin Cafe.

The present officers of the association are: President, G. Tracy Rogers; vice-presidents, Charles Clemmshaw and John Boyle; secretary and treasurer, Henry A. Robinson.

WINS SUIT ON TROLLEY HARPS.

The Star Brass Works, Kalamazoo, Mich., announces the decision of the United States Circuit Court which has modified a former order and now permits the Star company to sell trolley harps. The suit was brought by the General Electric Co., and the court order in favor of the Star company was issued August 16th.

THE DALLAS STRIKE.

The press reports from Dallas, Tex., might lead one to think that there really was a street railway strike at that place. The facts as reported by our correspondent in Dallas are: "Only a small number of men went out on a strike, and their places were filled at once. The cars were not delayed at all, and have since been operated as usual without any appreciable difference in traffic."

NOISELESS CAR WHEELS.

The Chicago City Railway Co. and the Chicago & Milwaukee Electric Railway Co. are each making a trial of noiseless car wheels which are the invention of Mr. I. Hogeland, 1113 Monadnock Block, Chicago. The wheels now in service on the Chicago & Milwaukee line are 33 in. in diameter while those under the Chicago City car are 30 in. in diameter, otherwise they are similar. The centers are of cast iron of the spoke type; the tires are of chilled cast iron and between the two sections is placed a layer of paper, the paper in a wheel weighing about 2 $\frac{1}{2}$ lb. The edge of the center and the inside surface of the tire are stepped and beveled so that the two pieces can be drawn tightly together. The fastenings consist of 12 $\frac{7}{8}$ -in. machine bolts placed parallel to the axis which are set up with a 30-in. wrench and the ends riveted over.

Besides the claim for noiseless running it is also stated that the Hogeland wheel is much cheaper in the long run, the cost of renewing (a new tire and the paper) being from \$1.50 to \$2.00 less than the cost of a new cast iron wheel of the ordinary type.

A safety water column of simple design is made by the Pittsburg Gage & Supply Co., Pittsburg. The device consists of a seamless copper float placed in the water column to which the gage glass is attached, and rises and falls as the water level varies. Should this level become either too low or too high for safety the float opens a valve which admits steam to a small whistle mounted on top of the column, thus sounding the alarm.

NEW PUBLICATIONS.

LEWIS INSTITUTE School of Engineering.—This is an illustrated pamphlet of 50 pages, describing the equipment of the Lewis Institute, Chicago, with particular reference to the school of engineering.

L'ALBUM DES ELECTRICIENS. Price 5 francs; foreign subscriptions, 5.50 francs.—The editors of L'Electricita announce they have issued a very handsome album containing 200 phototype portraits of men to whom the science and art of electricity owe their present development. The book is printed on fine art paper, quarto in size, but aside from its artistic merits should be valuable for reference. L'Electricita is a weekly paper of 19 years' standing published at Milan, Italy, via Cusani et.

ARTHUR KOPPEL'S ALBUM FOR 1900.—This interesting publication is a book of 50 pages giving descriptions and illustrations of a few of the field railways and light railways installed by Arthur Koppel, of Berlin. Among the countries represented by illustrations are Norway, Sweden, Denmark, Great Britain, Belgium, Holland, France, Germany, Russia, Austria, Italy, Egypt,

manual of the methods, utility, and cost of public improvements for the municipal officer, and the preface further explains that it is particularly intended as an aid to those members of town and city councils whose education and training have not made them familiar with the details of the municipal improvements to be undertaken during their terms of office. The first edition was published in 1892, and the present edition has been considerably enlarged, seven chapters having been added in the last revision. It does, in fact, constitute a valuable handbook for one seeking practical information concerning the building of sewers, streets, water-works, cemeteries, public halls and other improvements which a municipality is called upon to make or superintend. The author has added three chapters of what he calls "notes by the way," in which are given his ideas on elevated traffic versus subways, on civil service appointments, and on municipal ownership. He believes that the two-story street is more advantageous than a subway and far less costly; that civil service examinations in many instances are absurdly impractical, and that municipal ownership is a failure because it removes all real incentive to progress and effort. Commenting on the dearth of business ability in municipal management, he says: "What can we promise in the way of an able management of a gas plant or a street railway when our cities and towns are mulcted annually of large sums of money because of defective sidewalks, badly kept street surfaces, and weak bridges?"



KOPPEL TRAMWAY IN PESCARA.

Togo, Transvaal States, Persia, India, China, Japan, Australia, and nearly all the states of Central and South America. The album has all announcements and descriptions printed in six languages, and to this thorough method of advertising the firm doubtless owes a great part of the large foreign trade that it enjoys. The accompanying illustration shows a Koppel railway in Pescara, Italy.

DUNCAN'S MANUAL of Tramways, Omnibuses & Electric Railways, 23d annual edition. Published by T. J. Whiting & Sons, Limited, 7A South Pl., London, E. C. Price, 3s. 6d.—The 1900 edition of Duncan's Manual contains over 450 pages, being considerably larger than any previous issue. As heretofore the publication includes the tramway and omnibus companies of the United Kingdom, and the foreign and colonial companies that are registered in England; wherever it has been possible to do so an analysis of the revenue accounts is given. Some 15 new companies have been added and 5 foreign roads are this year omitted by reason of their being no longer controlled by English companies. Following the statements of accounts are extracts from the Tramways Act and samples of the by-laws adopted by English companies. The last 86 pages contain a directory, alphabetically arranged, of the directors, officials, engineers and auditors of the enterprises mentioned, and also of firms and individuals closely connected with the tramway industry. The publishers have won an enviable reputation for accuracy by their previous editions of the manual, and the same high standard is preserved in the present book.

MUNICIPAL IMPROVEMENTS. By W. F. Goodhue, Civil Engineer. Third Edition; 207 pages. Published by John Wiley & Sons, New York. The sub-title of this book shows that it is a

THE CAR-HOUR UNIT.

At the Chicago convention of the Street Railway Accountants' Association, Mr. H. C. Mackay, comptroller of the Milwaukee Electric Railway & Light Co., presented a paper in which he argued in favor of the car-hour instead of the car-mile as a unit for comparing the results of street railway operation. The discussion was very animated and indicated that there was considerable opposition to the proposed plan. Since then, the car-hour as a basis for comparing different lines has been adopted by the Milwaukee company and also by the Twin City Rapid Transit Co., of Minneapolis.

The Milwaukee Electric Railway and Light Company.

Report of Passenger Earnings.

For
 Tickets Collected,
 25 for \$1.00,
 6 for 25c.

COMPARISON MADE WITH SAME DAY OF THE WEEK.	CAR HOURS.		EARNINGS.			Increase or Decrease.	
	1900	1899	Car Hour.		1900		1899
Wells St.—Farwell Av.			1900	1899	1900	1899	
Fond du Lac Av.—National Av							
Walnut St.—National Av.							
Sixth Av.—Third St.							
Greenfield Av.—Third St.							
Oakland Av.—Russell Av.							
Holton St.—Mitchell St.							
Muskego Av.—Eighth St.							
Clybourn St.—Grand Av.							
Twelfth St.—Grand Av.							
Private Cars.							
Miscellaneous							
Total.							

YEAR.	Comparison made with Current Date.	MILEAGE.			EARNINGS.		
		Day.	Month to Date.	Year to Date.	Car Hour	Month to Date.	Year to Date.
1900							
1899							
Increase or Decrease.							

The accompanying reproduction shows a portion of the daily earnings sheet of the Milwaukee company, some of the names of divisions being omitted; the original is 8½ x 14 in., and has a similar ruling for the Milwaukee Light, Heat & Traction Co., which operates the interurban lines of the Milwaukee system. Some figures of actual operation are as follows:

Line.	Speed M.P.H.	Earnings per Car-Mile.	Earnings per Car-Hour.
1	8.3	\$.33 1-3	\$2.76
2	16.2	.2857	4.63
3	10.7	.2679	2.86

On the Twin City road it was found that lines showing the greatest earnings on a car-mile basis were inferior to others on the car-hour basis, the speed making the difference.

CHAS. J. MAYER,
President.

A. H. ENGLUND,
Sec'y & Treas.

THE MAYER & ENGLUND CO.

10 SOUTH TENTH STREET,
PHILADELPHIA, PA.

CABLE ADDRESS:
"MAYLUND" Philadelphia.
A. B. C. Code, 4th Ed.

NEW YORK OFFICE:
85 LIBERTY STREET.

Electric Railway Material and Supplies of Every Description.

~~~~~

We are exclusive Territorial Representatives of the following leading Manufacturers of Railway Materials:

|                                                                                                                   |                                                                                                 |  |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--|
| <p>R. D. Nuttall Co.,<br/>Gears, Pinions, Bearings, Trolleys, Etc.      Allegheny, Pa.</p>                        | <p>The International Register Co.,<br/>Single and Double Fare Registers.      Chicago, Ill.</p> |  |
| <p>Van Wagoner &amp; Williams Hardware Co.,<br/>Dropped Forged Copper Commutator Segments.      Cleveland, O.</p> | <p>W. T. C. Macallen Co.,<br/>Standard Overhead Insulating Material.      Boston, Mass.</p>     |  |
| <p>The Protected Rail Bond Co.,<br/>"Protected" Flexible Rail Bonds.      Philadelphia.</p>                       | <p>Bradford Belting Co.,<br/>"Monarch" Insulating Paper.      Cincinnati, O.</p>                |  |
| <p>American Electric Heating Corporation,<br/>Electric Car Heaters of Every Design.      Boston, Mass.</p>        | <p>Sterling Varnish Co.,<br/>Sterling New Process Insulating Varnish.      Pittsburg, Pa.</p>   |  |
| <p>Chisholm &amp; Moore Manfg. Co.,<br/>Moore's Chain Hoists.      Cleveland, O.</p>                              | <p>Garton Daniels Electric Co.,<br/>Garton Lightning Arresters.      Keokuk, Ia.</p>            |  |
| <p>New York &amp; Ohio Co.,<br/>"Packard" Incandescent Lamps.      Warren, O.</p>                                 | <p>D. &amp; W. Fuse Co.,<br/>Enclosed Non-Arching Fuses.      Providence, R. I.</p>             |  |

Special Agents: AMERICAN ELECTRICAL WORKS, Providence, R. I.

~~~~~

We carry the largest stock in this country of Strictly Electric Railway Material.

We are now occupying our entire building, five floors and basement.

Special Attention Given to Export Business.

Send for Catalogues.

TRADE NOTES.

THE JACKSON & SHARP CO., of Wilmington, Del., has recently completed an order for 100 trolley cars for Paris, France.

THE HUNTER ILLUMINATED SIGN CO. has just closed a contract with the Washington (D. C.) Traction & Electric Co. for the equipment of all its cars with signs.

THE TRIUMPH ELECTRIC CO., of Cincinnati, reports a large business, and says that the trade for the past year is over 50 per cent more than for the previous year.

THE BETHLEHEM STEEL CO. advises us that its office at St. Louis has been discontinued, and that the business in that territory will henceforth be handled by the Chicago office.

J. G. WHITE & CO., LTD., have been incorporated in London with capital of £100,000, to build railroads, tramways and telegraphs and to represent the firm of J. G. White & Co., of New York.

THE IMPERIAL ELECTRIC LIGHT, HEAT & POWER CO., of St. Louis, after a thorough trial of a year, has placed duplicate order for the Siegrist automatic oiling system for some new units it is now installing.

THE MORRIS ELECTRIC CO., 15 Cortlandt St., New York, has recently secured a large order for 8,000 iron poles to be used by the General Electric Co. in India. Mr. Morris also reports the shipment of five cars to Mexico.

THE MICA INSULATOR CO., Schenectady, N. Y., was awarded a gold medal for its unique exhibit of mica and micanite at the Paris Exposition. The award was made not only on the merits of the exhibit, but in consideration of the Mica Insulator Co. being the original inventor and patentee of "Micanite."

THE ROCKFORD RAILWAY CO., Rockford, Ill., has commenced installing the Weber joint on its lines, and will probably use this joint on its entire system. The sale was made by Mr. F. A. Poor, of the Chicago office.

THE STEWART HARTSHORN CO., of East Newark, N. J., has been awarded a medal of merit for its exhibit of self-acting curtain and shade rollers in the United States Department of Varied Industries at the Paris Exposition.


THE EDWARD P. ALLIS CO., Milwaukee, Wis., has established a branch office at 110 Mill St., Spokane, Wash., discontinuing the office at Butte, Mont. Mr. H. V. Croll has been placed in charge of the office at Spokane.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has issued Circular No. 59, of its regular series. The pamphlet describes and illustrates the installation of "Chloride Accumulators" in the mills of the R. & H. Simon Co., silk manufacturer, Union Hill, N. J.

THE MICHIGAN MANUFACTURING CO., Ypsilanti, Mich., reports an exceptionally lively trade, both at home and abroad, in track drills. Four of these drills were recently shipped to the City of Mexico, this being the second order received from the same parties this year.

THE CRANE CO., of Chicago, has sent us a very handsome metal sign printed in colors, showing the company's 18-in. No. 11-E iron gate valve with outside screw and yoke and by-pass. This type of valve is used extensively in the equipment of power plants, which has become such an important part of the Crane Co's. business.

A. L. IDE & SONS, of Springfield, Ill., have recently issued "Supplement No. 42," which is an 8-page pamphlet illustrating and describing their four-ported engines, which show a steam distri-



THE P & B

DENOTES THE WORLD'S STANDARD

P & B ELECTRICAL COMPOUNDS
The Standard for General Insulation. Quick Dryer, Penetrating, Elastic, Tenacious.

P & B ARMATURE AND FIELD COIL VARNISH
Made of Highest Ingredients. Elastic, Moisture Proof, Unaffected by Oil or Great Heat.

P & B INSULATING TAPE
No Rubber— Will not Vulcanize with Heat, or become Defective with Exposure and Use.

ALL THE ABOVE ARE ACID AND ALKALI PROOF.

— Write us about them. —

THE STANDARD PAINT COMPANY

NEW YORK 81-83 JOHN ST.	CHICAGO 189 FIFTH AVE.	HAMBURG GRIMM 33	PARIS 50 BOUL HAUSSMANN	LONDON 39 VICTORIA S.W.
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bution and economy closely approaching the Corliss type, and also embody the simplicity of the well-known "Ideal" engines which this firm has developed.

THE DICKE TOOL CO., of Downers Grove, Ill., has been awarded a bronze medal on tools at the Paris Exposition. This is the highest prize awarded on tools. Mr. Dicke was in personal attendance at the Paris Exposition and the exhibit created considerable interest among foreign manufacturers. Thomas G. Grier is the Chicago representative of the company.

THE DETROIT STEEL & SPRING CO., of Detroit, Mich., advises us that the fire at its works on the evening of August 19th was confined entirely to the foundry department, where steel castings for railway and other work are made. The rolling mills, spring shops, and other departments were in no wise affected. The loss was fully covered by insurance, and the foundry was again in operation in less than two weeks.

AS AN INSTANCE of direct returns from advertising, the Burt Manufacturing Co., of Akron, O., reports that it is crowded with orders as the result of an illustrated notice of its "Burt" exhaust head, which it has only recently commenced to advertise. "Any article of merit," claims Mr. Warden, manager of the company, "can be pushed successfully through judicious advertising in the trade journals, as we have demonstrated to our own satisfaction, at least."

THE GARTON-DANIELS CO., of Keokuk, Ia., has lately received a number of large and gratifying orders for lightning arresters, among others being one for 200 poles arresters from the Union Traction Co., of Philadelphia. The Garton-Daniels Co. expects to exhibit at the coming street railway convention in Kansas City, a perfected form of the "Automotoneer," a device for automatically regulating the speed at which the controller can be turned when starting a car.

STONE & WEBSTER, the well known electrical engineers, were completely burned out in the early morning of August 24th. Their offices occupied three floors at No. 4 Post Office Sq., Boston, and only the contents of the fire proof vaults escaped destruction. At 10 o'clock of the same morning the auditing and engineering departments were doing business in new offices at 95 Federal St., and it is more than possible that considerable activity was indulged in that morning.

THE CHICAGO MICA CO., whose main office is at its factory, Valparaiso, Ind., attributes the increase in sales of its products in the Central and Western States, to the fact that consumers of insulating materials appreciate being able to deal direct with the makers. The thorough equipment and organization of the Chicago Mica Co's. factory and its excellent location, 40 miles from Chicago on three trunk lines, enable shipments and deliveries to be made promptly and cheaply.

FISHER & SAXTON, 123 G St., N. E., Washington, D. C., have published their first catalog descriptive of the "Dromedary" mixer which has been introduced with great success for mixing concrete and mortar without the use of mixing platforms, wheel barrows, planks or other common accessories to the process. The catalog contains some 30 pages liberally illustrated with half-tone reproductions of the "dromedary" and a number of diagrams. It is printed on the finest paper and in the clearest type.

FOWLER & ROBERT, of No. 149 Broadway, New York, on August 16th incorporated their firm as the Fowler & Robert Manufacturing Co., to manufacture and deal in general railway supplies. The officers of the new company are J. W. Fowler, president; L. E. Robert, vice-president; G. W. Linch, treasurer, and F. Vieweg, secretary. Mr. Linch and Mr. Vieweg are both experienced street railway men. The former has been prominently connected with the Christopher & Tenth St. Ry. and the

THE CONVENTION CITY

Where Will Be Held October 16th—19th, the 19th Annual Meeting of the American Street Railway Association and the 4th Convention of the Street Railway Accountants' Association of America—
History of Missouri—Story of the Phenomenal Rise of Kansas City.

The coming of Christianity to the Mississippi Valley marked the beginning of its history. DeSoto, with his coterie of adventurers and priests, discovered the river in 1542. He found the country an unbroken wilderness, a barbarous solitude, and claimed it in the name of the king of Spain. That was the end of legend and the beginning of eventful modern times in the Western forests.

"When the Mississippi was first seen by white man," writes Mark Twain, "less than a quarter of a century had elapsed since Francis I's defeat at Pavia; the death of Raphael; the death of Bayard, sans peur et sans reproche; the placarding of the Ninety-five Propositions which began the Reformation. When DeSoto took his glimpse of the river Ignatius Loyola was an obscure name; the order of the Jesuits was not yet a year old; Michael Angelo's

guished office. They propitiated him with gifts of beads and furs. His march from Tampa Bay to the Mississippi under the verdant arches of the forest was that of a conqueror. But he found no gold. Everywhere through the trackless wilderness, over the barren sites of present cities, the lonely company of white men searched for caves of treasure, miraculous mines that should pour forth gold at the Spaniards' approach. Their quest was as erratic, as hopeless as that former one of Ponce de Leon searching for the waters of immortal youth in the Eden of Florida. A year or two of famine and disheartening failure, and DeSoto perished on the eastern border of what is now Missouri. The few followers that survived him kept his death secret from the Indians, fearing massacre should the savages learn that the protection of the Sun's Son was removed from them. DeSoto was buried at midnight in the



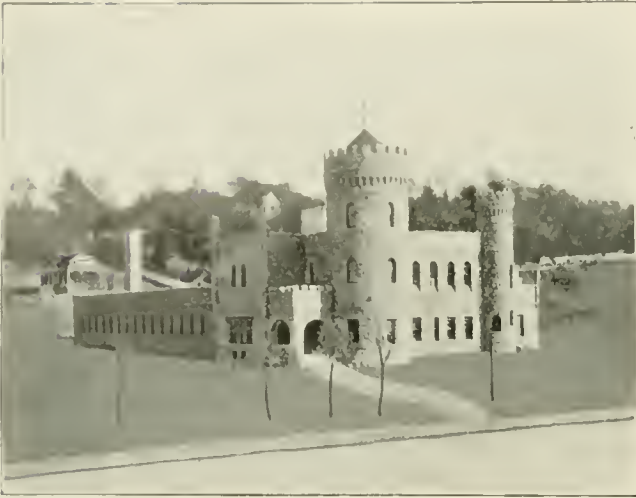
INCLINE—UNION DEPOT AND MANUFACTURING DISTRICT.

paint was not yet dry on the Last Judgment in the Sistine Chapel; Mary Queen of Scots was not yet born; Calvin, Benvenuto Cellini and the Emperor Charles V were at the top of their fame; the Spanish Inquisition was roasting and racking and burning. When DeSoto stood on the banks of the Mississippi it was still two years before Luther's death; 11 years before the burning of Servetus; 30 years before the St. Bartholomew slaughter; Rabelais was not yet published; Don Quixote was not yet written; Shakespeare was not yet born; a hundred years should elapse before Englishmen should hear the name of Oliver Cromwell. Unquestionably the discovery of the Mississippi is a datable fact which considerably mellows and modifies the shiny newness of our country and gives her a most respectable outside aspect of rustiness and antiquity."

The story of DeSoto's expedition is an unparalleled romance, and of all the expeditions to the new world it was the most disastrous. With nine ships, 700 men, 350 horses and the crudest of mechanical means DeSoto came to unearth a fabulous treasure in some unknown quarter of the continent, to wrest from the granite mountains, the river valleys and the primeval forests a quantity of gold and silver for the decoration of the Spanish court. DeSoto came with considerable pomp. He was believed by Indians to be the Son of the Sun, which they worshiped, and his shining rapier and resplendent dress were accepted as the livery of his distin-

Mississippi, an event remarkable as the first Christian ceremony solemnized in the western forests, and prolific of numberless dismal illustrations in the history readers of American school boys.

The early history of Missouri is inseparable from that of the entire Mississippi Valley. DeSoto had turned the eyes of the world upon this region. Within 130 years Marquette, Joliet and LaSalle completed DeSoto's work. Marquette, a French priest, named the Mississippi the Conception, in honor of the Virgin. The Missouri River, of which he was the discoverer, he called "Pekitanoui," meaning Muddy Water. The pious French soon established Catholic altars far to the northward, and pierced the wilderness of Missouri "to explain hell to the savages." Next came LaSalle, whose explorations gave Europeans their first accurate geographical knowledge of the Mississippi and its vast basin. LaSalle's first expedition was a victory. At the delta of the river he buried a silver plate, engraved with the arms of France, claiming the entire river valley for the French king, and naming it Louisiana in his honor. Through LaSalle, Louis XIV found a means of extending his domain, and sent out expeditions to colonize the wilderness. In a few years a miniature France mined, planted, fought and worshiped in the American forests. The Catholic missions became parishes. Forts guarded the frontier. Frenchmen became addicted to tobacco, and the Missouri and Illinois learned the use of firearms.



WORKHOUSE.

Crozat, who held the first Louisiana charter under the French king, ruled the colony by the same laws that governed Paris, and these were the first laws of civilized society that ever existed between the Gulf of Mexico and the Falls of St. Anthony. Later, the Mississippi Company was appointed to succeed Crozat, and under the new regime liberal inducements to French miners and mechanics were advertised. The tide of immigration swelled. Famous Fort Chartres 65 miles below the mouth of the Missouri was built in 1720, and was for a long time the strongest fortress on the continent. The Mississippi Company started the cultivation of wheat in Illinois, and that of tobacco, indigo, rice and silk throughout "Louisiana." The lead mines of Missouri were opened in the hope of finding silver, an experiment which nearly wrecked the company financially, and put the king in a bad temper. It cost him 50,000,000 livres yearly to support his colonial subjects while they wasted time in what amounted to an unavailing rainbow chase. But the French had a gambler's passion for risking all they had gained in the New World on the chance that the next venture would prove a lucky one. They believed that silver must abound in the unexplored West. Mining settlements sprang up and perished along the Missouri River, leaving no record. Ste. Genevieve, the oldest permanent settlement in Missouri, was founded. In 1719 Phillip Francis Renault, a director in the Mississippi Company, and a famous mining expert left France with 200 artificers and miners to solve the silver problem in Louisiana. In his passage he put in at the island of St. Domingo, where he purchased from the slave market 500 negro slaves for working his projected mines. Arrived in Louisiana he established his headquarters at St. Phillips, near Fort Chartres, and from here he sent out mining and exploring parties into various parts of Louisiana. The extensive lead mines on the St. Francis River, and those north of Potosi were discovered and the energies of the Mississippi Company were directed toward their development. The mines failed to yield silver. They were valuable, however, for the lead and copper they contained, and Renault continued their operation until 1731. He shipped great quantities of

these minerals from Ste. Genevieve, via New Orleans to France, and established a permanent industry west of the Mississippi. To him were made the first grants of lands in what later became the state of Missouri, and to him is attributable the introduction of negro slavery in Missouri. Thus, in the search for silver were sown the seeds of a national disgrace, which, more than a century later, ripened into the War of the Rebellion.

The colonial treasury was chronically empty. Next to mining, the fur trade was principally depended upon, and a grant of the exclusive privileges of trade in the north and northwestern part of the territory was made the firm of Maxent, Laclède & Co. Pierre Laclède Ligueste, or Laclède as he was generally known, though but a junior partner in the firm, was placed in command of an expedition which left New Orleans Aug. 3, 1762. The company spent the winter at Fort Chartres, and in February or March resumed their journey. On reaching the west bank of the Mississippi Laclède founded St. Louis by establishing his principal trading post on the site of the present city. He gave it the name St. Louis in honor of the French king, unaware that since his departure from New Orleans the entire valley had been ceded by France to Spain. The white flag of France was floated, a clearing made and a number of log cabins erected for the storage of merchandise. Other posts were established far to the West, near where Kansas City now stands. Guns and clothing were usually the articles exchanged for furs. The Indians showed a great preference for leather shoes, which they attached to strings of beads and wore as ornaments. The fur trade became the most important of colonial resources, and after 40 years amounted to \$200,000 per annum.

Disastrous mining ventures had exhausted the colonial treasury. A famine had brought death and devastation in the South. The disheartened colonists demanded the revocation of the Mississippi Company's charter, a demand with which the king willingly complied. In 1762 France could no longer support her prodigal colonies. The king had lost his power in Canada; his English enemies possessed Havana, and their ships in the harbor prohibited egress from the colonies by the sea. An incursion of the English into Louisiana was threatened, which would dispossess France of this territory forever. Hoping to save something from the wreck of his investment the French king ceded all Louisiana to Spain, which was then an ally of France. By this ruse the English incursion was forestalled, and forty years later France bargained for her colonies, which were retroceded by the treaty of 1800.

The colonies prospered during the 40 years that Spain ruled Louisiana. A happy commonwealth existed. Every head of a family was entitled to a house lot in his village, and to all the land he cared to cultivate, and in return it was required of him to keep a part of the highway in repair. An old historian writes disparagingly of these people, but admits that they were probably the happiest folk in the world. They had no politics to corrupt them, but were simply and loyally French. There was social intercourse but no society. Dancing and card games diverted everyone. The friendliest relations with the Indians were maintained, and from them the pioneers borrowed many customs, and learned their skill in the ways of hunters and woodsmen. No house was finer than its fellows, no man received more deference than he paid his neighbors. Slaves and cattle comprised wealth. There were no tailors, no shoemakers, no bakers, and no shops. Hogs, oxen and horses wan-



DELAWARE ST. NORTH FROM 7TH.

THE JUNCTION.

MAIN AND 9TH ST.



THE CONCOURSE.

dered at liberty through the village streets. Hospitality and honesty were the cardinal virtues of citizenship. "His magnanimous Majesty" attempted to establish schools, but not a single pupil was presented for the Latin class. The colonists cared not a fig for education. There were classes of manners, however, where the children were taught "politeness and self-denial." All were Catholics. The festivals of the church were observed devotedly, and anyone who joined in these celebrations with a gloomy countenance was suspected for a fraud and a hypocrite.

Money was as yet too scarce to be useful as a medium of exchange, though Spanish milled dollars circulated in the payment of certain debts. Peltry at a fixed rate was legal tender. The salaries which the priests, soldiers and officers received from the government were paid in foreign goods. The colonial "chef lieu" was removed from New Orleans to St. Louis, and Missouri's place as the commercial center of the colonies was established. Spain exacted little of her colonies in Louisiana. A duty of six per cent on all exports and imports was levied, aggregating \$120,000 annually. This, and a tax on salaries, legacies and liquor licenses, amounting to less than \$10,000, comprised Spain's only revenue from Louisiana.

While the pioneers of the Mississippi Valley were peaceably engaged in agriculture and the sowing of masses, the "Sons of Liberty" in the eastern colonies were bitterly resisting British oppression. England had prohibited manufactures in America. American farmers were compelled to send their products to England, and to purchase their goods in English markets. The odious Stamp Act of 1765 required that stamps bought of the English government should be put on all legal documents, newspapers and publications in English colonies in America. Exorbitant taxes were levied in order to defray the expenses of England's war with France, and the colonists were denied representation in the affairs of government. The Americans revolted. Every English colony in America was ripe for revolution, and in Philadelphia, Sept. 5, 1774, the First Continental Congress assembled to declare that the acts of the British parliament should no longer be obeyed. Paul Revere's lanterns in the church tower burned as beacons to National liberty. Lexington and Bunker Hill were fought, and Washington assumed command. The Declaration of Independence was adopted July 4, 1776. There followed the terrific struggle of the Revolution, the sorrowful winter at Valley Forge, and finally a splendid victory. Through Franklin, France was induced to acknowledge the independence of the United States, and to lend assistance. Thus a great Republic sprang into life in America. The pioneers of the Mississippi Valley, while they had no share in the revolution, rejoiced in the triumph of the United States. It promised them protection from the British, whose determination to expel Spain's colonists from the Mississippi Valley was well known. In 1780 the British governor at Michilimackinac sent a considerable force down the river to attack St. Louis. It was planned in London that when St. Louis should be in the possession of the English, troops should proceed down the river, and with the assistance of the English forces already stationed in southern Louisiana, capture New Orleans. The attack on St. Louis was defeated by General George Rogers Clark in command of the Virginians, who stationed a force at Kaskaskia sufficient to repulse the invaders. In lower Louisiana, Governor Galvez anticipating the British attack, successfully forestalled it by raising a

great force and capturing Natchez and Baton Rouge, which were England's only important strongholds on the Mississippi. Thus a common cause, their hostility to England, linked the Americans and the French in the Mississippi Valley. Spain offered most liberal inducements to emigrants from the United States who should settle within the borders of Louisiana. Lands were freely granted to all comers. A farm of 800 acres could be obtained for \$41. Often the tracts granted included valuable lead mines, and taxation was, practically, unheard of. No discrimination was made against Protestants. Emigrants poured into Louisiana from the United States, entirely changing the character and condition of the colonists. In 1803 three-fifths of the population of Louisiana were English-Americans, and the majority of these were the owners of negro slaves.

With the beginning of the 19th century Spanish rule in the Mississippi Valley was practically at an end. Napoleon, to whom Louisiana was retroceded in 1800, purposed to establish his power in America; the province of Louisiana was to be extended, the people of the Ohio Valley brought into subjection, and moreover, from this territory troops and supplies for the Haytian campaign should be procured. Two years were spent in the preparation of the expedition to Hayti, and in wrangling with Spain over disputed boundaries of the province retroceded, a contest in which the United States was involved for the protection of its harbor rights. In 1803 France was exhausted from her protracted wars; the plans for the occupation of Hayti were exploded, the presence of the English fleet prevented the approach of French vessels to the American coast. Napoleon was checkmated. An opportunity to part with his untenable province at a profit was welcomed, and Louisiana was sold, through negotiations concluded April 30, 1803, to the United States, for 80,000,000 francs, with the stipulation "that the inhabitants shall be incorporated in the Union of the United States, and admitted as soon as possible."

Napoleon appears as a prophet in this transaction. When he



BAND STAND IN FAIRMOUNT PARK.



THE COUNTRY CLUB.

signed the documents of the Louisiana Purchase he remarked to the American envoy: "This accession of territory strengthens forever the power of the United States. I have given England her greatest rival."

On March 9, 1804, the French flag in the public square at St. Louis was hauled down, and that of the United States unfurled in its place, while the assembled citizens of Missouri greeted it with patriotic cheers. The day was one of public rejoicing. American troops crossed the river, and the ceremony of Spain's evacuation was formally enacted. Captain Amos Stoddard of the United States Army received Louisiana from Don Carlos Delassus on behalf of France and transferred it, as he had been commissioned by Napoleon to do, to the government of the United States.

Louisiana was now erected into a territory, and accorded the privileges of self-government under the administration of a governor general. Trial by jury was introduced. French and English schools were established, and the French pioneers, who had cared not a fig for education, led the settlers from the States in petitioning for seminaries where Latin, Greek, mathematics, mechanics, philosophy and the principles of the Constitution of the United States should be taught. Wandering tutors divided their time between teaching and molding candles out of deer's tallow. Hebrew was "taught" in 12 lessons. Latin in 10. More pains were spent in the acquirement of skill in waltzing, fencing and piano playing. Turveydrop, if he had lived in Louisiana, might have been a happy man.

An act was passed "confirming all claims made by virtue of incomplete French or Spanish grants prior to the United States' accession of Louisiana." There was need of such legislation, for when Kentucky and Tennessee came pouring over the borders to seek homesteads in Missouri the condition of the country became like that of a pack of cards shuffled unskillfully. Each man hazarded an ambitious guess as to the largest possible limits to his acres; no one cared to live within hearing of the barking of his neighbor's dog. Claims encroached on claims that had the right of precedence, and little heed was paid the tenth commandment. The new settlers not only coveted; they usurped. Conflicting claims resulted in duels, and duels ended in feuds enduring for several generations. Every man went armed with dirk and gun. There was the droll paradox of judges "full of wise saws and modern instances," dispensing justice from the bench and tightly grasping cocked pistols in their hands for the preservation of their lives. Duels were considered sport among gentlemen. Murders were frequent among the lower classes. A story is told of two army officers, brave and adventurous men, both, who had lived for years such friends as Damon and Pythias, and one day disagreed about a mining claim. There was no quarrel. They were at dinner among friends when the dispute occurred, and one of them said:

"I have the highest opinion of your honor, sir, but you mistake. The property you claim is mine. Let us settle this little matter in an amicable way." Whereupon both rose in their places on opposite sides of the table; seconds were quickly chosen from among the interested guests; pistols were leveled, aimed, and at the signal fired. Damon fell dead, his blood mingling with the wine spilt in his fall upon the table cloth. Pythias, when the corpse had been removed, sorrowfully related anecdotes of his friend's good qualities during the remainder of the meal.

Towns were no longer formed merely to afford protection in numbers against the dangers of frontier life; they became the result of localized industry. A miner, perhaps, would be the first to settle on the site of a future city. In good time the miller followed, and

after him the blacksmith. Next would come the publican. When these four were engaged in a merry game of trade the storekeeper was attracted. There would soon be a school, then a church, and at last a post office. When numbers were thus attained and the community was self-supporting, a suitable extent of the surrounding territory would be laid out and erected into a county. The town was no longer attached to the judicial circuit; it was launched proudly into a separate political life, with judges and other county representatives of its own. The territory of Missouri comprised five counties in 1812, and 15 in 1820, in which latter year the population numbered 66,000. Ten thousand of these were negro slaves.

St. Louis, as the early capital, made rapid progress. This was a village of 180 houses when Louisiana was purchased by the United States. Four years later, in July, 1808, the first newspaper ever published in Missouri was established, and accomplished more than any other institution in advancing the political and commercial interests of the people. St. Louis was incorporated into a town in 1809, and in ten years, so rapidly did it progress, the streets were "lined with brick houses that would not have disgraced Philadelphia." In the homes of the rich there were valuable private libraries, notably those of Colonel Chouteau and Frederick Bates. Bishop Dubourg established a private gallery in which there were original paintings by Raphael, Rubens, Guido and Paul Veronese, strangers indeed in the wild country of the pioneers.

Rough roads were built connecting the counties and principal towns of Missouri, but these were comparatively little used. Until the coming of the "iron horse" many years later, the Mississippi River continued to be the chief artery of commerce. The dry goods with which Missouri was supplied were purchased in Philadelphia and wagoned across the Alleghany mountains to the Ohio River, and were then loaded on barges and brought down the Ohio and up the Mississippi to St. Louis. Groceries were purchased in New Orleans and brought to St. Louis on barges or rafts. A history published in Missouri in 1819 makes the following statement:

"Steamboats have lately engrossed the business of transportation and should they continue to multiply at the rate now indicated they will in a few years throw keel boats and barges out of the question."

Cutlery, castings, paper, and the implements used by farmers, carpenters, blacksmiths and miners were brought from Pittsburg.

Peltry was no longer legal tender. Money was scarce, however, and the Spanish dollars still in circulation were cut up into halves, quarters and eights. These latter were called "bits," and this is the origin of the term as applied to small change in the west at present.

The Bank of St. Louis went into operation in 1816. Others were soon established. They opened the flood-gates of trade, and land, live stock, slaves, personal property and everything salable found ready purchasers. Everyone spent his money as quickly as possible, "for a penny saved burnt a hole in the pocket." Credit was never denied. Debts accumulated against a day of wrath, and the day came in 1819. The tide of immigration was checked, owing to the stringency of the eastern money market. Local institutions, when the downpour of capital abated, could not meet the demands of the United States Bank for specie; many were forced into bankruptcy. Bank notes became worthless. Missourians were "property poor," and in the midst of broad acres the owners of abundant crops and comfortable homesteads "had not a penny to buy a blessing." These were hard times, indeed. The government rescued Missouri from the panic by instituting "a system of relief, which, by extending the time of payment and authorizing purchasers to secure a portion of their lands by relinquishing the remainder to the government, in the course of eight years extinguished a large



FAIRMOUNT PARK.

portion of these debts and eventually absorbed the whole without injury to the citizen and with little loss to the government."

The slavery system still existed in Missouri unchallenged. In 1818 Missouri applied for admission to the Union, and the slavery issue was opened by the House of Representatives amending the enabling act so as to prohibit the further introduction of slavery into the new state; the Senate rejected this amendment and as neither house would yield the territory was not admitted. In the following year Maine applied for admission and after a warm controversy in Congress the Missouri Compromise was effected by which both Maine and Missouri were to be admitted as states without restriction (i. e., Maine free and Missouri slave), but slavery to be forever prohibited in the other territories north of latitude 36° 30", the southern boundary of Missouri. Maine was duly admitted in 1820, but Missouri in framing her constitution inserted a provision declaring it to be the duty of the legislature to pass laws preventing free negroes or mulattoes coming to or settling in the state, and by reason of this clause she was again refused admission to the Union. Finally, in 1821 Missouri was admitted as a state on accepting the fundamental condition imposed by Congress that the obnoxious provision of constitution should never be enforced.

During the following 40 years, in which the clouds of secession and civil war were gathering, Missouri remained essentially faithful to the Union, though her interests and sympathies were identified with those of rebellious "Cotton States." Her slaves were valued at \$35,000,000. Abolition meant the loss of this great property, and a far greater loss resulting to the industries, agriculture and commerce of the state. There were many "rabid" abolitionists in Missouri, and most of them were unwise in the course they pursued to advance their cause. One, a rich man in St. Louis, invited a number of his neighbor's slaves to dine with him. A sumptuous banquet was served, and the ladies of his family received the negroes as honored guests. This radical action was considered an insult to St. Louis society, and the press throughout Missouri figuratively "mobbed" this hospitable abolitionist. Some papers published lengthy editorials denouncing the outrage; others caricatured the host and his family, and the scandal spread like wildfire over the whole of America. That dinner was perhaps the most expensive entertainment ever given in Missouri.

Such incidents became of daily occurrence. Reasonable arguments were unheard, and it was safer for a man to smoke his pipe in a gunpowder mill than to speak against slavery in Missouri. Preachers who preached against it were tarred and feathered. A system of running slaves over the borders into free territory re-



TROOST PARK.

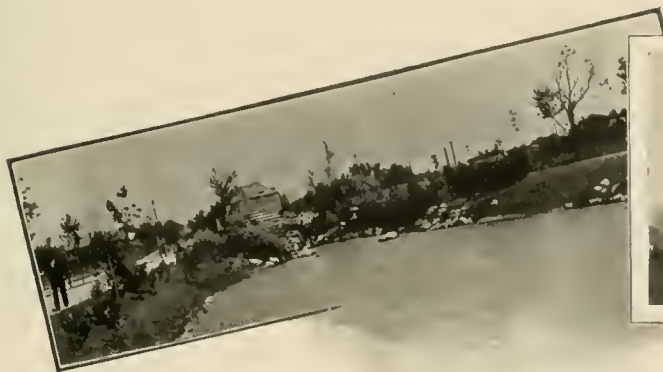
West, and occupied by Federal troops under General Lyon. The possession of Missouri was bitterly contested. An army of secessionists believing they were fighting for the cause of justice joined the Confederate forces at Memphis.

The official report of John B. Gray, adjutant general of the Missouri State Militia, to Hamilton R. Gamble, governor, rendered at St. Louis, Dec. 31, 1863, contains the following:

"The shock of the contest which was precipitated upon our state, and which was so nobly met by the loyalists of Missouri, has passed away, and the triumphant arms of the defenders of the Republic have forced the enemies of liberty from our borders, and they are now seeking battlefields far remote from that state which the traitors desired should experience all of its horrors and devastations.

"The accomplishment of this glorious result is due probably more to the efforts put forth by the loyal people of Missouri than to any other cause; for, without their bravery and patriotism, and without their willingness to submit to any and all sacrifices rather than prove false to the trust which was imposed upon them by the founders of our republic and the state, the war in Missouri might now be at its height, instead of so near its conclusion."

The defense of Missouri is a history in itself. The battles of Springfield and Bloody Hill were fought, Missourians against Missourians, but the battles in Missouri, terrible as they were, did not de-



LAKE-VIEWS IN THE PASEO-PERGOLA.

sulted in constant hostilities, and murders and lynchings frequently occurred.

When war was declared, Missouri decided for the Union. In his message to the General Assembly Governor Stewart announced:

"Missouri will hold to the Union so long as it is worth an effort to preserve it. If South Carolina and other cotton states persist in secession Missouri will desire to see them go in peace with the hope that a short experience at separate government and an honorable adjustment of the federal compact will induce them to return to their former position. I would here record my unalterable devotion to the Union so long as it shall be made the protector of equal rights."

St. Louis was made the headquarters of the Department of the

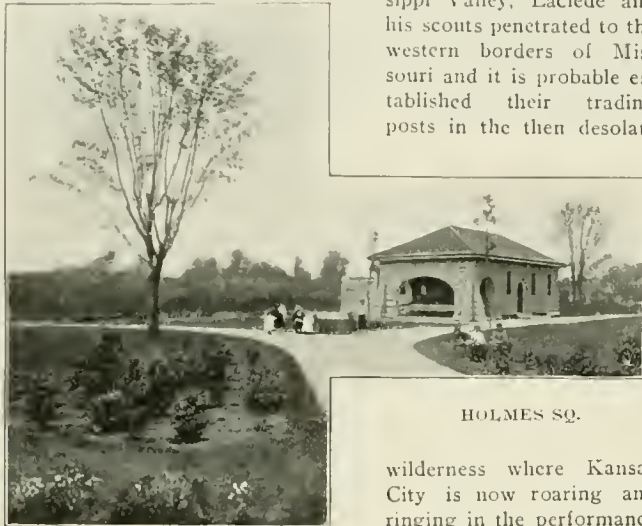
cide the fortunes of the Rebellion. In Missouri war was rather a long story of half rations, long marches, bad quarters and endless maneuvers for the advantageous position.

At the end of the war Missouri was poorer in slaves and richer in heroes. The subsequent history of the state is the story of prosperity and progress. Since the coming of the railways the swift advance in all commercial and educational institutions is evidenced in a score of cities. The empire state of the West is unexcelled in its natural resources; nowhere is business better, nowhere are people more hospitable. The prophesy of Napoleon, that the accession of the territory of Louisiana should strengthen forever the power of the United States, to make them England's greatest rival, has been fulfilled, and the credit belongs to Missouri.

KANSAS CITY.

Nothing succeeds like success. Kansas City illustrates the principle, and proves the energies of success in this direction. Located just where the West rushes into the East, just where the mountains rise from the prairies to mark the spot, and just where the rivers come pouring into each other as if unanimous in their choice for the site, Kansas City is the elect of Nature as the first city of the Plains.

Half a century ago the site of Kansas City was marked by a flatboat landing and the Santa Fe trail. While the French colonists under Spanish rule still occupied the Mississippi Valley, Laclède and his scouts penetrated to the western borders of Missouri and it is probable established their trading posts in the then desolate



HOLMES SQ.

wilderness where Kansas City is now roaring and ringing in the performance of her business. Perhaps they stalked great game

where rows upon rows of homes were later built; they may have sat round camp fires with red aborigines and traded guns and whiskey for priceless furs in the very place where men trade better things for gold in Kansas City marts today. The fur trade throughout this region in the early days amounted to \$200,000 annually; from it the territorial government derived its most important revenue. Lewis and Clarke, engaged in the profitable business of fur-trading, visited this place on one of their expeditions into Kansas, and the following old record, dated June 26, 1804, relates their experience.

"We encamped at the upper point of the mouth of the River Kansas. On the banks of the Kansas reside the Indians of the same name, their encampment consisting of two villages, one at about 20 the other 40 leagues from its mouth, and amounting to about 300 men."

Another entry is made in September, 1806, "About a mile below the Kansas River we landed to view the situation of a high hill which has many advantages for a trading house or fort, and while on shore we gathered great quantities of Papawa, and shot an elk. The low grounds are delightful, and the whole country exhibits a rich appearance." A writer in the Magazine of Western History, April, 1889, states that the hill which Lewis and Clarke admired as an advantageous site for a trading house or fort, is the high bluff north of Fifth and Bluff Sts., in Kansas City. Elk are not shot there now.

A branch of the great American Fur Co. established a post at St. Louis in 1819, and two years later a depot for supplies and storage was erected opposite Randolph Bluffs, three miles from Kansas City. The trappers built log cabins at the mouth of the Kansas River, and thus the first permanent settlement of Kansas City was made. Locally the Kansas River is also known as the Kaw.

In 1830 a few rail fences marked the site of the coming Kansas City. Squatters, Indians and half-breeds lived in rough shacks which they managed to stick on the side of precipitous bluffs, and did nothing for a living. There were two or three cabins in the wooden ravines, occupied by old French trappers who spent their time hunting deer, trading whiskey with the Indians for pelts, and raising families of half-breed children.

John C. McCoy laid out the town in 1833, and called it Westport. Westport was four miles south of the Missouri River. Steamboats

landed at the place where the city now stands, and this place was called Westport Landing. The owner of the landing died, five years later, and a company was organized, which purchased Westport Landing for \$4,220, and there laid out the town of Kansas. The land was platted, in 1846, and 150 lots were sold, bringing on an average \$55 each. Less than a year later, 600 people lived in the town of Kansas.

The story of the growth of Kansas City is a story of adventure. Forty years ago the town was the advance-guard of a westward-roving people, that was all. There was but one thing about it significant of the wonderful development that was to come. That one thing was its location at the junction of two great rivers. Up and down these rivers fussy little steamboats of ungainly shape and noisy importance came and went, bringing a great deal of freight to the town of Kansas. The town of Kansas then became the great receiving and distributing point of southwestern commerce. All the goods which the East poured into the Southwest were handled in Kansas City. Rapidly as the resources of the whole country are developed, just so rapid is the increase of a great American trade which follows the course of the sun to the West, and when Kansas City became at last the nucleus of all these streams of commerce her future was determined.

The way in which the gentle Indian has been made to do his part in building up the white man's cities, to his own deprivation and despair is not without a moral. Kansas City allowed the Indians to do much toward her advancement. Across the western border of Missouri lay the Indian Territory,—for as yet the Territory of Kansas did not exist,—and the people of Kansas City had for near neighbors the tribes of the Shawnees, the Delawares, the Wyandottes and Pottowatomies. These guileless Indians received from the United States government several hundreds of thousands of dollars in gold and silver, annually, in payment for lands farther East from which they had removed at the demand of the white strangers. An Indian with gold and silver is defenseless. He knows that money is the magic by which the white man conjures into this world all the joys of the happy hunting grounds, and he envies him. But when possessed of money himself, the Indian fails to conjure anything except trouble; he doesn't know the combination. So when the Shawnees, the Delawares, the Wyandottes and Pottowatomies received their gold from the United States they were at a dead loss what to do with it. The white men came to their assistance and showed them how to exchange their money in the growing town of Kansas for firewater and Eastern blankets, and the Indians expressed themselves as much obliged. In this way a lively local trade was inaugurated.

Crops were good around Kansas City. Farmers had plenty for themselves, and became rich supplying the Santa Fe trade with cattle, hogs and grain. Their prosperity had its direct effect on the merchants, and Kansas City lost some of its wild west aspect and took on an air of pride.

In the earlier years of its history the Santa Fe trade, which began about 1838, amounted to from \$50,000 to \$100,000 in merchandise conveyed each year across the plains to Mexico. Outward bound caravan trains consisting of two or three wagons each were loaded with whiskey, provisions (including fancy groceries), cotton, domestics, prints, notions and Indian goods. Returning, they loaded with gold dust and sometimes with silver ore, with buffalo robes,



C. M. & ST. P. RY. BRIDGE.



GRAND OPERA HOUSE.



AUDITORIUM.

dried buffalo meat, rough wool and Mexican dollars sewed up in rawhide sacks. In 1843 hostilities with Mexico checked trade for a year. The northern ports of entry into Mexico were closed, and though this temporarily threatened disastrous consequences to Kansas City, the embargo was removed a year later, and trade resumed. Business increased, and in 1850, six hundred wagons left Kansas City, loaded with merchandise for Mexico. In 1855 the business transacted amounted to \$5,000,000, and in 1860 there were shipped from Kansas City 16,439,134 lb. of freight, in 3,033 wagons, giving employment to 7,084 men, over 6,000 mules, and nearly 28,000 yoke of oxen. Kansas City now became a bustling market place. Six steamboats thumping and bumping against her wharf at once yielded up their motley freight to a throng of busy stevedores; nearby a great area was filled with horses and caravans, making ready for their expedition. Burly drivers of all complexions swore fiercely in a half dozen different languages with weird effect. The mules, the horses and the oxen would not be reconciled. Dogs napped or fought everywhere regardless of the peril of stampeding hoofs and the sudden movement of heavy wheels. Ox whips cracked and the sound was like curses. The scene was exciting. It was chaos before the formation of the present orderly and expeditious shipping system in Kansas City.

Two events which gave the town a friendly lift in her struggle to attain great numbers and importance were the discovery of gold in California in 1849, and the opening of the Kansas and Nebraska territories in 1854. Kansas City was directly on the overland route to the gold fields and afforded hospitality to endless trains of emigrants, dusty and weary from travel, sometimes also half starved and sick. These stopped long enough there to make good their courage for the rest of the way, and when they left the town was richer by their good will and a little of their money. Other gold seekers bound for California came up the Missouri River in boats, and these purchased in Kansas City the entire outfit of horses, wagons and provisions necessary for crossing the desert.

The opening of Kansas and Nebraska attracted a different class of emigrants, who passed through Kansas City on their way to new homes on the western prairies. The growing town had not only the Santa Fe trade and the Indian trade to supply, but also the little communities which soon became thickly scattered through Kansas and Nebraska. These dependents poured riches into Kansas City. Two banks had been in operation since 1849, and money was abundant until 1854 when Kansas City suffered in company with St. Louis and all the rest of Missouri the miseries of the great financial panic which preceded the more terrible troubles of the Civil War.

Kansas City was on the soil of a slave state. Her progress was held in check and her destiny uncertain during the bitter conflict which threatened the severance of the state from the Union, and resulted in civil war. But even in these turbulent times Kansas

City was doing her best to forge successfully ahead. In 1857 four miles of road were graded and macadamized; in 1858 the telegraph strung Kansas City on its humming wire, and the lightning brought her the news of violent times in the East. The Western Journal of Commerce, Kansas City's first daily newspaper, was established in 1858, and in 1860 the Chamber of Commerce was organized. In 1860 bonds were voted for a steam railway to connect with the Hannibal & St. Joseph R. R. at Cameron. This road, which was called the Kansas City, Galveston & Lake Superior R. R., was partially constructed in 1861; but the war interrupted and the road was not completed until 1867. Following this pioneer railway with the long name came the Pacific of Missouri, later known as the Missouri Pacific; the Kansas City, St. Joseph & Council Bluffs R. R. and the lines now known as the Hannibal & St. Joseph and the Wabash. In 1869 James F. Joy completed the "Hannibal" bridge of great fame and importance, and Kansas City leaped ahead of her competitor, Leavenworth.

Kansas City owes a lion's share of her progress to the activity and enterprise of her newspapers. The "Journal," established in



AQUADUCT BRIDGE OVER THE KANSAS RIVER.

1858, proved under the management of Col. R. T. Van Horn, a powerful ally of the city's interests. In 1869 Dr. Morrison Munford started the publication of the "Index," a journal devoted to real estate. Two years later he purchased an interest in the "Kansas City Times," a daily which had recently been launched with great success, and at once assumed active management both in the

editorial and business departments. The "Times" began a career of hustle marked with unqualified success. It was a Democratic paper. It was a paper which soon made Kansas City famous. Dr. Munford was a keen and vigorous writer. He believed in Kansas City devotedly, and banked his fortune and his future on her success. The "Journal," a Republican newspaper, was a worthy competitor for the "Times," and both papers were united in a bold and energetic policy for the advancement of Kansas City which



BOARD OF TRADE.

availed to float the town through all seasons of discouragement and financial depression.

"The rapid increase of Kansas City in population, business and wealth is one of the marvels of the great West, but it is as natural as the rank growth of wheat and corn in the deep rich soil of the surrounding prairies," writes Z. L. White, in an article on Western Journalism. "And in a city that accomplishes in a decade what older Eastern cities have only done in half a century, newspapers well edited and managed necessarily attain in a very short time circulation, pecuniary prosperity and influence which the journals of the Eastern cities are many years in securing. Kansas City, beside being the metropolis of western Missouri and eastern Kansas, is the newspaper center of a broad region of country beyond. Dr. Morrison Munford and Colonel Van Horn and their newspapers are almost as much essential parts of Kansas City as her streets and public buildings."

Certainly the influence of the press of Kansas City, voicing the ambition of a busy and determined people, has been felt not only through the contiguous country, but in the far Eastern States and across the Atlantic as well, for capital from Boston and from distant Scotland was attracted during the earlier years of the boom, and has remained satisfactorily and lucratively invested in Kansas City ever since.

Kansas City has now four great dailies; the "Journal," Republican, and the "Times," Democratic, both morning papers; the "Star" and the "World," independent, evening papers.

On the map Kansas City is nicely balanced on the line separating Kansas and Missouri. This leaves the inquiring mind in doubt whether Missouri stole the best part of the town, or whether the town's founders elected the location with a just idea of impartiality. There are in Kansas City, Mo., 200,000 people, and in Kansas City, Kan., 50,000. This is because the army of early immigrants marched from East to West, and coming to the western borders of Missouri, settled Kansas City within the confines of that state and were satisfied to go no further. Until a few years ago there was no Kansas City, Kan. The nearest town on the eastern border of Kansas was Wyandotte, and not till Kansas City, Mo., had attained importance and prestige did Wyandotte collect her outlying suburbs and incorporate them with herself as Kansas City No. 2.

The Civil War left strange wreckage in Kansas and Missouri. As undesirable debris drifts to the shore from a wreck at sea, so a population of queer people was tossed up in Kansas City in the years immediately following the Rebellion. These were never Kansas Cityans, they were strays, and had no share in the enterprise

from which the Kansas City of today resulted. Some came with a purpose of perpetrating all kinds of villainy, and a rapidly growing city on the borders offered them opportunity. They had their measure of success. A motley crowd of vagabonds made merry mischief in Kansas City for several years. Saloons and "dives" of a murky character where all kinds of bloodthirsty deeds were incubated outnumbered the dwellings of people who had right and business there. Then the boom came, and Kansas City shuffled off these incumbrances, and cleared the deck for a race which has placed her in the lead of all the cities of the West.

Property values increased commensurately with the increasing current of immigration. Money was abundant. The poorest found no lack of business opportunities, and each new comer was accepted at the highest possible estimation, and given a chance to prove his abilities. No city in America has offered stronger inducements, or rewarded the pluck and energy of her citizens more abundantly. With the railroads in operation the boom spirit struck Kansas City like a Dakota cyclone, and no cyclone ever altered the aspect of a town so suddenly, certainly never with such beneficent effect. There was nothing undecided about the boom. It came with its mind made up, and when the gale abated a wonder was discovered. From the soil of the tough frontier town a great city had sprung up miraculously, as Cadmus' army was harvested in a night from a such unpromising seed as dragon's teeth. Regiments of dwellings lined up the streets. Battalions of stores and office buildings stood at attention throughout the down town district. Steep bluffs had been tumbled over to fill up unsightly gorges, and ranks of level streets were made to cross these spaces. Enough substantial homes to shelter a populous city had been built; enough more were projected to house half of London. Acres upon acres of city lots were platted out; and these were bought and sold repeatedly at prices which challenged the courage of the most reckless speculator.

The boom, of course, could not last forever. Had it continued at an equal pace till now, Kansas City's city limits would be encroaching on Chicago; San Francisco would be a suburb. After a season of extravagant profits the tide turned; and when the prosperous wave ebbed away Kansas City was stranded, indeed. Banks broke, and business temporarily collapsed. Great fortunes faded out of sight as pools left by receding breakers sink in the sand. Kansas City was a sadder and a wiser town, but she had gained distinction as a great American trade center, and the energy of her promoters sufficed to build her fortune for a second time. The value of land settled down to compare about equally with that in Minneapolis, which was uniformly less than in Cleveland or Chicago. The era of speculation was over, and that of sound development begun. Kansas City has been visited by several booms, since; safe booms, and less fantastic. The cable railways accomplished very much to relieve the strained conditions in Kansas City after



RESIDENCE OF D. L. LUMBAR.

the collapse. They were first suggested by the promoters of real property, and were copied after the system in use in San Francisco. This happened in 1886. In a year 40 miles of cable railways had replaced the horse car lines. The most remote suburbs became easily accessible, and the effect was to make Kansas City possible as a city of homes as well as pre-eminently a city of hustle. Outlying property was again readily disposed of; more houses were built, land bought and sold, and the tax rolls swelled. In 1888 the



CITY HALL.



POST OFFICE.



COURT HOUSE.

transfers of city property recorded amounted to very nearly \$40,000,000. In the same year, according to Bradstreet, business capital of the city, exclusive of street railways, amounted to \$107,616,500 wholesale capital; \$65,267,400 retail capital, while bank clearings reached the high water mark of \$421,771,953. A large share of this good fortune was attributable to the street railways.

When the boom was at its height several great steam railroad projects were evolved, and by their successful consummation Kansas City became next to Chicago the greatest railroad center in the United States. Fifteen companies are now operating through trains on 37 different routes out of Kansas City. The names of the companies are: the Wabash; the Missouri Pacific; the Atchison, Topeka & Santa Fe; the Kansas City Southern; the Chicago, Milwaukee & St. Paul; the Chicago Great Western; the Kansas City, Fort Scott & Memphis; the Chicago, Burlington & Quincy; the Missouri, Kansas & Texas; the Chicago, Rock Island & Pacific; the Kansas City & Northern Connecting; the St. Louis & San Francisco; the St. Joseph & Grand Island, the Alton and the Union Pacific. The finest trains in the world—in reality, hotels on wheels,—are ceaselessly rumbling in and out of the Union Station, bound for or returning from every city between Boston and San Francisco, Duluth and New Orleans. The sight of the parading trains, the multitudes of passengers and mountains of freight in the Kansas City station is unparalleled except in Denver and Chicago. There are no "prairie schooners" hitched to rebellious mules, discouraged oxen or misanthropical horses, loading at the wharves in Kansas City nowadays.

The Indian,—his numbers are no longer great nor his blankets fancy, though he enjoys his firewater with undiminished appetite,—has witnessed all these changes with profound surprise. Surely the white man has conjured into this life strange things from the happy hunting grounds; but the Indian does not know the combination.

When he occasionally appears in Kansas City he is regarded curiously as a relic; and is in danger of being stolen by some tourist for a souvenir.

It is said that all the inhabitants of the earth could be fed from the land within a circle of a thousand mile radius around Kansas City; could not only be fed, but could draw their supplies of iron for their manufactures, lumber for their building, gold and silver to jingle in their pockets, and oil to light them to bed from this magic circle for indefinite time. Last year Kansas City's stockyards handled over 6,000,000 head of live stock, valued at \$121,706,632. Over 2,600,000 swine surrendered their lives to satisfy the hungry, and the mills of Kansas City turned out over 350,000 barrels of flour. Anyone who sees the freight piled on endless trains pulling out of Kansas City's depots might easily believe that all the earth's inhabitants are being fed out of that bountiful circle.

There is a tradition that mud was once abundant in Kansas City. The oldest inhabitant is said to remember the time when there was mud; much mud, and yellow. But that was only a necessary incident in the town's progress.

When still very young, Kansas City set about leveling the high bluffs which interfered with the landscape and made street railways an impossibility. And in the leveling process a great deal of soft, sticky earth was spilled over the town. The result in wet weather led to mistakes. A traveler who happened upon the town just after a rain storm reported he had found a new Vesuvius that spit forth mud, and under it a modern Pompeii. But these slanders have lost their point, for Kansas City is free from mud. As early as 1885 forty miles of brick, asphalt and cedar block pavements were laid. In later years vast sums of money have been expended on the best of pavements, the amount so spent in 1899 being \$787,000.



The city now covers an area of nearly 27 square miles and has 178 miles of paved streets. In these are stretched 160 miles of street railways carrying 50,000,000 passengers annually. All roads in Kansas City lead to one or another of half a dozen extensive parks which are equipped for sports of all sorts and every kind of public entertainment, combining with natural scenic beauties the attractions which modern architecture and an abundance of money afford. The business buildings of Kansas City are capacious and substantial. A new Federal building has been erected at a cost of \$3,000,000 and will soon be ready for occupancy. City hall, court house, schools, libraries, art galleries, museums, alms-houses, theaters and prisons have been built according to the principle that what is worth building at all is worth building well. The municipal improvements authorized by the city government in 1899 cost \$1,370,345. The total of taxes paid annually to the city and county on \$71,000,000 assessed valuation of property is less than 27 mills on the dollar, clearly giving Kansas City the advantage in the matter of taxation over many cities in the United States.

Kansas City would be distinguished as a city of rapid growth and wonderful prosperity, if in no other way, by her modern and beautiful homes which typify the success of her industries. Kansas

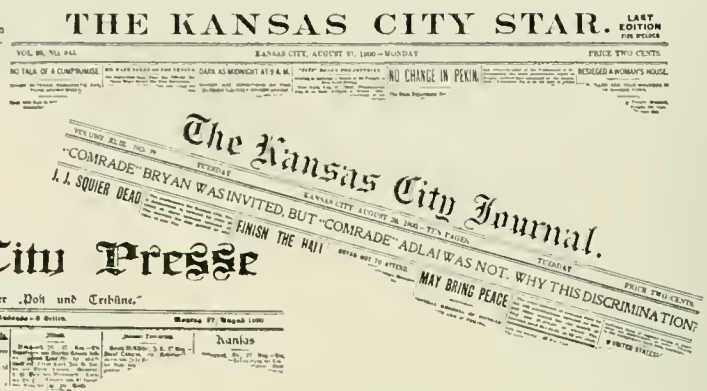


City has become a city of fashion as the result of having been particularly a city of enterprise.

Here is located the second live stock market in the world, her packing industries giving employment to 50,000 people and representing an investment of \$30,000,000. There are also 28 elevators and warehouses with a total storage capacity of 6,765,000 bushels. No city west of St. Louis surpasses Kansas City as a lumber market. There are 23 lumber yards and nearly 100 firms engaged in the

usually the parades and balls given by the Priests of Pallas and Karnival Krewe. Horse shows and sporting events of far-reaching interest are also billed each year, and bring the devotees of sport from East and West.

Kansas City has 4,800 telephones in operation, and has a fire department unexcelled if not unequalled in the world. Her fire crew defeated all competitors in the Omaha Exposition in 1898. At an earlier exhibition in London the crew won great honors, and



wholesale and retail lumber business. From 3,600 to 4,000 cars of soft wood and 1,000 cars of hard wood are handled annually.

Kansas City has a world-wide reputation for hospitality, and combines with its reputation the most practical facilities in the way of numerous hotels of the first class. Besides the never-ceasing stream of visitors bent on business or diversion there is each year a multitude attracted by the political or other conventions, the musical festivals, street fairs and festivities in which the chief features are

her men and apparatus were awarded first prize at the Paris Exposition this year. The department employs 175 men and 77 horses and the finest engines and other equipment for fighting fire.

Kansas City has best of all an accommodating climate which liberally allows 255 sunny days on an average each year. The rainfall is just sufficient to do the duty of a rain-fall, and the wind may be depended upon to blow from the Southeast eight months out of twelve.

CONVENTION HALL.

The spacious and costly auditorium in which the meetings of the Accountants' and the American Street Railway Associations will be held and where the exhibition of apparatus and supplies will be given is at the corner of 13th and Central Sts., a location convenient to the depots and principal hotels, and reached by either the Broadway or Wyandotte electric lines.

The building is about 300 ft. long by 200 ft. wide, with walls of stone and brick, and roof supported entirely from the side walls on steel girders leaving the interior unobstructed by posts or

Accountants' Association will be held in the upper gallery, reached by a stairway and inclines from the rear of the hall, so that all delegates and others in attendance will pass through the hall on their way to the meetings. The lighting, heating and ventilating arrangements are of the best.

Convention Hall is in itself a building of which any city may well be proud, but loyal Kansas Cityans tell with especial pride of how it was built. There had previously stood on this site a mammoth convention building that had cost over \$100,000, but on



CONVENTION HALL AS REBUILT.



RUINS OF CONVENTION HALL, APRIL, 1900.

columns. Tiers of galleries rise one above another until the top-most gallery, known as the roof garden, is reached, the ascent being made by means of inclines instead of stairways. The floor is of cement and around the sides under the first balcony are rows of small stalls or boxes well fitted for exhibition purposes. At the south end of the building are dressing and toilet rooms, telephone booths, registration rooms, etc. There are several wide doors at the front and sides so that trucks, cars and other large exhibits can be taken inside the hall without difficulty. The meetings of both the American Street Railway Association and the

the afternoon of April 4th last, just as preparations were being commenced to get the place ready for the Democratic National Convention which was to meet on July 4th following, the structure burned to the ground. With characteristic spirit and pride a committee of prominent citizens was appointed before the fire was out and enough money subscribed to insure the erection of a new and better building. Teams and men were at work preparing the new foundations before the ruins had ceased smoking, and the building was in excellent shape in ample time for the convention that nominated Mr. Bryan.

The Metropolitan Street Railway System of the Two Kansas Cities.

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The same spirit of progressiveness and enterprise that has placed Kansas City as a commercial and financial center far ahead of other cities of equal population, has been manifested in the growth and development of her transportation system. Working at a disadvantage as regards the layout of the city's streets, her street railway promoters have been quick to adopt improved apparatus and methods brought out in other cities, and not content with this, have freely given their financial encouragement to those who were seeking by experiment and research to demonstrate new principles in the science of street railroading.

The first horse railway in Kansas City was built in 1870 while the town was little more than a way-station. The first cable road was commenced in 1882 just as that system of traction was coming into vogue in San Francisco and Chicago; and it was on the old horse line from 16th St. to Westport, that Mr. J. C.

scheme and in securing a franchise. But the road was finally built and it took but a few months to demonstrate the advantages of cable traction for Kansas City's steep grades. Before the year 1890 over 75 miles of cable lines had been laid down. Mr. Gillham was ably assisted in his labors by Mr. Clift Wise, now a prominent engineer of Chicago.

While the work of changing the old animal power lines to cable was going on, Mr. J. C. Henry on the Westport line was carrying out his experiments with electricity, which was ultimately to become as formidable a rival to the cable as the cable had been to animal traction. Mr. Henry had taken out a number of patents covering his motor and overhead trolley, and in 1884 he was successful in interesting Mr. W. H. Holmes, then president of the Westport & Kansas City Street Railway Co., in his ideas. Mr. Holmes donated an old mule car and half a mile of track for



WALTON H. HOLMES,
President.



CONWAY F. HOLMES,
General Manager.

Henry as early as 1884 carried on his experiments with the overhead trolley system while the possibilities of electricity in its application to street railways were still but phantoms in the minds of a few enthusiastic "cranks," so called.

The first horse road extended from the corner of Fourth and Main Sts., by way of Fourth, Walnut, 12th and Grand Ave., to 16th St. It was built by the Kansas City & Westport Horse Railway Co., of which the leading spirit was Mr. Nehemiah Holmes, father of Messrs. W. H. and C. F. Holmes, now president and general manager, respectively, of the Metropolitan company. The first cable line was commenced in the fall of 1882, and in June, 1885, was opened for travel from the Union Depot, over the viaduct, to Eighth St. and Woodland Ave. This enterprise was one of the boldest engineering feats of recent times and its successful completion was due to the inventive skill and personal efforts of Mr. Robert Gillham, who early in 1878 conceived the scheme of a cable railway to connect the Union Depot in the West Bottoms with the city proper on the cliffs above. The only means of making the trip at that time was by rickety bob-tail cars nominally operated by mule power, which was usually reinforced, however, by the combined efforts of the passengers on the up trips. The line was barely earning enough to feed the mules. Mr. Gillham spent four years in attempting to interest capital in his

experimental purposes. The power house was a frame dwelling near 39th St. and Broadway, and the generator was driven by an old portable threshing machine engine that had been purchased from a junk dealer. The 2,000-lb. motor was placed on the front platform without counterweight on the other end, and must have made the little 16-ft. car look as though it was trying to plough a hole in the ground. Possibly the idea was suggested to the early stockholders who were furnishing the capital that it was trying to dig its own grave. The motor armature revolved constantly and the car was started and stopped by throwing the armature shaft into or out of gear with the axles. There were about 30 gear wheels.

These experiments did little more than prove that cars could be run by electricity from an overhead trolley, but this was a tremendous step. Mr. Henry continued in his work and was soon able to demonstrate his ability to construct an electric line that would prove a success commercially, and in 1887 the Kansas City Electric Railway Co. was organized, and built a double track line on Fifth St., which for a time at least paid satisfactory interest on the investment.

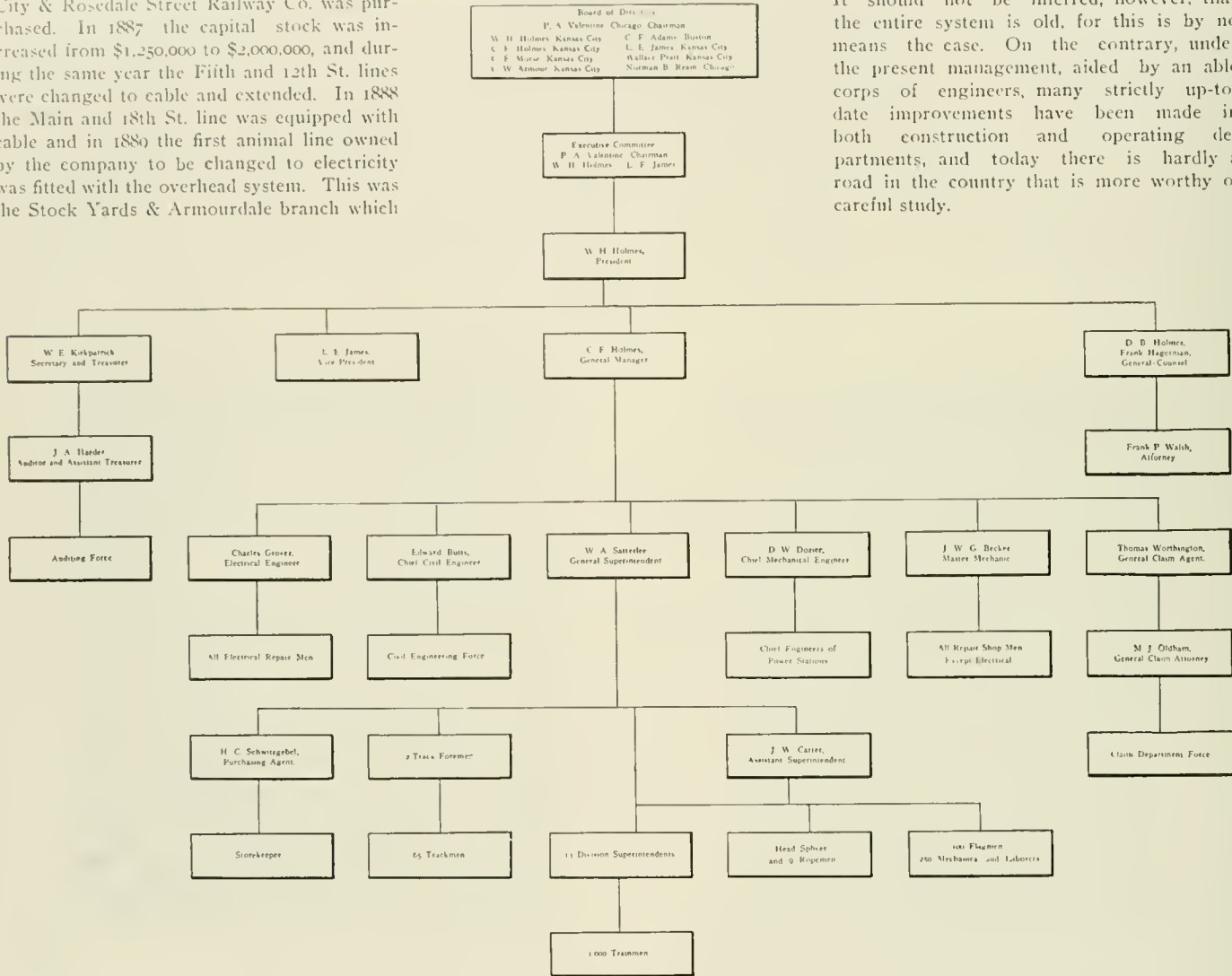
The present Metropolitan Street Railway Co. was chartered in August, 1886, with \$1,250,000 capital stock and in that year purchased all the property of the Corrigan Consolidated Street Rail-

way Co., consisting of the Union Depot Horse Ry., the Kansas City Horse Ry., the Jackson County Horse Ry. and the Corrigan Horse Ry., comprising 20.7 miles of horse and mule lines, several of which had been in operation since the early 70's. The Metropolitan company also assumed a \$1,000,000 mortgage that had been issued on the Corrigan property to secure funds for changing to mechanical power, and at once took up the work of equipping the lines for cable traction and rapidly carried it to completion.

In October, 1886, the property of the Kansas City & Rosedale Street Railway Co. was purchased. In 1887 the capital stock was increased from \$1,250,000 to \$2,000,000, and during the same year the Fifth and 12th St. lines were changed to cable and extended. In 1888 the Main and 18th St. line was equipped with cable and in 1889 the first animal line owned by the company to be changed to electricity was fitted with the overhead system. This was the Stock Yards & Armourdale branch which

PRESENT CONDITION.

In a city with the topography of Kansas City and on a system formed as the Metropolitan Street Ry. has been, by successive consolidations of horse, cable and electric lines, many of which were pioneer roads, it is not surprising to find a somewhat varied collection of apparatus and engineering work, a portion of which would now be considered almost obsolete. But to the credit of the early workers it may be said that much of their handiwork is still doing good service and earning dividends. It should not be inferred, however, that the entire system is old, for this is by no means the case. On the contrary, under the present management, aided by an able corps of engineers, many strictly up-to-date improvements have been made in both construction and operating departments, and today there is hardly a road in the country that is more worthy of careful study.



DEPARTMENT ORGANIZATION OF THE METROPOLITAN STREET RAILWAY CO.

is still running. The officers of the company in 1888 were: President, C. F. Morse; treasurer, A. W. Armour; secretary and general manager, R. J. McCarty; superintendent, E. J. Lawless.

The next important event occurred in May, 1894, when the Metropolitan company acquired a controlling interest in the stock of the Kansas City Elevated Railway Co., operating an elevated electric line, and guaranteed the interest of a mortgage for \$2,600,000 covering the property. In the same year other smaller independent lines were absorbed.

The longest step in the formation of the present system was taken in May, 1895, when an agreement was reached whereby the Metropolitan company came into possession of the Kansas City Cable Ry., the Grand Avenue Cable Ry., the Kansas City & Independence Rapid Transit Ry., and the Westside Ry., of Kansas City, Kan., consisting of 67.5 miles, measured as single track and operated by cable, electricity, steam dummy and animal power. The final consolidation took place in 1899, by the acquisition of the Central Electric Railway Co., which was the successor to the Brooklyn Avenue Railway Co., and the North East Electric Railway Co. By this act the Metropolitan company secured control of the last line in independent operation in Kansas City, Mo., Kansas City, Kan., and the adjacent suburbs.

TRACK CONSTRUCTION.

The Metropolitan system comprises 164 miles of railway measured as single track, most of which is laid as double track. Of this 47.6 miles are operated by cable and 116.4 miles by electricity; two miles of double electric track are built on an elevated structure; one-half mile of cable on inclined trestles with an average grade of 15 per cent, and one-fourth mile of electric road through a tunnel. There are numerous grades of from 5 to 10 per cent, the steepest on the cable lines being 18½ per cent, and on the electric lines 8 per cent.

The Metropolitan standard rail sections for electric track are 6 in. and 9 in. center bearing girder rails, weighing respectively 83 and 103 lb. to the yd., and rolled by the Lorain Steel Co., of Lorain, O. There is some mileage laid with lighter sections and some with T rails, but in all future work it is the intention to use center-bearing sections of the weights mentioned. The standard cable rail is a 4¾-in., 60-lb. center-bearing girder.

According to later-day practice a center-bearing rail for electric roads is obsolete, but the Metropolitan company's experience with this shape has been so satisfactory that it has determined not to change to the more modern sections. Mr. E. Butts, the company's engineer, has made a study extending over several years, of rail

shapes and their effects on street traffic and on the cars, and is convinced the center-bearing girder combines all the advantages of a T rail for city streets and is preferable from both the company's and the city's standpoints. He contends the extra groove on the outside of the rail between the rail and the paving stone catches most of the dirt that would otherwise lodge on the head of the rail, thus giving better electrical contact and making a much easier riding bearing surface for the car wheels. Furthermore, in his opinion, the granite blocks at the side give a better



WORK OF ELECTRIC INSTALLATION CO. ON 14TH ST.

purchase to wagon wheels when turning out of the track than does the outer flange of the usual girder rail.

About 12 miles of electric lines in Kansas City measured as single track are built without the use of ties, the rails being embedded in solid beams of concrete, prepared as explained later in this article. In this work a trench is dug for each rail 20 in. wide at the top, 16 in. wide at the bottom and to a depth of 15 in. below the top surface of the rail. The rails are placed in the trenches in the position they are to occupy permanently, and wherever there is a possibility of any yielding or variation of alignment, 1-in. tie rods are inserted at intervals of 6 ft. and fastened with heavy hexagonal nuts on both sides of each rail. When working in paved streets it is not usually necessary to employ tie rods. When the roadbed has been thus prepared the concrete, mixed to the consistency of a paste, is poured into the trenches and tamped around

With natural cement at 80 cents a barrel and the portland at \$3.50 the saving is evident, and in Kansas City at least the results are in every degree as satisfactory as when the higher-priced material is used exclusively.

The concrete mixture for trench work is compounded as follows, all proportions being accurately determined by measure; one part cement (mixed as above), two parts clean sand, five parts fine broken stone, pieces from 1/4 in. to 1 in. in greatest diameter. Measurements are made by barrel and it is stipulated in all specifications that a barrel is to mean 3 1/2 cu. ft.

The Metropolitan company is so well pleased with the results of this tieless concrete construction that it has decided to follow this practice wherever possible in new work, and in rebuilding. The cost is but \$3.50 per ft. exclusive of the cost of the rail, which is practically the figure the company has paid for roadbed laid with wooden ties in the usual way. It is also important to note that there are in Kansas City miles of tieless track, on some of the heaviest lines, that have been down five years and on which not one cent has been paid for repairs, and thorough inspection fails to reveal signs of wear. This means not only a saving in maintenance charges but also in all the losses attendant upon opening streets in business portions of the city to repair tracks.

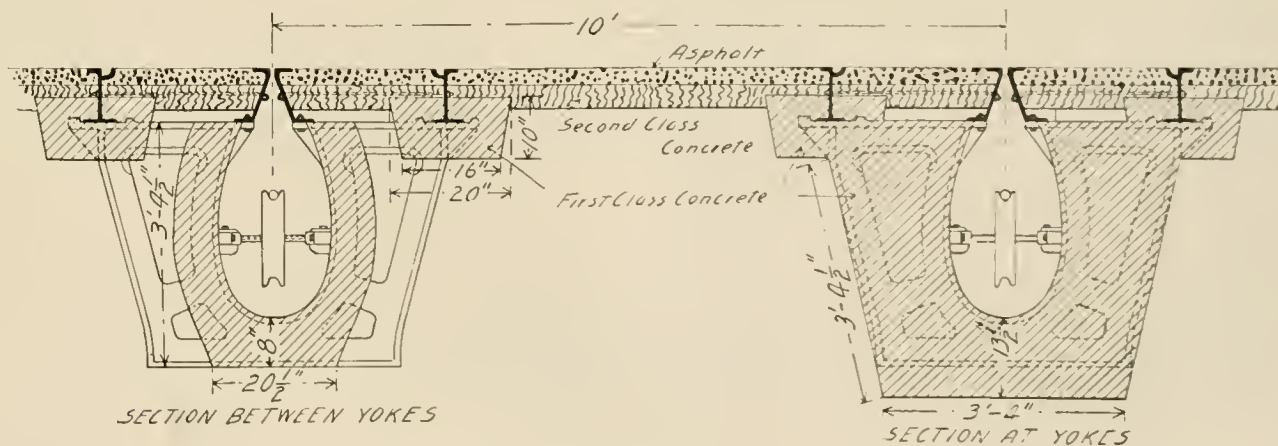
Another advantage is due perhaps largely to local conditions. Owing to the many hills, the Metropolitan company is compelled to use salt in large quantities to keep rails free from ice, and in a number of instances has had to replace rails laid with the regular tie construction, where the base of the rail had been almost eaten away by the action of the salt, while the head was still in good condition. With the base embedded in concrete there is of course no corroding action possible from this source.

But probably the strongest claim that can be brought forward for this concrete construction is the saving in the return circuit and the absolute prevention of stray currents. Concrete is one of the best insulating materials known, and the time may come when this practice of embedding rails in concrete without ties may be the most economical way of removing the slight arguments upon which water companies and cities now base their claims for damages from electrolysis.

Where ordinary tie construction has been put in, split hewn white oak railroad ties, 6 x 8 in. x 8 ft. are standard. These are spaced 2 ft. c. to c. with 6-in. rail, and 30 in. c. to c. with 9-in. rail.

The cable roads were built at different times by different companies and the cross sections vary widely as to shape of yokes, pulley supports and rails. One of the sections in the business portion of the city is given among the engravings accompanying this article.

Most of the Metropolitan tracks, both electric and cable, are cast welded at the joints by either the American or Falk methods.



LATER CABLE CONSTRUCTION.

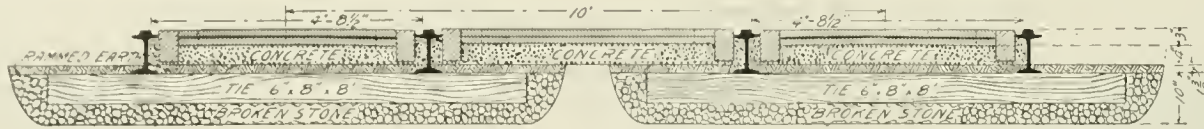
and under the rails with care, to insure perfect alignment and surface. Four days are allowed for the concrete to properly set before the track is used.

In preparing concrete the company departs from the notion usually accepted by civil engineers that portland and natural cements can not be mixed with good results, and all the concrete used in the tieless construction is made from a half-and-half mixture of the two grades.

The Falk company as contractor also built a number of the electric lines complete, and has laid down nearly all of the recent special work required, the most intricate layout of this nature being the section of track from Third to 13th Sts., on Grand Ave. The cable tracks on this thoroughfare between Eighth and Ninth Sts. were originally laid on a diagonal line, the ends being about 15 ft. off center to obtain room for making the curves into the cross streets. It was thought desirable to change this arrangement

and the Falk company took the contract to move the conduit, rails, pullies and cables bodily into the center of the street. In order to do this it was necessary to cut out 12 or 15 ft. of rail from each track to bring them into the new position, after which the curves had to be readjusted and relined. When this task had been completed special work was put in place, consisting of a double track branch off curve at Ninth St., and a double track

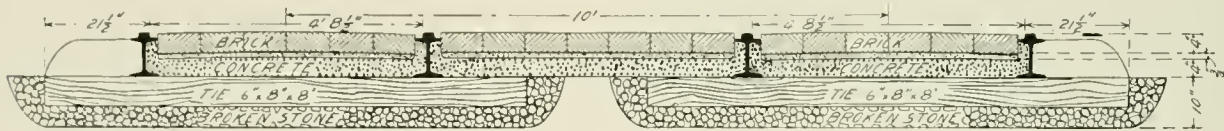
About 10 miles of track and 40 miles of overhead work were constructed by the Electrical Installation Co., of Chicago, which has been doing work for the Metropolitan company since 1896. The North American Railway Construction Co., Chicago, of which Mr. A. S. Littlefield is president has also received several contracts for track and overhead work in Kansas City, and this company laid the first track built on concrete beams instead of ties.



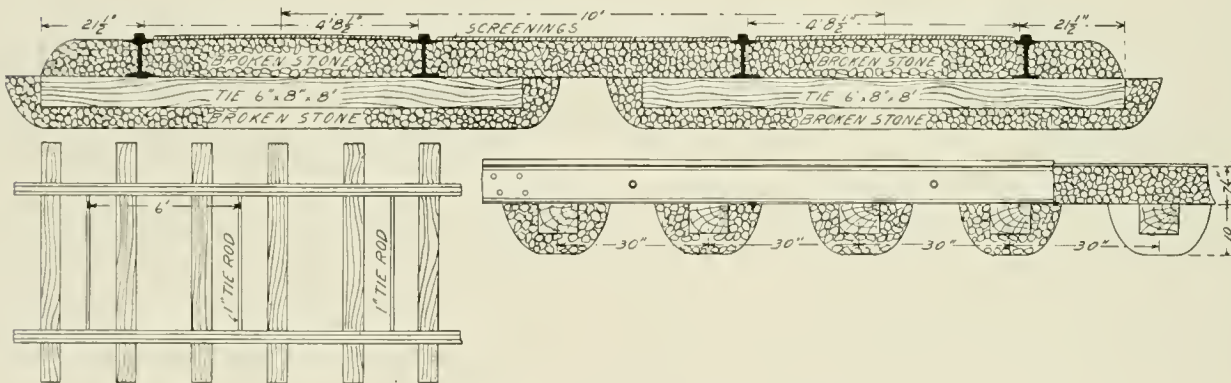
CROSS SECTION WITH ASPHALT PAVING.



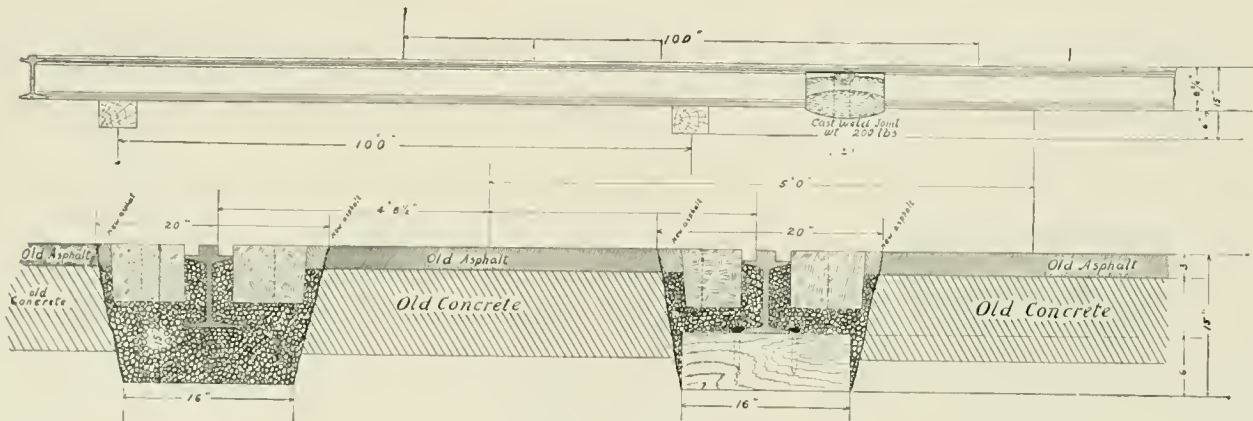
BRICK PAVING—LONGITUDINAL SECTIONS—ASPHALT PAVING.



CROSS SECTION WITH BRICK PAVING.



PLAN AND SECTIONS WITH MACADAM PAVING.



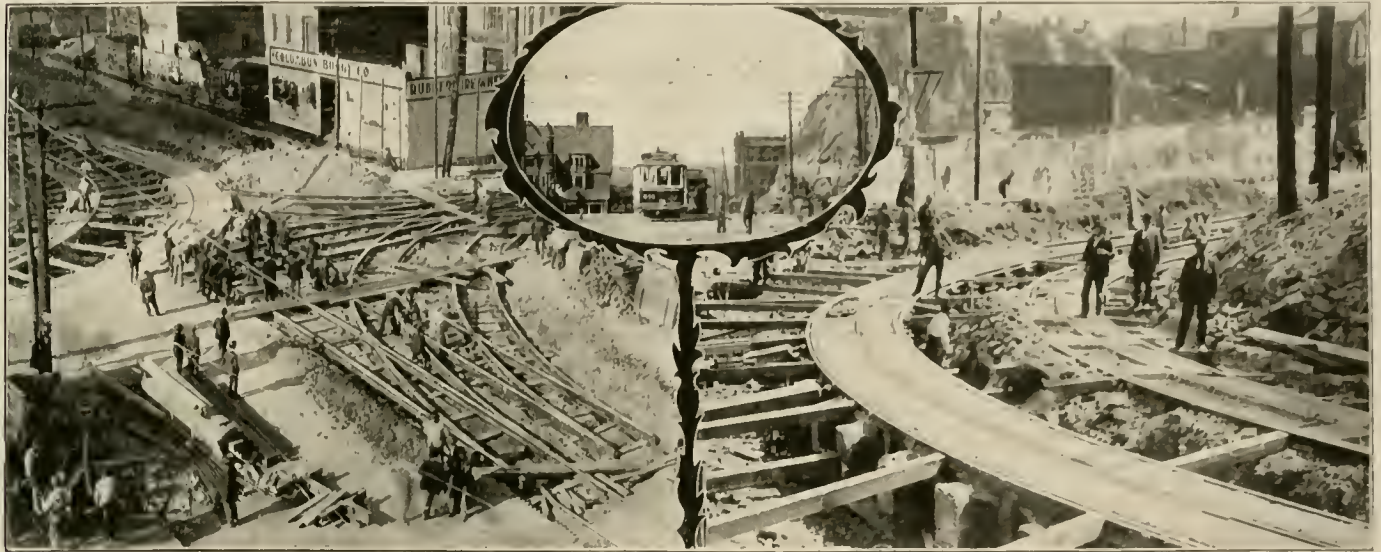
TRENCH CONSTRUCTION.

layout at Eighth St., the latter including a double track crossing a double track with double track curves connecting three of the corners. The rails and slot rails on cross streets were also changed and laid on concrete. All this work was completed in 60 days with cable and electric cars passing over the tracks at intervals of two minutes, without a single accident or delay to traffic.

A large portion of the special work put in by the Metropolitan company in the last five years has been of the Lorain "Guarantee" construction and most of the cable crossings are of the Lorain cast steel design. Two very complicated pieces of special work furnished by the Lorain Steel Co. are located at Grand Ave. and Eighth and Ninth Sts.

The elevated structure previously mentioned was built in 1888. It is of the truss type, the cross members being iron I beams 40 in. deep x 20 ft. 6 in. long, resting on iron posts. Where the smaller supporting girders intersect, the members are held together by pin connections. The iron columns rest on concrete foundations 4 ft. square.

jasperite. In several places all three pavings are found between the curbs of the same street. For instance on Grand Ave. near the company's general offices, the space between the two tracks is paved with brick, between the rails of each track with jasperite and the remainder of the street with asphalt. This condition is due to the fact that nearly all of the cable lines were originally paved



RECONSTRUCTION WORK DONE BY FALK CO. ON GRAND AVE., KANSAS CITY.

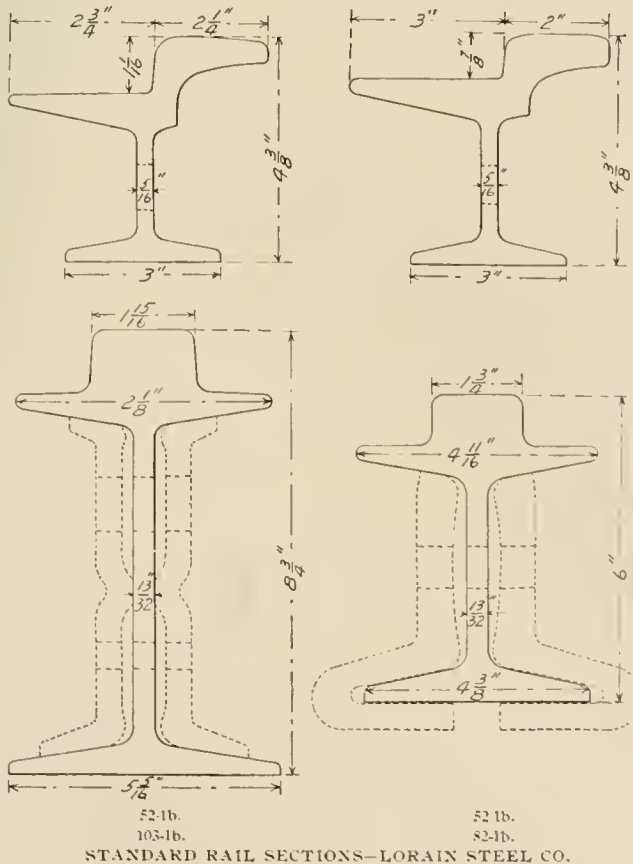
The tunnel through which cars pass just before reaching the elevated structure is 15.1 ft. high at the center line and 21.30 ft. wide at the widest part. The brick arch lining is 2 ft. 2 in. thick.

PAVING.

As in the other departments, considerable diversity of practice is found in the methods of paving, due to the many different managements under which the work has been done, and to the various changes in motive powers. Three materials predominate, asphalt, brick and Sioux Falls imitation granite, otherwise known as

between the track rails and slot with jasperite and the space between the up and down tracks with cedar blocks. As these blocks were unsatisfactory they were replaced temporarily with brick, which, however, have never been disturbed, and when the city wanted to pave the remainder of the street, it decided upon asphalt. Asphalt is the favorite material with the company and has been used almost exclusively for the past three years in reconstruction work and on new extensions. The price paid per sq. yd. laid is \$2.12, with a 10-year guarantee that there will be no expense for maintenance, which, considering the durability of other materials and the greater satisfaction given by asphalt from the standpoint of the general vehicle traffic, makes this the most desirable paving the company has discovered.

Trinidad Lake asphalt is used. In preparing the street a bed



STANDARD RAIL SECTIONS—LORAIN STEEL CO.



TRACK ON BROADWAY, ELECTRIC INSTALLATION CO.

of concrete is first laid to a depth of 4 in., or more if the conditions require. On this is placed the asphalt in two strata, the lower or binder course, 1/2 in. in depth, consisting of asphaltic cement mixed with fine clean gravel. After the binder course has been thoroughly tamped, the asphalt is spread on in a layer 1 1/2 in. thick, and rolled, dusted and finished with hot irons. Whenever asphaltic pavement is put down, "toothing stones" of jasperite are invariably placed along either side of each rail in alternate headers

and stretchers, that is a stone laid lengthwise and the next endwise. This effectually prevents the formation of wagon wheel ruts at the sides of the rails.

Brick paving is being laid in some quantities in localities where there are apt to be changes, as repairs or abandonment of line and on some of the cable lines that are to be changed to electric traction in the not distant future. Wherever brick are used they are placed on a 4-in. foundation of concrete and 1 in. of sand, tamped to a smooth surface and grouted with portland cement grout, consisting of one part cement to two parts sand, accurately measured. The grouting mixture is poured over the concrete-sand foundation and tamped and pressed into all openings and crevices. The cost of brick paving of this character averages \$1.25 per sq. yd. The durability of brick for street surfaces in Kansas City has been limited, the life varying according to street traffic density from three to six years.

On some of the early cable lines, cedar blocks were tried for paving between the slot and the rails, but these had to be removed almost immediately, as moisture caused the blocks to expand and close the slot openings.

A few of the outlying lines are paved with macadam.

POWER STATIONS.

The Metropolitan system is operated from eight power stations, of which two are electric, two cable, three combined electric and cable, and one a cable plant driven by motors taking current through feeders from the largest electric station.

KAW RIVER OR CENTRAL AVE. STATION. This is located just

load rating 50 per cent for three hours. Runs at 80 r. p. m. Was erected and started in September, 1898. This is direct connected to a 1,500-h. p. cross compound condensing Allis engine, with cylinders 22 and 56 in. x 60 in.

One 550-kw. 550-volt direct current General Electric generator, overload rating 50 per cent for three hours. Runs at 90 r. p. m. Was erected and started in February, 1900. This is direct connected to a 1,000-h. p. tandem compound condensing Allis engine, with cylinders 28 and 44 in. x 48 in.

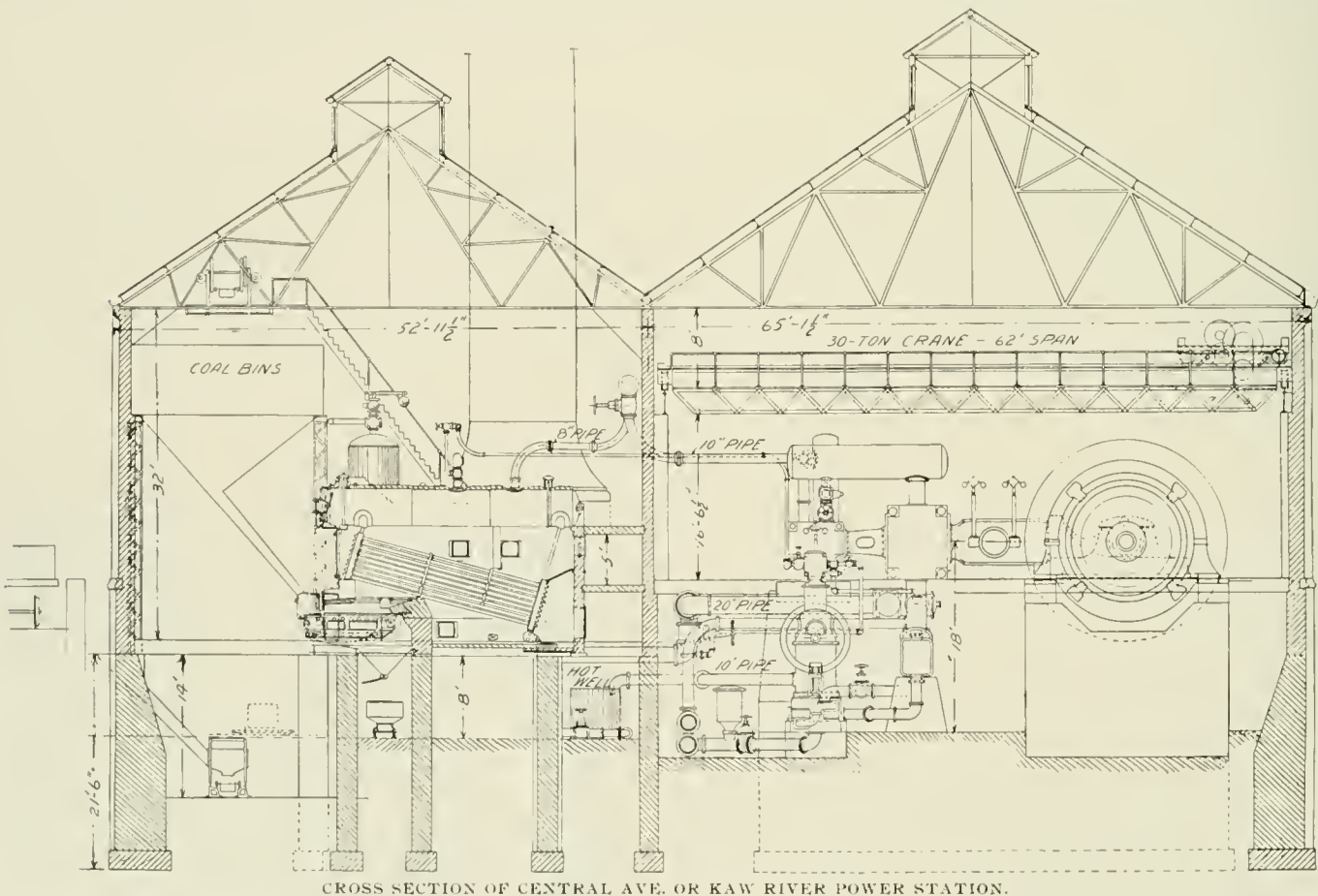
One 1,500-kw. 550-volt direct current General Electric generator, over-load rating 50 per cent for three hours. Runs at 75 r. p. m. Was erected and started in August, 1900. This is direct connected to a 3,000-h. p. cross compound condensing Allis engine, with cylinders 36 and 72 in. x 60 in.

The first unit is equipped with Reynolds-Corliss combined air and circulating pump, air cylinder being 36 in. x 16 in. stroke and steam cylinder 14 in. x 18 in. stroke; also a Wheeler condenser having 3,000 sq. ft. of cooling surface.

The second unit has Blake combined air and circulating pump with cylinders as follows: Steam, 16 in. x 24 in. stroke; air, 20 in. x 24 in.; water, 22 in. x 24 in.; also Wheeler condenser having 3,000 sq. ft. cooling surface.

The third unit has Blake combined air and circulating pump with cylinders as follows: Steam, 14 in. x 16 in. stroke; air, 16 in. x 16 in.; water, 16 in. x 16 in.; also Wheeler condenser having 1,800 sq. ft. surface.

The fourth unit has one vertical Allis independent triple plunger circulating pump rated at 5,000,000 gal. in 24 hours, and an Allis



across the Kaw River in Kansas City, Kan., and is the main electric generating power house of the system.

It contains four units as follows:

One 1,200-kw. 550-volt direct current Walker generator, overload rating 50 per cent for six hours and giving in service 1,500 kw. continuously at 80 r. p. m. This was erected and started in June, 1897, being one of the first machines built by the Walker company of a larger size than 800 kw. It is direct connected to a 1,500-h. p. tandem compound condensing engine built by the E. P. Allis Co. Cylinders are 30 and 60 in. x 48 in.

One 1,200-kw. 550-volt direct current Walker generator, over-

air pump, 42 x 16 in. with Reynolds valves and gear; also Wheeler condenser with 5,000 sq. ft. of surface.

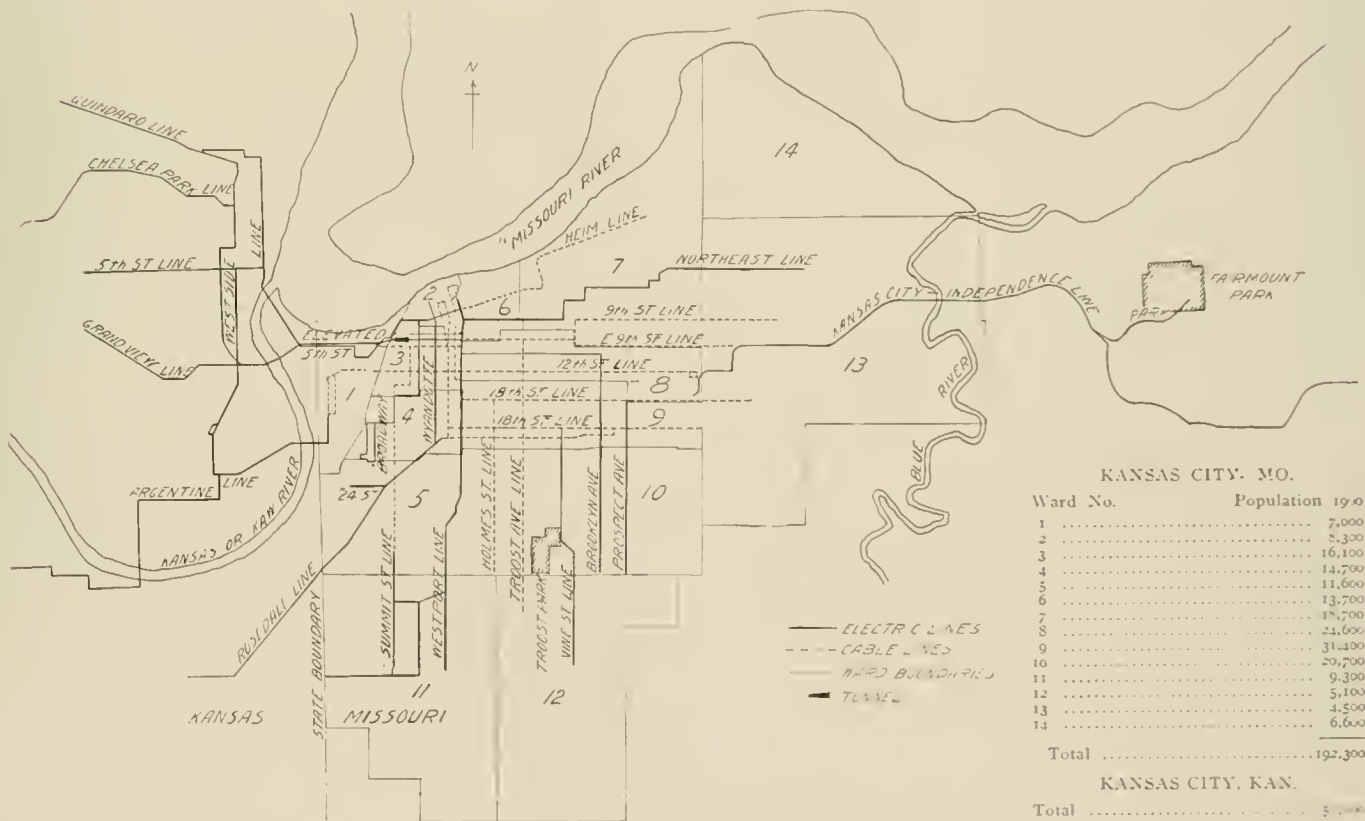
The engines are fitted with an automatic gravity oiling system.

At all four engines the steam is lead from the main steam pipe into a Reynolds separator. Each engine also has between its high and low pressure cylinder a reheater which is jacketed with steam led from the high pressure cylinder through a small by-pass.

All water from condensation is returned to a hot well in the basement, from which it is taken by the feed pumps and passed through a 3,000-h. p. feed water heater, heated by the exhaust steam from the auxiliary units, which raises the temperature from



1885 - KANSAS CITY STREET RAILWAYS 1890.



THE STREET RAILWAY SYSTEM OF KANSAS CITY IN 1900.

KANSAS CITY, MO.	
Ward No.	Population 1900
1	7,000
2	5,300
3	16,100
4	14,700
5	11,600
6	13,700
7	18,700
8	21,600
9	31,400
10	29,700
11	9,300
12	5,100
13	4,500
14	6,600
Total	192,300
KANSAS CITY, KAN.	
Total	5,000

LENGTH OF THE SEVERAL LINES IN FEET.

ELECTRIC.		CABLE.	
Westport	20,327	Broadway	10,962
Summit St.	7,396	West Side	20,838
33d St.	2,776	North East	20,843
Wyandotte St.	7,531	Vine St.	12,044
Argentine	26,665	Rosedale	25,430
Prospect Ave.	9,024	Kansas City & Independence	40,138
5th St.	23,363	Park Connecting	4,300
		Elevated Road	31,489
		Chelsea Park	12,400
		Grand View	8,800
		Brooklyn Ave.	18,443
		24th St.	1,860
		Broadway Plug	2,709
		Total	307,340
		15th St.	21,094
		Summit St.	11,453
		Holmes St.	9,040
		East 9th St.	8,691
		Troost Ave.	13,563
		9th St.	20,458
		12th St.	21,276
		18th St.	20,166
		Total	125,720

Total length measured as single track, 866,120 ft. equals 164 miles.

COST OF POWER AT CENTRAL AVENUE STATION (KAW RIVER).

Referred to as No. 10 in other Power House Reports in the "Review."
Output measured by Wattmeter.

MONTH.—1899-1900.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.							Total.	Gals. Cy-linder Oil per 10,000 k. w. h.	Gals. Lub-ricating Oil per 10,000 k. w. h.	Lb. Fuel per k. w. h.
		Fuel.	Labor.	Supplies, Oil, Waste, etc.	Water.	Repairs.		Miscellan-eous.				
						Engines.	Generator.					
October.....	513,959	.109	.247	.011	.010	.094	.001	....	.473	2.10	4.80	4.89
November.....	507,346	.111	.209	.006	.009	.003	.005	.001	.343	1.98	....	3.25
December.....	548,891	.103	.366	.012	.008	.001	.004	....	.493	2.70	2.90	5.06
January.....	539,000	.104	.390	.002	.012	.008	.019	.010	.544	....	....	6.23
February.....	572,187	.102	.282	.012	.012	.006	.017	.001	.432	3.50	5.24	4.68
March.....	746,084	.081	.276	.006	.009	.002	.009	....	.383	2.30	....	4.80
April.....	812,789	.077	.231	.007	.007	.004	.004	.001	.331	1.86	1.17	4.85
May.....	894,415	.078	.257	.008	.005	.004	.016	....	.368	3.35	1.70	4.93
June.....	878,604	.088	.268	.005	.005	.014	.012	.001	.393	1.14	2.27	4.22
July.....	960,589	.082	.313	.012	.005	.007	.012	.002	.432	4.19	2.60	4.86

The quantities of coal and oil are estimated from the total quantity purchased.
The fuel used is Cherokee slack, which on occasions of extra heavy load is mixed with nut coal, half and half. The cost per ton is from \$1.20 to \$1.40.

110° to 180 or 190° before the water reaches the boilers. Losses in the circulating system are made up by water automatically trapped in from the city mains. The water for condensing purposes is taken from the Kaw River through two 24-in. mains and returns by gravity.

The switchboard comprises 35 panels as follows:

One wattmeter panel with one 5,000-ampere Thompson recording instrument.

Three 3,000-ampere generator panels, each containing one Form K, G. E. circuit breaker, one Weston illuminated dial ammeter, two quick break switches, rheostat and switch for field coils of generator and one lightning arrester.

One 5,000-ampere generator panel, same as other generator panels except instruments are for 5,000 amperes.

Thirty feeder panels, capacity from 500 to 800 amperes, each

ning the length of each side wall and supported by the columns of the building.

At present steam is generated in six 250-h. p. Babcock & Wilcox boilers and two 500-h. p. Aultman & Taylor "Cahall" horizontal water tube boilers. Four additional boilers of the same size and make as the two latter are nearly ready for use. Steam is carried at 160 lb.

One of the most interesting features at this station is the piping system; though the main header is over 200 ft. long it has no expansion joints. The boilers are arranged in batteries of two and from each battery a pipe bent to form a reverse curve leads to the main header which is carried along the side wall as shown in one of the engravings. The header is anchored near its middle point and supported on cradles with rollers. The main engines only are supplied from this header, an auxiliary header being provided to take steam to the pumps and other auxiliary machinery. The piping was made for a pressure of 250 lb. per sq. in. All flanges are of flomed steel, extra heavy, and the valves of the Crane extra heavy gate pattern.

Six of the boilers are fitted with B. & W. automatic chain-grate stokers and the others with Green chain-grate stokers, fed by means of an elaborate system of coal-handling machinery and storage bins. The bins are 14 in number, carried near the roof of the boiler room, partly by the side walls and partly by independent girder columns. Two girder beams each 7 ft. deep span the boiler room, and form the upper part of the bin sides, the canting or converging bottoms being made of 3/4-in. steel plates riveted together. A conveyor carries the coal from the basement to the bins above, which have capacity for 800 tons. The two bins in the center are kept for storing ashes which are lifted by the same conveyor at times when it is not working on coal. When ash bins are full the ashes are dumped into wagons or cars for removal.

The company uses principally Cherokee slack costing \$1.20 to \$1.40 per ton and which contains nearly 10,000 heat units per lb. When slack can not be easily obtained and on special occasions when it is necessary to force the boilers owing to extra heavy loads, a mixture of half and half slack and nut is used.

The stack is 183 ft. high from the boiler room floor and 18 ft. across at the base. The flue is 100 in. in diameter the full length. The stack is of steel plate, self-supporting construction, and is lined with brick through to the top. A second stack similar in all respects to the first is in course of erection for use when the additional boilers are ready.

The building itself is 148 ft. 11 in. x 118 ft. 6 in., and 61 ft. high, divided by a brick wall into two bays, one the engine room, 63 ft. x 148 ft. 11 in., the other the boiler room, 52 ft. 6 in. x 148 ft. 11 in. The walls are 18 in. thick at the base, and are of brick with stone trimmings. Each bay has a steel truss monitor roof covered with slate, with gutter and spouts of copper.

In excavating for the foundation it was necessary to go down 22 ft. to reach a firm footing in the shape of a stratum of coarse sand. On this was spread an 18-in. layer of concrete, and all wall, boiler and engine foundations go clear down to this concrete bed. Fifteen feet of the engine foundations are of heavy rubble masonry, built with portland cement and the rest of hydraulic pressed brick in portland cement. All foundations are spread to give ample foot-



EXTERIOR OF KAW RIVER STATION

panel containing one Form K, G. E. circuit breaker, lamp bracket with shade, one Weston round pattern ammeter, one quick-break switch and one lightning arrester.

For all the generator panels mentioned two 750-volt Weston illuminated dial voltmeters are used. The switchboard is also fitted with one 750-volt recording voltmeter and one 3,000-ampere recording ammeter of Bristol make. Readings from these instruments showing the output of the station will be found in a table given later in this article.

Spanning the engine room is a 63-ft. 32-ton hand-power crane, built by the Brown Hoisting & Engineering Co., of Cleveland. The crane travels on 56-lb. T rails, bolted to 24-in. I beams run-

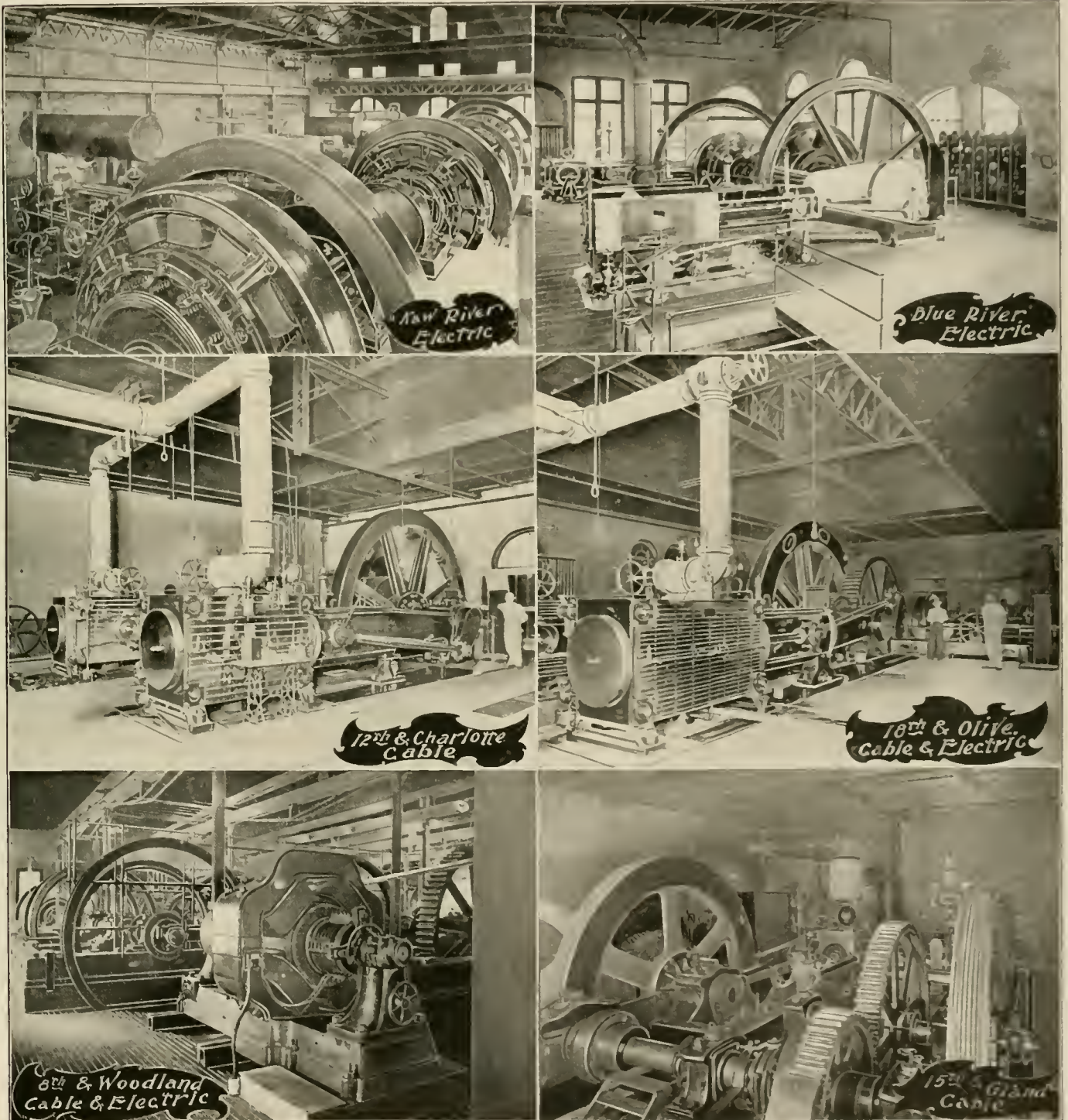
ing surface and are designed to support 2 tons to the sq. ft. of base area.

The boiler room floor is supported on 15-in. I beams running from wall to wall, upon which is laid a granitoid floor composed of portland cement, sharp sand and granite screenings.

BLUE RIVER OR SHEFFIELD ELECTRIC STATION. This is 16-

direct connected to a 500-h. p. simple condensing W. Wright engine.

One 250-kw. 550 volt direct current General Electric generator, likewise compounded for 10 per cent rise in voltage at full load. This is direct connected to a 300-h. p. simple non-condensing Allis Reynolds-Corliss engine, with cylinders 24 x 48 in.



VIEWS IN SOME OF THE METROPOLITAN POWER STATIONS.

cated on the Blue River about six miles east of Main St. in Kansas City, Mo., and operates the interurban line to Independence.

It contains two units:

One 450-kw. 550-volt direct current General Electric generator, compounded for 10 per cent rise in voltage at full load. This is

There are three duplex feed water pumps, one Allis jet condenser and one feed water heater.

The switchboard is in the shape of the arc of an ellipse and comprises 10 panels as follows: One wattmeter panel with Thompson and Bristol recording instruments; one 1,000-ampere generator panel; one 800-ampere generator panel; three 300-ampere feeder panels;

four 800-ampere feeder panels. These have a full complement of instruments, switches, circuit breakers, etc.

Steam is taken at 100 lb. from five 125-h. p. fire tube boilers.

The station on a recent test developed a total output of 739 electrical h. p. for a single hour.

EIGHTH AND WOODLAND AVE. COMBINED CABLE AND ELECTRIC STATION. This station is about half way between the Kaw River and Blue River power houses and its electric generating unit is used to help out either one or the other of those stations as the load requires. This it does through a system of



STEAM PIPING, KAW RIVER STATION.

feeders, which will be described later. Its cable plant drives the Ninth St. cable, the Independence Ave. cable, the Troost Ave. cable and the East Ninth St. cable.

The station contains the following:

One 300-kw. 550-volt direct current General Electric generator belted to a 500-h. p. simple non-condensing Wright engine, with cylinders 28 x 48 in. As the boilers carry steam at 160 lb. for the cable engines, and this Wright engine was built for 120-lb. pressure, steam is taken through a Davis reducing valve. The switch-board comprises one 3,000-ampere generator panel and four 300-ampere feeder panels.

The cables are driven by a 1,500-h. p. tandem compound non-condensing Allis Reynolds-Corliss engine, with cylinders 26 and 40 in. x 72 in. It runs at 42 r. p. m. This engine is half of a double tandem which ran in Machinery Hall in Chicago during the World's Fair. It is coupled direct to the line shaft which extends across the building. On the shaft are the four cable pinions which are connected to it by friction clutches. The pinions drive the gears at a reduction in speed of 134.

The boiler room contains two 400-h. p. and two 300-h. p. Babcock & Wilcox boilers, with B. & W. automatic stokers; two feed water pumps, and one feed water heater. As this plant has been troubled with excessive boiler scale the engineer is using a compound furnished by the Dearborn Drug & Chemical Works, Chicago, which is fed into the hot well drop by drop from a barrel at the top.

In the boiler room there is also a water storage tank, 24 ft. in diameter and 18 ft. deep, in which the feed water is stored. Steam coils around the inside of the tank raise the temperature of the water to a considerable degree before it passes to the heater itself. The coils take steam from the exhaust main.

EIGHTEENTH AND OLIVE STS. AND 31ST AND HOLMES STS. COMBINED CABLE AND ELECTRIC STATIONS. The electrical units at these two stations feed into the same feeders and the two stations together operate the Vine St. electric line and the Prospect Ave. electric line, and when necessary they can help out on some of the other near-by branches.

The cable machinery at the 18th and Olive Sts. house drives the 18th St. cable, the Main St. cable and the 19th St. cable. The 31st and Holmes Sts. house drives the Holmes St. cable.

The station at 18th St. contains the following: One 125-kw. 550-volt Westinghouse generator belted to the balance wheel of a

Hamilton-Corliss twin engine which also drives the cable machinery. The engine was built by Hooven, Owens & Rentschler, of Hamilton, O., has cylinders 30 x 72 in. and each side is rated at 750-h. p. There are also two reserve units consisting of two D-62 500-volt Thompson & Houston generators belted to two high-speed Armington & Sims engines. The steam plant includes three 200-h. p. Babcock & Wilcox boilers.

The 31st St. station contains one 125-kw. 550-volt Westinghouse generator belted to a 300-h. p. simple non-condensing Reynolds-Corliss engine, with cylinders 24 x 48 in., taking steam from two 175-h. p. Babcock & Wilcox boilers. The same engine drives the cable machinery.

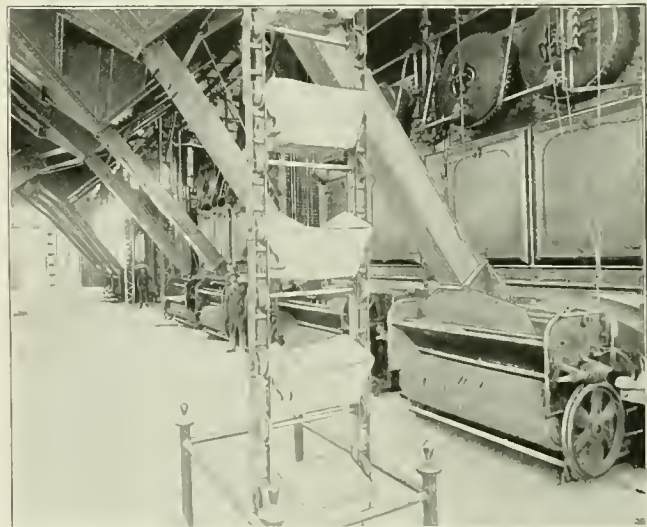
FIFTEENTH AND GRAND AVE. CABLE STATION. This house operates the Walnut St., the 15th St., and part of the Holmes St. cable lines, the machinery being driven by one 750-h. p. simple non-condensing Allis engine, with cylinders 36 x 48 in., and one 500-h. p. simple non-condensing Allis engine, with cylinders 32 x 48 in. Steam is taken at 100 lb. through a separator from four 250-h. p. Babcock & Wilcox boilers. Two Worthington duplex pumps supply the boilers with feed water which passes through a Berryman heater.

TWELFTH AND CHARLOTTE STS. CABLE STATION. This house runs the 12th St. cable line by two ropes driven by two 600-h. p. simple non-condensing Hooven, Owens & Rentschler engines, with cylinders 28 x 60 in., taking steam at 110 lb. from three 200-h. p. Babcock & Wilcox boilers. All the cable drums are in the basement beneath the main engine room, the pinions passing up through the floor to mesh with the gears. The station also contains a Worthington pump for supplying water to an automatic fire sprinkling system protecting the repair shops and car barn which are in the same building.

NINTH AND WASHINGTON STS. MOTOR-DRIVEN CABLE STATION. This installation which operates the Summit St. line is interesting as showing the application of electricity to driving a cable where severe grades forbid the use of the overhead trolley system.

The cable machinery at this house was originally driven by a pair of 24 x 48 in. Wright engines, but is now operated by two 300-kw. 550-volt General Electric generators, arranged to run as motors and taking current through feeders from the Kaw River station.

To protect these motors against the excessive variations in the load incident to this service a small electro magnet is mounted at



BOILER ROOM, KAW RIVER STATION.

one side of the main circuit breaker for each machine, its coils being connected as a shunt to the motor circuit, and provided with mechanism for automatically opening the breaker whenever the line potential falls below 400 volts or rises to a dangerous point.

The starting rheostat consists of 12 separate boxes made of white pine, each box containing 680 ft. of No. 9 galvanized iron wire, wound in helices 2 in. in diameter, and placed in a zig-zag shape with glass partitions between to prevent electrolytic action. Water

is passed in a continuous stream through the boxes to keep the wire cool during the time the rheostat is used in operating the motors at very low speeds. Each box has four points of resistance in series which are connected to quick-break switches on the switchboard, and the 12 boxes are connected in parallel. The arrangement of the resistance coils gives from 50 to 1,080 amp. at 500 volts for any desired length of time. The rheostat is connected in on the negative side of the motors to prevent a leakage of current through water connections.

It is estimated a saving of 70 per cent is secured by driving this cable in this way instead of by steam engine direct.

FEEDER SYSTEM.

As can be readily imagined the general layout of the Metropolitan's electric lines has made the problem of economical distribution of power an extremely difficult one, and to the company's electrical engineer, Mr. Charles Grover, belongs the credit of having worked out a system, which, while it requires a considerable investment in copper, is undoubtedly the best that could be devised under the conditions and one that is giving highly satisfactory results.

The feeder system comprises 889,106 ft. of cables, as follows:

	Positive Cables, Ft.	Negative Cables, Ft.
No. 0	6,114	4,650
No. 0 0	33,946	7,652
No. 0 0 0	80,062	
No. 0 0 0 0	154,360	22,459
250,000 c. m.	7,719	1,000
300,000 c. m.	15,643	
350,000 c. m.	36,256	10,549
400,000 c. m.	30,597	
450,000 c. m.	34,396	
500,000 c. m.	43,247	23,616
550,000 c. m.	18,587	
600,000 c. m.	82,529	10,900
650,000 c. m.	52,992	8,113
700,000 c. m.	43,537	650
750,000 c. m.	17,245	
850,000 c. m.	53,850	750
950,000 c. m.	11,490	1,000
1,000,000 c. m.	32,351	33,838
Total length	763,929	125,177



BUILDING THE VINE ST. LINE IN 1887.

As has been stated, electric power is taken from five different plants, and it is carried to all parts of the system by an arrangement of feeders shown in the accompanying diagram. The Holmes and Olive Sts. houses work together through feeders as a single unit.

Ordinarily the Kaw River or Central Ave. power house carries all the lines in Kansas City, Kan., and those in the western portion of Kansas City, Mo., but when necessary it calls on the Woodland Ave. station for help, at which times the latter house carries the lines in its immediate vicinity. When the load on the Independence line approaches the total capacity of the Blue River station it likewise seeks help from the Woodland house, the times of heavy load on the two river stations seldom occurring at the same period of the day. When the Woodland generator is assisting either station in this way it cuts direct into the feeder system of the station it is helping and no equalizing wire is used. This arrangement has been found in practice to work perfectly. Of course when the point of

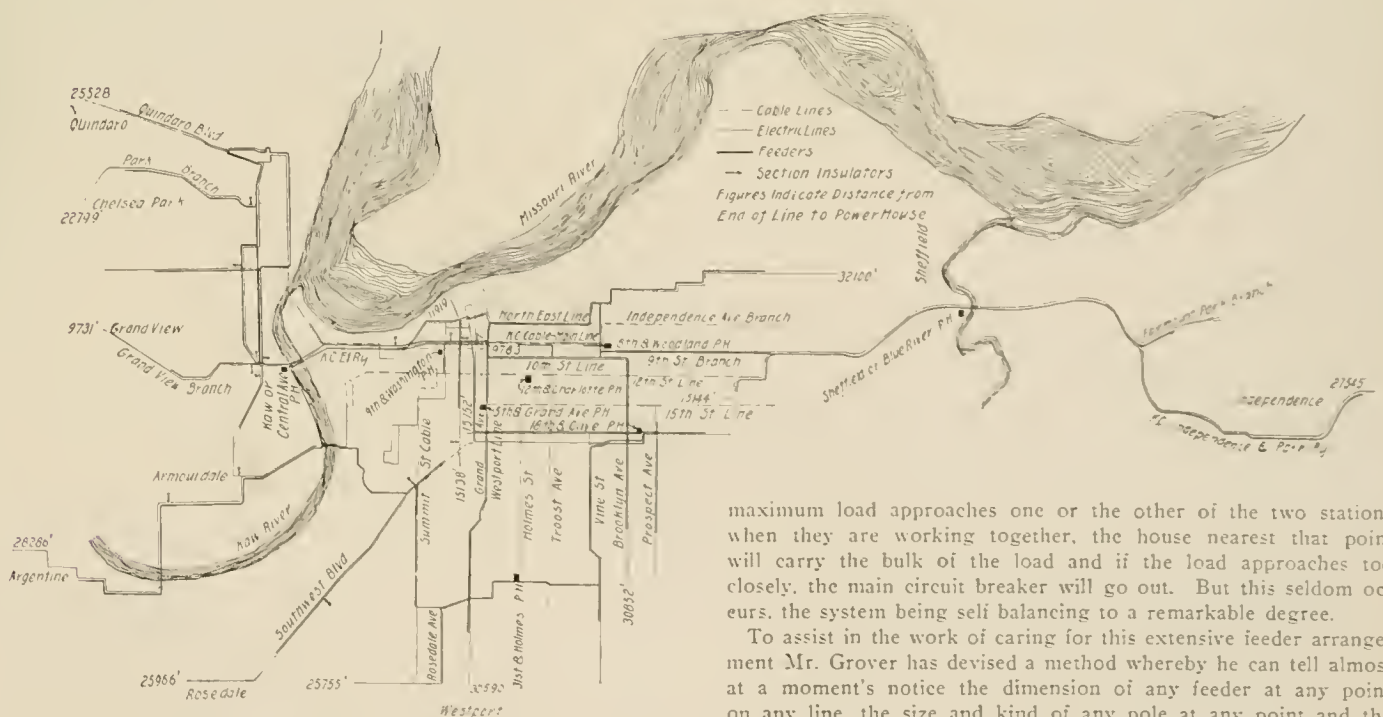
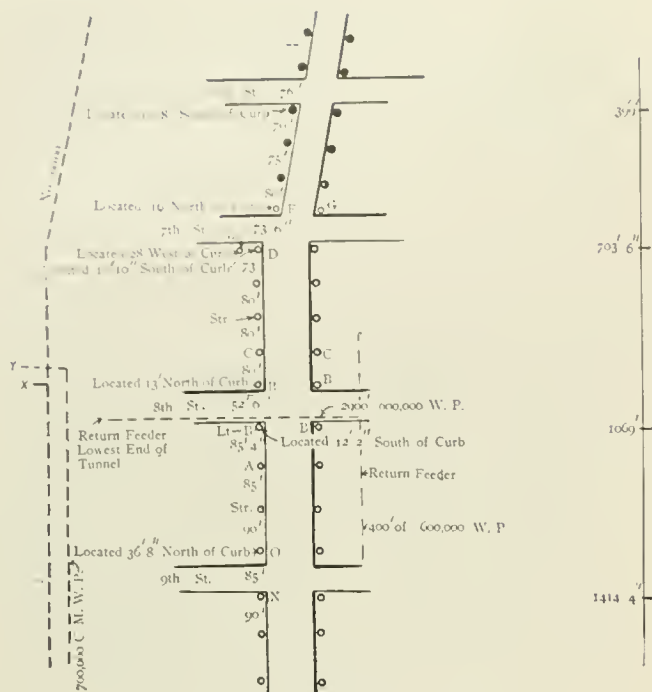


DIAGRAM OF FEEDER SYSTEM.

maximum load approaches one or the other of the two stations when they are working together, the house nearest that point will carry the bulk of the load and if the load approaches too closely, the main circuit breaker will go out. But this seldom occurs, the system being self balancing to a remarkable degree.

To assist in the work of caring for this extensive feeder arrangement Mr. Grover has devised a method whereby he can tell almost at a moment's notice the dimension of any feeder at any point on any line, the size and kind of any pole at any point and the location of every lightning arrester and section insulator. He



SECTION OF FEEDER RECORD DIAGRAM.

All poles unless marked differently must be set 10 in. back from curb line and 12 in. against span.

Cross arms for feeders will be placed on west side of street.

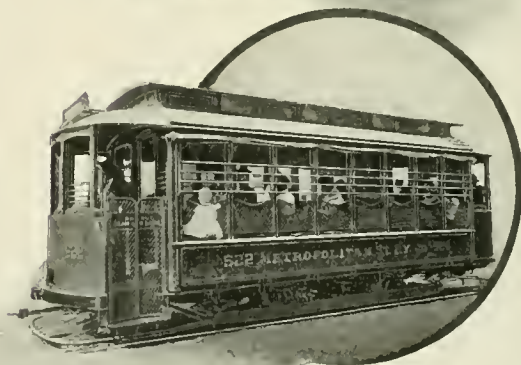
- 6-7-8-in. by 31-ft. poles unless marked differently.
- 6-7-in. by 30-ft. poles.
- A—6-7-8-in. by 32-ft. poles.
- B—6-7-8-in. by 33-ft. pole; raked 14 in. against span.
- C—6-7-8-in. by 32-ft. pole; set 6 ft. deep; set anchor No. 1 without ring or collar.
- D—6-7-8-in. by 31-ft. pole; set as anchor No. 1; rake 14 in. against span and 6 in. north.
- E—6-7-8-in. by 31-ft. pole; set as anchor No. 1; rake 14 in. against pole D.
- F—6-7-8-in. by 31-in. pole; set as anchor No. 1; rake 6 in. east towards opposite pole.
- G—6-7-8-in. by 31-ft. pole; set as anchor No. 1; rake 14 in. against span.
- H—6-7-8-in. by 31-ft. pole; set as anchor No. 1; rake 12 in. against span and 6 in. south.
- I—6-7-8-in. by 32-ft. pole.
- J—6-7-8-in. by 33-ft. pole.
- K—6-7-8-in. by 31-ft. pole; set 6 ft. deep as anchor No. 1; rake 12 in. against span and 6 in. south.
- L—6-7-8-in. by 32-ft. pole; set 6 ft. deep as anchor No. 1; rake 12 in. against span and 6 in. south.
- M—6-7-8-in. by 33-ft. pole; set 6 ft. deep as anchor No. 1; rake 14 in. against span.
- N—6-7-8-in. by 31-ft. pole; set as anchor No. 1; 6 ft. deep without collar or ring; no rake.
- O—6-7-8-in. by 31-ft. pole; set as anchor No. 1; 6 ft. deep without ring or collar; rake 14 in. against span.
- X—Two 650,000-c. m. (water proof) feeders to power house.
- Y—950,000-c. m. (water proof) feeder to power house.
- Str—Strain plate; placed every ten or twelve poles and on each side of curves and crossings.
- Fd—Feeder tap.
- Lt—Lightning arrester.
- SL—Section insulator.

keeps these records by means of sheets of tracing paper, on which the different lines are plotted in detail as shown on the portion of a sheet reproduced herewith. If repairs are to be made or a new line built across an old one, a blue-print copy of the line involved is given the assistant engineer in charge of the construction gang enabling him to clearly understand the situation and follow his instructions more intelligently.

OVERHEAD WORK AND MATERIALS.

Practically all of the 116 miles of overhead construction is No. 0 hard drawn copper wire supported on span wires from iron tubular poles 30 to 40 ft. high set 10 in. back from the curb line. Most of the work has been erected or rebuilt and thoroughly standardized in every part under the supervision of Mr. Grover, who designed all the standards and also all the overhead materials used which are made by the Ohio Brass Co., according to the Metropolitan specifications and purchased through the B-R. Electric Co.,

local agent. The various conditions found on the system have been studied with care and a solution adopted for each problem, and whenever a similar condition was encountered the same solution was invariably applied, this practice resulting in a small number of standards that will make all repairs and the designing of new work a simple matter of reference to what has been done before. Another prominent feature of this road is the attention that has evidently been given to the inter-relation of the trolley wheel and stand, the trolley and span wires and the cars, cross-overs and



TYPICAL KANSAS CITY MOTOR CARS.

other overhead appliances, each part having been specially designed to work in the fullest harmony with all the others, and so well has this been done that the company owns but one tower wagon and that does not average one call a month for emergency repairs. In fact the company does not keep regular horses for the wagon but rents a team from private stables when there is any work to be done.

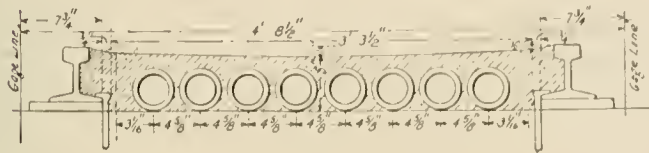
On page 568 is a special truss pole used where excessive strains are to be met or where there is not room for a regular turn-buckle brace. The truss rod is held firmly against the pole near the top by an iron ring that is slipped on while hot and allowed to shrink, and the rod itself is heated for some distance before it is coupled up with pin coupling as shown, so that when it cools the pole is strongly braced in the desired direction.

In nearly all cases feeders are carried overhead, but in a few instances as at boulevards it is necessary to run them underground for a short distance. Where these underground cables come up to join the aerial lines a novel junction box is used which is shown herewith. Its chief feature is its compactness, as it will hold eight cables in a space 18 x 25 in. and 9 in. deep. The feeders are brought up in two sets, one set behind the other, the cables at the

back leading out near the top of the box and those in front near the bottom. Each cable is supported from the roof of the box by a Brooklyn insulator, to which is fastened a small casting carrying two V-shaped bolts through which the feeder passes. The portion of the cable near the points of support has the lead covering cut away and is wrapped with insulating tape.

An accompanying drawing illustrates the method of carrying the underground feeders across the Eighth St. viaduct. They are strung between the rails in asphalt paper ducts laid in portland cement and covered with asphalt.

All trolley wheels are made at a local brass foundry after patterns prepared by Mr. Grover, and are machine finished in the

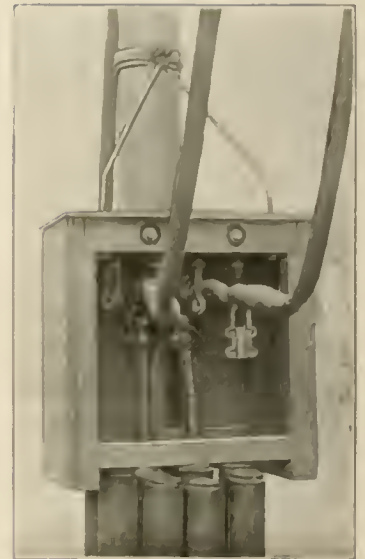


SECTION OF FEEDER CONDUITS.

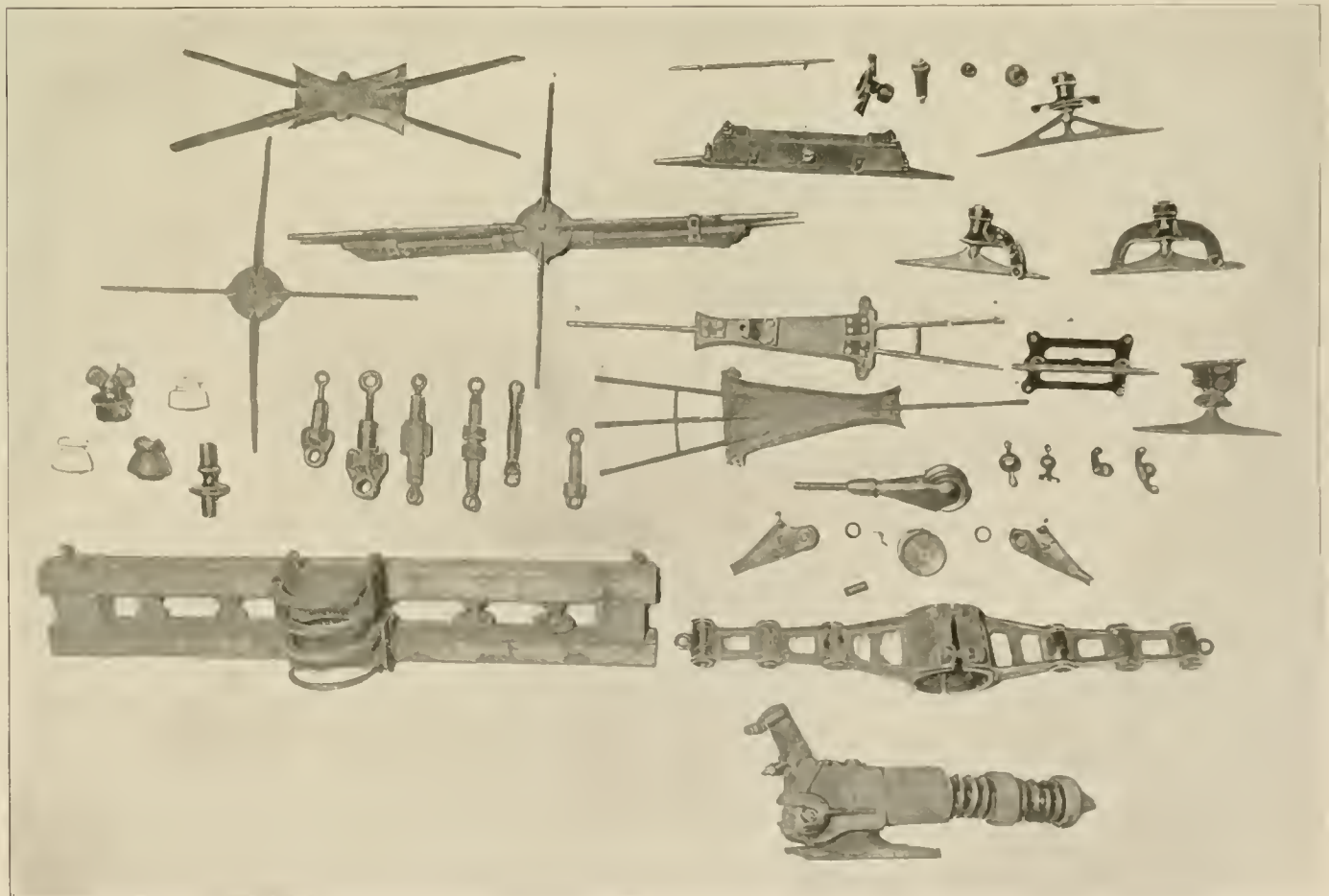
company's shops. The harp, as will be seen from the cut on this page, has absolutely no projections to catch in the overhead work. On the under side the two halves of the harp come together and are held by a screw so that there is no chance of the trolley wire becoming caught in the harp when the conductor is pulling the pole down to replace the wheel on the wire. The spindle is made of Shelby seamless steel tubing with two opposite holes at its center, through which project a small copper plug and a steel plug for contact points, the plugs being continually pressed outwardly by means of a hair-pin spring. The spindle is oiled through a screw-hole, the screw when in place also acting as a stop to keep the spindle in its proper position.

The trolley stand was designed by Mr. J. W. G. Becker, the company's master mechanic. It is of the compression helical spring

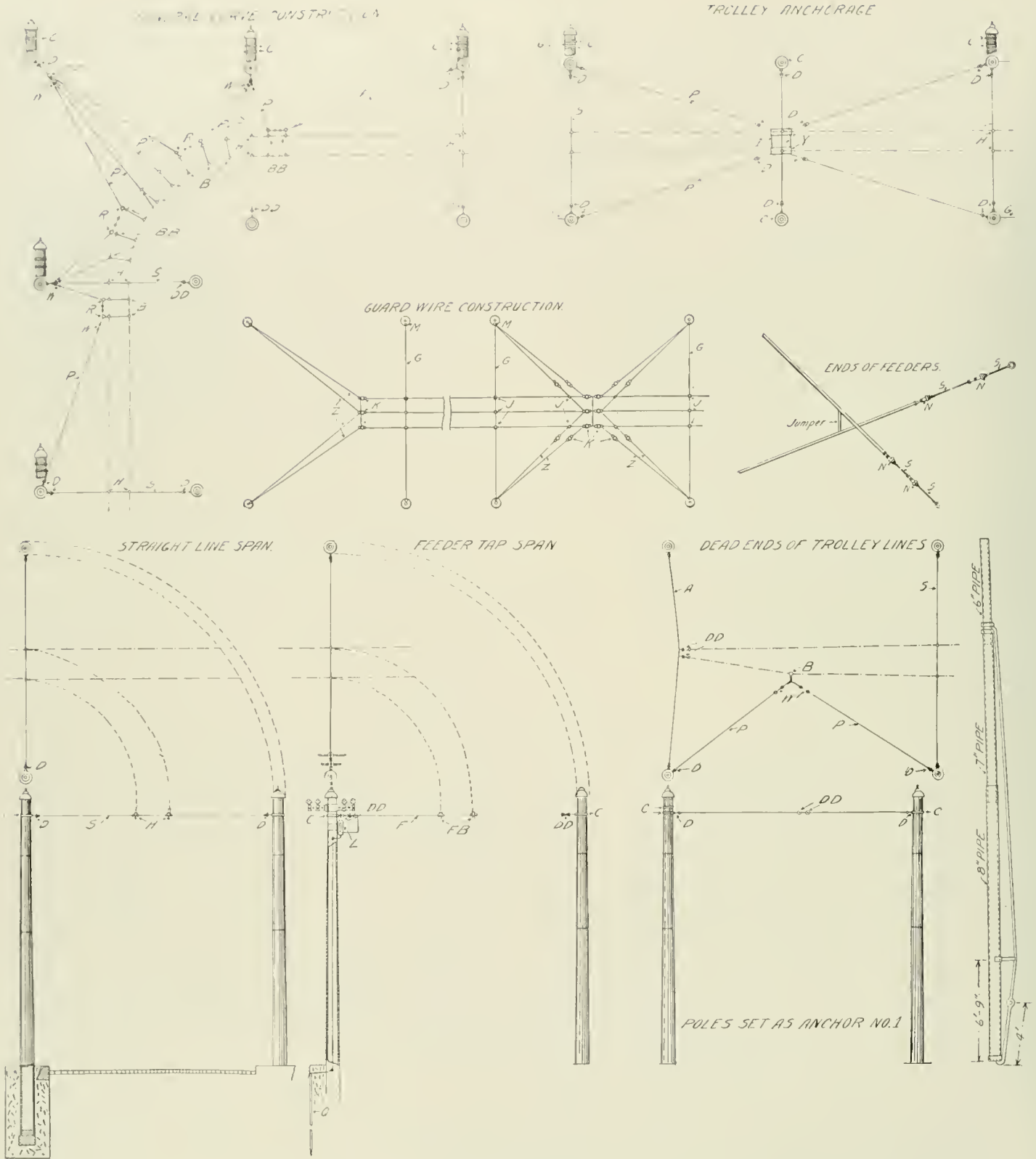
type and consists of a cast iron case containing a connecting rod, joining the spring pin to the steel casting that holds the trolley pole, the spring and the connecting rod being joined by a pin link, the pin having its ends elongated to travel in horizontal guideways on the inside of the case, causing the end of the connecting rod nearest the springs to always travel in a horizontal plane. The piece that holds the trolley pole is pivoted in C-shaped babbitted bearings and is held in its bearings by the tension of the springs alone, being free to move for a limited distance in the opposite direction from the springs, this freedom to "kick" greatly easing the blow caused when the trolley wheel jumps the wire and the pole flies upward suddenly. This blow is further cushioned by a piece of rubber 1 x 1 1/2 x 4 in., which is inserted at the top of the casing where the pole-base casting would otherwise strike. The backward kick is limited by two projections on the under side of the base casting which strike a stop bar and prevent a dislocation of the base piece from its bearings. This arrangement makes a differential joint keeping the upward pull exerted at the outer end of the pole nearly constant whatever the position of the pole, for as the end is pushed or pulled down the tension of the springs increases in practically the same proportion as the leverage decreases.



JUNCTION BOX.



OVERHEAD MATERIAL AND TROLLEY BASE—METROPOLITAN STREET RAILWAY CO.

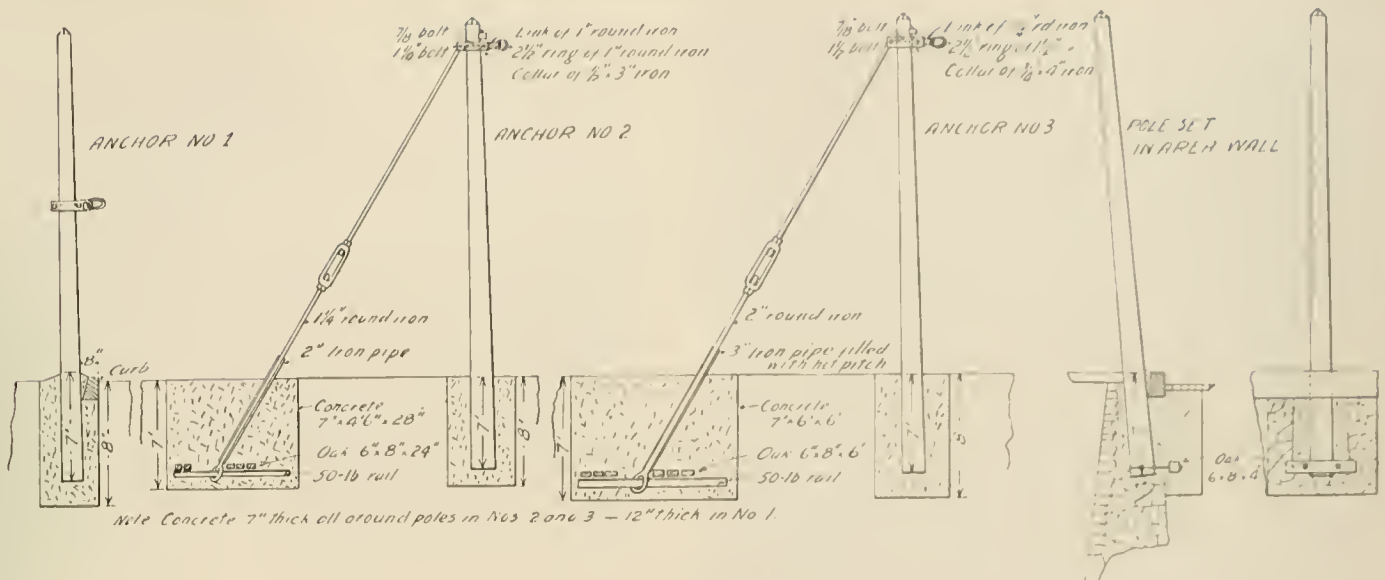


OVERHEAD LINE WORK.

The various standards for pole and span erection are shown in the accompanying plates. The reference letters have the following significance:

- A. 9/16-in. seven strands galvanized steel cable.
- B. Single pull off; body 3/8-in. malleable iron japanned with 5/8-in. insulated stud bolt and brass ear with Detroit lip tinned.
- BB. Double pull off; body of malleable iron japanned, with 5/8-in. insulated stud bolt and brass ear having Detroit tinned lip.
- FB. Feeder tap; body made of brass with 5/8-in. cap screw and lock washer.

- C. Pole collar; made from 1/4-in. x 1/4-in. iron clamped around the pole with 3/8-in. machine bolt and 1/2-in. x 1 1/4-in. machine bolt for fastening the insulator.
- D. "D" Insulator.
- DD. Double "D" insulator.
- F. No. 0 seven strands weather proof copper cable.
- G. 1/4-in. seven strands galvanized steel cable.
- H. Straight line hanger body with brass ear with Detroit lip and 5/8-in. insulated stud bolts.
- HH. Same as H except with stronger ear.
- I. No. 1 B. S. weather proof copper cable.
- J. General Electric straight line guard wire holder.



ANCHOR POLES.

- K 1 1/2-in. spherical strain insulator. (On curves pull-offs are spaced the same as on trolley curves.)
- L Lightning arrester type M. S. with No. 4 B. & S., W. P. wire soldered to feeder tap span and connected to the fuse box of lightning arrester. The ground connection is made with No. 0 bare copper wire, run down inside of the pole and wrapped around pipe Q six turns and soldered. The top of pipe must be 3 in. below the sidewalk level and covered in with a portland cement finish.
- M 5/8-in. plain eye bolt.
- N Brooklyn strain insulator; 5/8-in. for 300,000-c. m. or less and 3/4-in. for larger feeders.
- P Pull off wires out of 1/4-in. seven strands galvanized cable.
- Q 1-in. iron pipe 8 ft. long, driven down in ground outside of the concrete the full length.
- R Wrought iron ring 1 in. inside diameter made of 3/8-in. round iron.
- RR Wrought iron ring 1 1/2 in. inside diameter made of 1 1/2-in. round iron.
- S 5-16-in. seven strands galvanized steel cable. On feeder anchors and strain guys 9-16-in. cable is used for feeders larger than 300,000-c. m.
- U Stirrup made out of 3/8-in. round iron to fit pole and clamped on two (1 1/4-in. x 3-in. x 8-in.) finished oak strips. Nuts must be countersunk in strips. The iron and strips to be painted before erection of the arrester.
- W Wood strain insulators.
- Y Brass strain ear with Detroit lip and malleable iron guard plate supported to span by straight line body and 5/8-in. insulated stud bolt.
- Z No. 6 B. & S. silicon bronze wire.

All galvanized cable is of the best quality covered with heavy double galvanizing. The hangers, ears, insulators, etc., are the company's special pattern shown on page 567, which also illustrates the Metropolitan feeder anchor, standard pole cross arm, switches, and trolley wheel and stand. The straight line ears are slightly arch shaped, thus giving the wire a tendency to support the ends, preventing them from working loose; ears are clamped to the wire and then soldered; all cross-overs have unusually long flaring approaches and rounded guidways at the sides; strain ears have upwardly flaring edges; and likewise in all other overhead material the one idea is carried out to offer the least possible obstruction to the passage of the trolley wheel and reduce to the minimum the danger of pulling down the span work or injuring the trolley pole when the wheel leaves the wire. As before stated results have proven the efficiency of the designs.

Anchor No. 1.—The pole is set with 18 in. rake at the top in direction opposite to pull of feeders and, if carrying the span wire also, with a rake of 14 in. opposite to the pull of the span wire. This anchor is used for dead ends of feeders when the total area is 350,000 c. m. or less; also for end span of trolley lines and dead ends of trolley wire.

Anchor No. 2.—The pole is set straight unless it carries span wire,

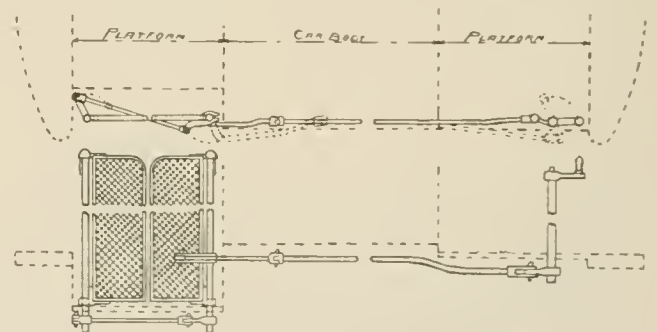
then it is given to in. rake in direction opposite to pull of span. This anchor is used for dead ends of feeders where the total area is 400,000 to 950,000 c. m.

Anchor No. 3.—The pole is set straight unless it carries span wire, then it is given to in. rake in direction opposite to pull of span. This anchor is used for dead ends of feeders having a total area of 1,000,000 to 4,000,000 c. m.

In addition to the three types of anchors the drawing shows a pole as set in an area wall. The anchor thus provided has been found to prevent the butt of the pole being pulled over and breaking out the wall.

REPAIR SHOPS AND REPAIR SHOP PRACTICE.

The principal repair shops for the Metropolitan system are at 12th and Charlotte Sts., and a few repairs on cable cars are made at the Ninth and Washington Sts. barns and minor repairs and



CAR GATE AND OPERATING MECHANISM.

inspections at all the terminal barns. Plans are under way for building a new central repair shop with larger capacity and better accommodations.

The 12th St. shops are equipped as follows: Machine shop: eight lathes of various sizes; two planers, 24 x 72 in.; four drill presses; one 50-in. Niles boring mill for boring ear wheels; two shapers; one Watson-Stillman hydraulic jack axle straightener; two belt cutters; one hack saw; one rail saw; one slotting machine; one grindstone; one twist drill grinder and one circular saw grinder. All tools are belted to ceiling shafting driven by a small New York Safety engine.

Wood-working department: One band saw; one circular rip saw; one Egan shaper; one Egan joiner; one 6-ft. lathe for pattern work; one router; one Fay tenoning machine; one Fay 6-in. planer; one Fay mortising machine and one saw grinder.

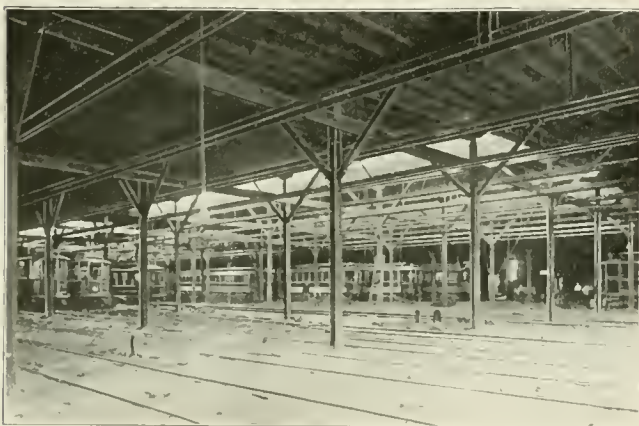
Blacksmith shop: Three open forges blown by small electric motor; one heavy drill press; one heavy combined shears and punch; one small furnace for retempering springs; one steam hammer for heavy forgings and one hydraulic wheel press for pressing wheels on and off axles. The smith shop is connected with the ear barn by a single rail ceiling track, on which runs a trolley carrying



TRENCH CONSTRUCTION NORTH AMERICAN RAILWAY CONSTRUCTION CO.

chain block and tackle. This facilitates the handling of heavy parts from the cars to the shops.

The company casts its own babbitt bearings, which are used exclusively. A jig is kept for every size of bearing and a lathe chuck for boring each different diameter. Formerly it was the practice to have a standard diameter for armature shafts for each make of motor; the standard being the smallest shaft on the road for that particular make. This often necessitated turning down a comparatively little worn shaft to meet the standard, resulting in considerable waste. Now each armature and its shaft is given a serial number and the shaft keeps its own diameter, being turned down when worn, just sufficient to true it up. The number is stenciled into the shaft with steel stencils and steel wire gages are



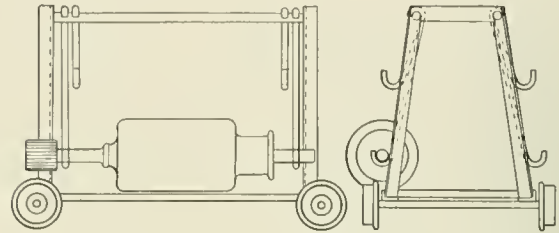
EDGERTON CAR BARN.

made giving accurately the diameter of each end of the shaft. To these gages are attached a brass tag bearing the make of motor and the corresponding shaft number. These tags and gages are filed at the repair shop. When the motor-inspector decides a motor will need new bearings in a short time he sends the shaft number to the shop and bearings are cast and bored in accordance with the corresponding gages. It is therefore not necessary to keep an armature out of service until new bearings can be made.

Armatures after being rewound are baked for 48 hours at 200°

F., in a small oven 6 ft. square and 6 ft. high. The oven is made of sheet iron lined with asbestos, and is heated by a steam coil in the bottom. Four armatures may be baked at one time and are supported in the oven on an armature truck, shown herewith.

All tracings and blue prints used in connection with repair work of any kind are kept in the master mechanic's office in enclosed cardboard mailing tubes with a removable cap at one end. The



ARMATURE RACK.

tubes are numbered and drawings are indexed in a small blank book.

Mr. Becker has originated the following model set of rules to be observed by all shop employes:

SHOP RULES.

1. The time for commencing and stopping work will be indicated by steam whistle. All employees must have their shop clothes on, prepared for work at that time, and not then begin to get ready. Repeated tardiness will not be overlooked. Shop engine will be started five minutes before whistle blows. Smith helpers must light their fires at the same time and have them ready for a heat promptly when whistle blows. All oiling of machinery must be done before whistle time.
2. No employe shall leave his respective department during working hours, except by permission of his foreman. An employe intending to be absent must notify his foreman of such intention, so that foreman can arrange work accordingly.
3. Smoking during working hours is positively forbidden.
4. It is our intention to employ only strictly sober, steady, reliable men; those in the habit of losing time unnecessarily, and without previously notifying his foreman will not be retained.
5. Loud and unnecessary conversation with other workmen is forbidden.
6. All devices, patterns and tools made by mechanics to facilitate their work, shall be the property of the company, and must not be destroyed or taken from the premises.
7. No employe shall use any material for his personal use or do any kind of work for himself on the company's premises.
8. Each workman will be responsible for all tools or machines, including counter-shafts and loose pulleys, used by them, and for the window at their benches. Any breakage of tools, machinery, waste of material, breakage of glass, or damage to building, must be reported at once to their foreman, who will fix the responsibility.
9. No employe will be allowed to leave his work during working hours to procure beer or other stimulants; neither will the drinking of the same be allowed on the premises at any time, under any circumstances.
10. Employes are expected to pay strict attention to their work during working hours, to the exclusion of all other subjects, and at all times endeavor to advance the interests of the company in every way. Inasmuch as they each expect their full wages, without deduction for time wasted, material destroyed or imperfect work, it is but just they should be willing to give an equivalent for what they receive.
11. Each workman will record his daily work on a time card provided for same. You will receive instructions as to what division and account your work is to be charged to when assigned to it by your foreman.
12. Each workman is expected to keep his respective tools clean and well oiled; also their places clean and free from offal. Employes must not occupy car or other vehicles while eating meals or when not at work; neither shall they leave any refuse from their meal exposed when through eating.
13. Violation of, or indifference to the foregoing rules will be sufficient cause for discharge.
14. The foreman of each department is expected to be present



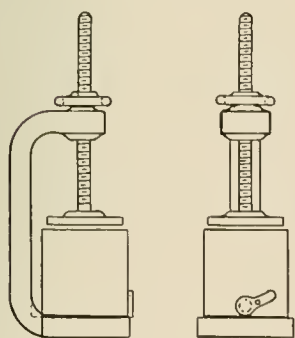
AGNES AVE. TRESTLE 1888.

there at least ten minutes before and after working hours. He will be responsible for the conduct and work of the men in his charge; will see that the rooms and machinery in his department are kept clean and in good order, and that all "waste" and waste material and litter are removed at the close of each day. It shall be his special duty to see that these rules are duly enforced.

PAINT SHOP METHODS.

The routine of repainting a car is as follows:

After burning off, two coats of lead are applied and the crevices and nail holes puttied. The surface is then given what is known in these shops as a "glazing" coat, consisting of a mixture of putty, white lead and varnish, a few drops of color corresponding to the final color being added. The glaze dries two days, when it is sandpapered and three coats of paint put on, allowing a day between each coat. The car is then ready for varnishing, during which process all the windows in the shop are closed and the floor around the car sprinkled with water to ensure freedom from dust. Over the last layer of paint is applied a layer of color varnish, mixed in the proportion of one-sixth of color to five-sixths of varnish. This is not rubbed at all, the glaze coat giving all the effects secured by the rubbing process. Two coats of finishing varnish, on which no rubbing is done, complete the car body.



PAINT PRESS.

The dash is treated in a little different way. After burning it is washed in a strong solution of lye to remove any scraps of the old paint. The lye is washed off and as a precaution against rust the surface of the dash is gone over with a piece of block pumice stone and afterward treated with a washing of coal oil, which has been found to absolutely kill all traces of rust. The coal oil is washed off with gasoline. After these preparations the dash is painted and varnished according to the same process as is followed on the body.

The interior decorations are seldom touched, but when it is necessary are re-stained.

Paint brushes when not in use are kept in water and varnish brushes in varnish to which a little oil has been added to prevent skin forming on the surface. Brushes are suspended around the inside of small tubs by means of screws, screwed a short distance into each handle and catching on the edge of the tub.

Paints are purchased in small cans and instead of dipping them out with a stick or brush, which always results in more or less loss, a small screw press is used having a disk at the lower end of the screw just large enough to fit into the inside of the can. By turning the screw the desired quantity of paint may be forced out through a small trap door in the bottom of the can which is

fastened to the wall by brackets. The disk always rest on the top of the paint, preventing evaporation or the formation of scum.

ROLLING STOCK.

The company owns 814 cars, of which 482 are grips and cable trailers and 332 are electric motors. They are of various sizes and shapes, but the company has selected the following lengths for future standards: For single truck cars, 24 ft. bodies, 30 ft. over all; for double truck cars, 30 ft. bodies, 42 ft. over all. The cars have been supplied by the Brownell Car Co., the Laclode Car Co., the American Car Co., the St. Louis Car Co., and the Stephenson



PARLOR CAR—METROPOLITAN RAILWAY BUILT BY BROWNELL CAR CO., ST. LOUIS.

Co. Part are mounted on Du Pont single trucks, part on McGuire maximum traction trucks, a number on Brill and Peckham double trucks and the remainder on Bemis box trucks. The Du Pont "C" single truck, made by the Lorain Steel Co., is the standard for single truck cars.

The motor equipments in service are as follows: 22 G. E. 57; 24 G. E. 1,200; 30 G. E. 800; 74 G. E. 1,000; 172 G. E. 52; 490 G. E. 67; 20 Westinghouse No. 12; 16 Westinghouse No. 3. Eighty-five of the double truck cars have four motor equipments to the car. Some of the cable trains are fitted with friction brakes, some with track brakes and 86 of the newer electric cars have Christensen air brakes of a recent type.

The company also owns 15 McGuire electric sweepers, eight cable sweepers, one Trenton trolley wagon, and is now rebuilding three passenger cars, which will be used for carrying mail bags from the post office and sub-stations along the route to the depots, a



INTERIOR OF PARLOR CAR.

contract recently having been made with the Government for this service.

Most of the wheels in use have been furnished by the Kansas City Car & Foundry Works, now owned by the Griffin Wheel Co., Chicago. Cable car wheels are 30 in. in diameter and electric wheels 33 in. Each wheel at the time it goes into service is given a serial number, cut into the hub with steel dies, and when it is removed a report of its life is made out on a form reproduced herewith.

All motor cars are built with vestibules completely enclosing the platforms except on the side nearest the curbs, this opening being protected by folding gates which are operated by the motorman. The arrangement of levers by which the gates are opened and closed from the front platform will be apparent from one of the accompanying sketches. A motorman that opens his gates before he has brought the car to full stop is immediately discharged.

have instructions that whenever an accident occurs involving personal injuries, to notify the office at once by telephone and the surgeon immediately goes to the scene. He renders all assistance possible and has the person removed to the hospital or home, as seems best. If the patient so desires he takes full charge of the case, making as many visits as necessary and providing medicine and bandages without charge.

Metropolitan Street Railway Co.

Report of Wheels Changed Under Cars.

On..... Division, Month of..... 190..

DATE PUT IN	No. and Date on Wheels Removed and Manufacturer's Name						No. and Date on Wheels Put in and Manufacturer's Name						Car No.			New or Old Wheel Put in	Axle Put in, New or Old	WHY REMOVED
	No. on Wheel	Mfr's No.	Day	Month	Year	Manufacturer	No. on Wheel	Mfr's No.	Day	Month	Year	Manufacturer	Grip	Closed	Open			

CAR HOUSES.

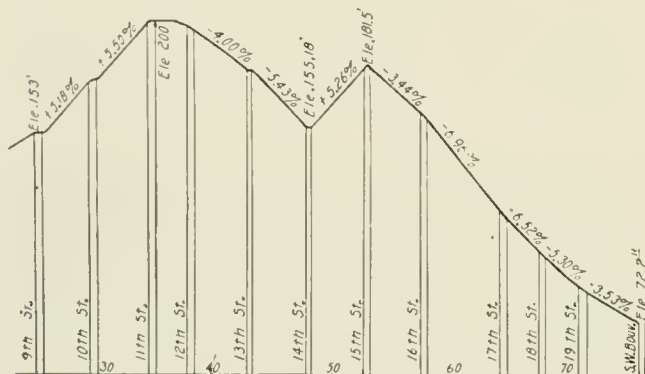
There are on the Metropolitan system 14 car barns, most of them at the terminals of important lines. They are used mainly for storage purposes, for inspection of cars at night and for making such light repairs as the foremen can attend to.

CLAIM DEPARTMENT.

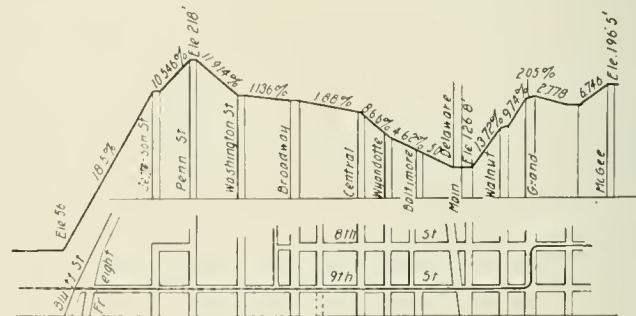
The great number of hills, and the many intersecting points of cable and electric lines in the business district tend to make the item of "claims and damages" on the Metropolitan system excessive, although the amount is not nearly as large as one would be apt to predict after riding over the system for the first time. The trainmen seem to be above the average in the display of ability and good judgment, and the knowledge of the hazardous conditions undoubtedly causes a higher degree of care on the part of both public and employes. Special signalmen at the more dangerous points, careful inspection of braking mechanism and the use of safety platform gates on electric cars, also have the effect of keeping down the number of accidents. The following records give

A full report of every mishap is required from both conductor and gripman or motorman. These reports are made in copying ink on blanks printed in copying ink. The blanks show date, direction car was going, time, number of car, names of train crew, rate of speed, exact place of accident, name, occupation and address of person injured and part of body hurt, or name, occupation and address of owner of property damaged, kind of property and extent of damage. In addition the names of all witnesses that can be secured must be given and a statement by conductor and motorman or gripman. On the reverse side of the form is printed a diagram, on which the trainmen must indicate relative positions of car and persons or wagons struck, and the location of any object that would have any bearing on the case.

The day the report is received at the office, blanks are sent to all the witnesses named, asking the following questions: Did you see the accident? When and at what time did it occur? Where did it occur? Where were you when the accident took place? Was the car in motion? Were the bells ringing? Do you know anyone else who saw the accident? If so, give names and address. Who in your opinion, is to blame for accident? Please give full account of accident as witnessed by you, showing no favor to either party.



HEAVIEST ELECTRIC GRADES.



HEAVIEST CABLE GRADES.

the total number of all occurrences during June and July that could possibly result in actions for damages being brought against the company, including ejections of passengers. The months are average ones.

ACCIDENT STATEMENT.

Total accidents for July, 1900.....	445
Fatal accidents for July, 1900.....	2
Total accidents for June, 1900.....	409
Average per day, July, 1900.....	14.35
Average per day, June, 1900.....	13.63

Considering the conditions these numbers are not excessive. Of the 445 accidents for July, 1900, 116 were collisions of cars with vehicles; 55 were the result of persons leaving moving car; 32 of persons boarding moving car; 22 were accidents to employes; 21 were collisions of cars with persons, and 15 were ejections of passengers.

At the company's office there are in constant attendance from the moment the first car is scheduled to start in the morning until the last car is turned into the barn at night, at least one expert surgeon and one or two assistant claim agents. The car crews

In the case of personal injury accidents the attending surgeon also makes a report, using a blank on which the following questions are asked: Name of injured party. Age and nationality. Present residence. Occupation. Married or single. Place of accident. Time of accident. Statement of injured party. Is this accident slight, serious or probably fatal? Will any permanent injury or deformity result? If so, what? How soon will injured party be able to resume his usual occupation? Previous disability? Where was injured person treated? What disposal was made of injured person?

As soon as the train crew's report is turned in it is given a serial number, and all replies received from witnesses, the surgeon's report and any other papers connected with the case are given the same number and pinned together. These are filed in numerical order. The train crew's report is also copied into an ordinary letter copying book, so that there shall always be a duplicate in case the original is sent to some other department for reference or should be lost.

The files of reports are double indexed in a small book under the motorman or gripman's name and under the name of the person injured or the owner of the property damaged.

The secretary of the claim department makes up a statement at the end of each month showing the number of each kind of accident for each line. To facilitate this work all the various kinds of accidents are given numbers, as shown by the following schedule, and in making the report the accidents are referred to by these numbers.

CLASSIFICATION OF ACCIDENTS.

1. Boarding moving cars.
2. Leaving moving cars.
3. Cars striking obstruction in slot or track.
4. Fell in cars.
5. Cars starting while alighting.
6. Cars starting while boarding.
7. Cable slot injury.
8. Collision of cars.
9. Collision of cars with persons.
10. Collision of cars with vehicles.
11. Collision of cars with animals.
12. Cars off track.
13. Fell off cars on curves.
14. Fell off cars on straight track.
15. Struck by column while boarding.
16. Struck by column while alighting.
17. Struck by column while passenger.
18. Center pole injury.
19. Bicycle accidents.
20. Disturbance on cars.
21. Ejectment through trouble about fare.
22. Ejectment through trouble about transfer.
23. Ejectment through trouble about change.
24. Employes injured while on duty.
25. Electric shock to persons.
26. Electric shock to animals.
27. Frightened horses.
28. Injury to company's property.
29. Miscellaneous.
30. Injury to packages, clothes, etc., belonging to passenger.
31. Fell leaving standing train.
32. Fell boarding standing train.
33. Struck while on one car by car passing on opposite track.
34. Falling in excavations in or at side of track.
35. Fell after leaving car.
36. Hit by brake handle or grip lever.
37. Injured by car door.
38. Fell before getting on.
39. Manhole covers to slot breaking.

When the person involved in the accident is a woman the fact is indicated by drawing a circle around the number. A number underscored once indicates "also personal injury," as when a car smashes a wagon and also injures the driver. A double underscore indicates "fatal."

The company has had trouble with "accident" lawyers locally known as "snitches" who make a specialty of inducing persons injured by cars or owners of property damaged to bring suit against the company, whereby the client usually receives one-third of the money recovered and the lawyer the remaining two-thirds. In one instance the company discovered that one of these practitioners was in the habit of keeping close watch at the company's office and whenever the surgeon left, apparently for the scene of an accident, the lawyer would mount his wheel and endeavor to make a contract at once with the injured party to bring suit.

Suits for damages in the state of Missouri must be brought within five years of date of accident or they become outlawed.

The personnel of the claim department is as follows: General claim agent, Thomas Worthington; general claim attorney, M. J. Oldham; secretary claim department, Omar R. Nagle.

METHOD OF PURCHASING AND KEEPING SUPPLIES.

The purchasing agent, Mr. H. C. Schwitzgebel, buys all materials with the exception of rails, ties, cables, wheels, oil and one or two other items that are purchased on contract and charged to special accounts. Materials bought through the purchasing agent go into a general storeroom and are given out only on requisitions signed by the division superintendents or heads of departments and O. K.'d by the general manager or superintendent.



ELEVATED ROAD, SURFACE LINES AND TUNNEL.

The storekeeper enters on the requisition the value of the goods corresponding as near as possible to the price originally paid for them and charges them to the division on which they are to be used under one of the following heads:

Car repairs (which includes everything that is not movable connected with a car).

Car expenses (which includes all movable parts of a car).

Track repairs.

Motor repairs.

Overhead line and trolley repairs.

Bridge repairs.

Building repairs.

Engine and machinery repairs.

Electric light repairs.

Miscellaneous.

Construction (which includes materials for new work not ordered by contract).

The company carries from \$30,000 to \$35,000 in stores.

PARKS AND PLEASURE RESORTS.

The Metropolitan lines serve several parks, two of which have been fitted up quite elaborately with the usual attractions found at places of this kind. Fairmount Park, located seven miles from the center of Kansas City on a spur from the Independence electric



PAVILION AT TROOST PARK.

line, is the most extensive and contains a dancing pavilion, a lake covering five or six acres, athletic grounds, hotel, cafe, small theater and a large uncovered amphitheater having a stage and sounding board where free entertainments of a high order are given nightly and afternoons. During the past season the Banda Rosa rendered concerts for three weeks. The fare from the heart of Kansas City to Fairmount and return is 25 cents.

STATISTICS ON TRACK AND TRAFFIC.

	AVERAGE MILES OF TRACK.				Gross Receipts.	CAR-MILES RUN.				PASSENGERS CARRIED.			
	Horse.	Cable.	Electric.	Total.		Horse.	Cable.	Electric.	Total.	Horse Lines.	Cable Lines.	Electric Lines.	Total.
Six months ending Dec. 31, 1886.	20.4	...	...	20.4	\$265,325	1,283,225	.....	.....	1,283,225	5,269,828	.....	.....	5,269,828
Year ending Dec. 31, 1887.	20.8	3.0	...	23.8	428,954	1,342,684	635,962	.....	1,978,646	5,710,624	2,766,044	.....	8,476,668
" " " 31, 1888.	17.8	14.7	...	32.5	594,416	1,274,140	2,852,070	.....	4,126,210	3,948,544	7,831,295	.....	11,779,839
" " " 31, 1889.	15.8	22.9	1.7	40.4	754,891	1,111,373	4,569,746	86,855	5,767,974	2,998,439	11,733,577	299,955	15,021,971
" " " 31, 1890.	10.9	25.4	7.7	44.0	781,913	678,953	4,606,294	437,108	5,722,355	1,648,073	12,772,578	1,173,731	15,594,382
" " " 31, 1891.	10.9	24.2	8.2	43.3	675,501	614,026	4,348,713	416,292	5,379,031	1,304,536	11,128,021	1,016,570	13,449,127
" " " 31, 1892.	10.8	24.8	8.2	43.8	723,662	550,481	4,281,123	402,977	5,233,681	1,266,975	12,097,492	1,049,590	14,414,057
" " " 31, 1893.	9.7	24.8	8.2	42.7	683,828	496,044	4,156,298	445,975	5,098,317	1,084,608	11,444,858	1,083,661	13,613,127
Seventeen mos. ending May 31, 1895.	9.3	24.9	33.1	67.2	1,131,937	666,624	5,656,739	1,908,740	8,291,603	1,486,198	15,706,225	5,388,875	22,581,298
Year ending May 31, 1896.	12.8	62.4	58.1	133.4	1,780,940	496,127	9,022,913	2,592,777	12,021,817	1,173,916	26,828,455	6,343,675	34,346,046
" " " 31, 1897.	13.2	62.4	59.8	135.5	1,774,892	404,850	9,092,120	2,550,995	12,047,065	793,693	26,773,889	6,577,307	34,344,889
" " " 31, 1898.	7	62.4	71.3	134.4	1,949,606	6,060	9,264,781	3,142,739	12,413,580	1,809	28,276,107	9,214,576	37,492,492
" " " 31, 1899.	...	57.0	78.4	135.5	2,094,378	.....	8,974,572	3,736,245	12,710,817	.....	28,600,781	11,699,105	40,299,884
" " " 31, 1900.	...	52.5	92.0	145.5	2,353,267	.....	8,879,945	5,025,782	13,905,727	.....	29,421,390	16,066,987	45,490,377

This resort and Troost Park, two miles from the business district, are owned by a park company, of which Mr. C. W. Waddell is president.

EMPLOYEES.

Applicants for the positions of gripmen, motormen or conductors are required to answer certain questions as given below, and to their applications are attached a report made by the company's physician. The blank used is as follows:

METROPOLITAN STREET RAILWAY CO.

EMPLOYEE'S EXAMINATION.

Name of Applicant _____
 Residence _____
 Nationality _____ Married _____ Single _____ Age _____
 Former Occupation _____
 Application for position of _____
 Have you now any diseases or disorders?
 For what have you had medical advice during the past two years? _____
 What physician did you consult? _____
 What personal injury or accident have you had? _____
 Have you ever had any of the following?
 Dropsy _____
 Diseases in Urinating _____
 Disease of Heart or Brain _____
 Loss of Consciousness _____
 Habitual or Chronic Cough _____
 Defect of Sight _____
 Headache, (frequent) _____
 Do you use alcoholic liquors or narcotics? _____
 Have you been in any sanitarium or taken treatment for alcohol or narcotics? _____
 Signed this _____ day of _____ 190____
 (Applicant sign here) _____

EXAMINER'S REPORT.

Did he sign the above in your presence? _____
 Has he had stricture or venereal disease? _____
 Has he a rupture? _____
 Has he the appearance of a temperate man? _____
 What is his figure? _____ Height _____ Weight _____
 Chest circumference in repose _____ Forced inspiration _____
 Forced expiration _____ Circumference of Abdomen _____
 Condition of heart _____ Pulse rate _____ Temperature _____
 Urine, specific gravity _____ Albumen sugar _____
 What is the condition of eye sight? _____ Hearing _____
 Would you class him as fully up to average of requirements? _____
 Remarks: _____
 Dated _____ day of _____ 190____
 By _____ M D

If the examination is satisfactory the applicant deposits \$25 and signs an agreement with the company covering rate of wages, liability of company toward the employe in case of accident, and other matters. He then works seven days without pay as a student, in charge of a regular employe, and if he proves himself capable at the end of this period he is assigned to some division and placed at the bottom of the extra list. It usually takes from five to eight months to secure a regular run.

Trainmen are paid according to the following schedules: On cable lines, 17 cents an hour the first year, 18 cents the second, 19 cents from the third to the fifth, and 20 cents thereafter; on the important electric lines, 16 cents the first year, 17 cents the second, 18 cents from the third to the fifth, and 19 cents thereafter; on the lesser electric lines, 15 cents the first year, 16 cents the second, 17 cents from the third to the fifth, and 18 cents thereafter. The runs average from 9 to 12 hours a day.

Each division superintendent keeps a record of every man on his division, entering in an indexed book every time the employe violates a rule.

The following are two sample records:

John Smith. Employed July 19, 1895. Gripman. Broken in by Chas. Peters. Feb. 12, 1896, failed to release cable at Brooklyn Ave., west bound. Broke wheel and delayed trains about 30 minutes. Said he made throw all right and in good time, but found that rope was not going to leave grip and then tried to stop but found he could not stop in time to save wheel. Discharged for want of evidence to bear out his statement. Mar. 26, 1897, reinstated in company's employ. July 2, 1898, missed run. July 6, 1898, missed run. Sept. 10, 1898, resigned to go to work on a farm. This man was never contented with what he had. Was only a medium gripman.

Peter Jones. Employed Apr. 22, 1898. Conductor. Formerly dry goods salesman. Feb. 16, 1899, suspended three days for starting his train before passengers were safely on and off. May 22, 1899, suspended one day for not making his meal relief at supper. Aug. 15, 1899, discharged for missing fares.

TICKETS AND TRANSFERS.

There are 63 transfer points on this system, and although transfer tickets are given at practically all intersections the arrangements are so made that a passenger can not ride in a loop and must make a continuous journey. The transfer system makes possible several trips approximating 12 miles in length for a single five-cent fare. Transfers for each division are numbered consecutively and a record is kept of the total number issued to each conductor. The month and day are punched out by the division superintendents in the morning and the conductors punch the time and division to which the ticket is issued. Tickets must be presented within 15 minutes of the time punched. A different color is used for each day, ten colors in all being employed, as follows: Light green, mandarin, straw, lilac, old gold, salmon, blue granite, rose, oiive and gold, these having been found the most satisfactory. The company issues about 75,000 transfers a day.

On the line to Independence regular stations are established and single, round trip and commutation tickets sold to each station at proportionate rates.

FINANCIAL.

The total capital liabilities of the Metropolitan company aggregate \$14,086,800, of which \$5,586,800 is capital stock issued, the total authorized stock being \$8,500,000, and \$8,500,000 is mortgage bonds, part being the obligations of the underlying companies, to retire which at maturity a sufficient amount of Metropolitan bonds are held in escrow. The company also guarantees the interest on \$2,600,000 Kansas City Elevated Co's. bonds.

The accompanying table shows the growth of the Metropolitan Street Railway Co. since 1886. These statistics do not include the figures for the purchased companies prior to their becoming a part of the Metropolitan system.

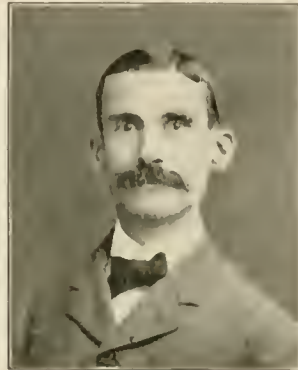
Personal and Biographical.

Kansas City has been the schooling place for a number of prominent street railway engineers and managers. A few of these have passed from this life, but several others are still actively engaged in railway work, and are profiting by the experience gained while trying to find ways and means of keeping cars running over the city's hills. This description of Kansas City's street railways would not be complete without some further mention of these pioneer workers to whom the industry at large is indebted for many of the ideas and principles that are now common property.

Mr. Nehemiah Holmes, well styled "the father of Kansas City's street railways," was recognized as one of the most progressive and public-spirited citizens in the state. A man of large



W. E. KIRKPATRICK,
Secretary and Treasurer.



J. A. HARDER,
Auditor.

means, he was always foremost in making improvements and starting new enterprises, some of which have, since his death, been carried forward by his sons, Walton H. and Conway F., to an importance exceeding his own flattering anticipations.

He was born in New York in January, 1826. He left school at an early age and went to Aberdeen, Miss., where he engaged in the mercantile business with highly successful results. Disposing of his establishment in 1856, he was attracted to the hustling town of Kansas and ultimately became closely identified with its growth and prosperity. In 1868 he projected the Kansas City and Westport horse railway and completed it to Westport. He also built the Jackson County horse railway to the state line, and at the time of his death, in 1873, was the chief street railway capitalist west of the Mississippi River. Mr. Holmes was an old line Whig, and a grand worthy master of the Independent Order of Odd Fellows.

Mr. Robert Gillham, the founder of Kansas City's cable railway system, was born in New York, Sept. 25, 1854. He continued the study of engineering until 1874, when, at the age of 20, he began the practice of his chosen profession at Hackensack, N. J., and by faithful work and the display of unusual ability soon attracted a wide clientage. In 1878 he went to Kansas City, where he determined to make his home. He had been in the city but a short time when he was taken with the idea of substituting the cable system on the unsatisfactory horse lines then constituting the only means of transit, and at once bent his energies toward carrying out his projects. After years of discouragements and delays he saw his cherished plans completed and lived to enjoy the full fruits of his labors. Mr. Gillham subsequently acted as consulting engineer for cable railway companies in St. Joseph, Mo., Nashville, Cleveland, Ft. Worth, Providence, Brooklyn, Chicago, Omaha and Denver. At the time of his death in 1898 he was general manager of the Kansas City, Pittsburg & Gulf R. R.

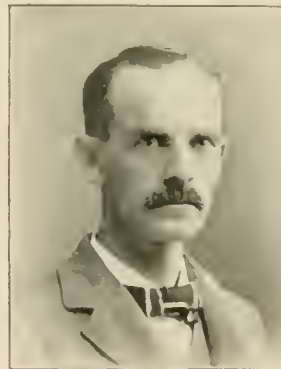
Mr. Clift Wise, who assisted Mr. Gillham in the construction of the early cable line, went to Kansas City in January, 1884, having been appointed division engineer of the Kansas City Cable Ry. The following year he was made chief engineer, succeeding Mr. Gillham, who had been badly injured while working in a cable conduit. Mr. Wise built the Independence Ave. line, the East Ninth St. line, and the Troost Ave. line, and was chief engineer of

construction work on the Eighth and Woodland Ave. power station. He left Kansas City in 1889 to take a position with the St. Paul Street Ry., St. Paul, Minn., from which city he went to Chicago to engage in general railway construction work. Mr. Wise tells with pleasure that he gave Mr. M. K. Bowen his first street railway position and in 1889 obtained for him the office of superintendent of the Kansas City Cable Ry.

The late M. K. Bowen began his street railway career as transit man on the Kansas City Cable Ry., but by the display of those rare qualities that foretold something of his coming successes, he soon advanced to the positions of chief engineer and superintendent of the system. Upon the completion of this road Mr. Bowen went to New York City as representative of the Short Electric Railway Co. He remained there a year and then went to Chicago as assistant superintendent of the Chicago City Ry., from which office he rapidly advanced until finally he became president and general manager, which positions he held until his death on Apr. 9, 1899.

Mr. J. C. Henry was born in Woodstock, Ont., in 1848. He left school at the age of 16 and immediately took up the study of telegraphy. During the next to years of his life he was employed as superintendent of telegraph lines and train dispatcher for the Philadelphia & Erie Ry., the Union Pacific and other roads, but spent his evenings and holidays in studying electrical science with particular reference to the application of electric power to street railways. In these years he made a number of valuable inventions, including the Henry velocimeter, now sold in slightly modified form under the name of the Boyer speed recorder.

In 1883 he resigned his railway position so that he might devote all his time to experimental and inventive work. The following year he moved to Kansas City and installed two electric railways on the overhead system as described elsewhere in this issue. After completing his Kansas City work Mr. Henry went to San Diego, Cal., where he built a number of electric roads, on one of which



W. A. SATTERLEE,
General Superintendent.



CHARLES GROVER,
Electrical Engineer.

a 9-per cent grade was successfully surmounted by cars equipped with his apparatus. In 1889 he went East and became connected with the Thomson-Houston and General Electric companies as an expert in patent matters. He now lives in Denver, Col., where he devotes his time to making further developments in electric railway apparatus.

Mr. E. J. Lawless commenced his street railway career in 1877, taking charge of a crew on the construction of a branch line of the Sutter Street Ry. in San Francisco, Cal. When the work was completed he was made assistant secretary and afterwards assistant superintendent. In 1885 he was called to Kansas City and superintended the operation of the Kansas City cable road until 1886, when he was engaged by the Metropolitan road to superintend that system, which position he held until 1888. He then retired from the railroad field, but came back to the fold in 1891, when he was engaged as manager for the Paterson Railway Co. In 1894 he became general agent for the American Car Co., of St. Louis, which company he still represents.



EDWARD BUTTS,
Chief Civil Engineer.



D. W. DOZIER,
Chief Mechanical Engineer.



J. W. G. BECKER,
Master Mechanic.



THOMAS WORTHINGTON,
General Claim Agent.

The general direction and management of the Metropolitan system are now in the hands of two gentlemen who were born and reared in Kansas City and have been in the street railway business all their lives, Walter H. and Conway F. Holmes, sons of Nehemiah Holmes. At the age of 12, Mr. W. H. Holmes went into the office of his father's company, the Kansas City & Westport Horse Ry., and his brother Conway at the same time was a mule car driver. Within a few years the brothers organized the Grand Avenue Cable Co., of which Walton was president and Conway general manager. In the spring of 1894 this company absorbed the Kansas City Cable Co., and the following year was itself merged into the Metropolitan Street Railway Co., Walton being made vice-president and general manager, and Conway general superintendent of the consolidated system. These positions they held until 1899, when Walton became president and his brother general manager, which offices they now occupy. Walton H. has just passed his thirty-eighth year and Conway F. is three years his junior.

The Holmes boys, as they are familiarly called in their native city, have a business record seldom equalled and still more rarely surpassed. Trained by their father during their early years to appreciate that success is but another name for hard work, they have learned and practiced his lessons well. Always business-like and to the point in their dealings, yet courteous and with the highest ideas of integrity, they are admired and respected by their business associates and their fellow citizens; and strict yet always just and considerate in the exercise of their offices as managers, they enjoy the loyalty and good-will of every man in their employ.

Mr. W. E. Kirkpatrick, secretary and treasurer, was born in 1858, at Niagara Falls, Ont., but calls himself a Western man, as he went to Chicago in his early youth and most of his life has been spent in that city. In 1874 he accepted a responsible position in the dry goods house of Field, Leiter & Co., now Marshall Field & Co., and at the same time was an officer of the Chicago Title & Trust Co. These relations remained unbroken until a trifle over a year ago, when Mr. Kirkpatrick left for Kansas City to take his present offices with the Metropolitan Street Railway Co. He is also secretary and vice-president of the Kansas City Electric Light Co.

In Mr. W. A. Satterlee, the general superintendent, the president and general manager have an able assistant, who has every detail of the system, literally at his finger's ends, for he can answer after a moment's reference to one of half a dozen note books tucked away in the pigeon holes of his desk, and indexed according to a system of his own, about every question that could be asked concerning the company and its property, from the date each line was built to the age and weight of the last conductor added to the extra list.

Mr. Satterlee was born in February, 1856, at Birmingham, Mich. He graduated from the University of Michigan at Ann Arbor in 1877, and for the next two years taught school in his native state. He went to Kansas City in 1880, and started a successful carriage business which he continued until 1882, during which year he associated himself with the Smith & Keating Implement Co. When this company sold its business in 1887 he was retained to

close up its affairs. In 1890 Mr. Satterlee commenced his street railway life as purchasing agent for the Kansas City Cable Ry., and the following year was made auditor, purchasing agent and cashier. In 1895 when the property of the Kansas City Cable Co. was sold to the Metropolitan Street Railway Co., he was retained as purchasing agent for the system until April, 1899, when he was appointed general superintendent.

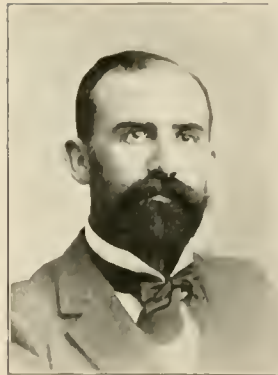
Mr. Edward Butts, chief civil engineer, has had nearly 40 years' practical experience in engineering work, 12 of which has been devoted exclusively to street railway construction. He is the son of Mr. Anson Butts, who was also a civil engineer and surveyor of wide experience. Mr. Edward Butts commenced work as transitman on the Albany & Steventown R. R. in 1869, and from that time until 1892, was connected with several railroad enterprises. In the latter year he was appointed city engineer of Kansas City, Mo., but resigned two years later to become chief engineer of the Metropolitan Street Ry. He is the author of the "Civil Engineer's Field Book."

Mr. Charles Grover, electrical engineer, is a native of Liberty, Mo., born in February, 1863. At an early age he went to Kansas City, Mo., where he soon took up the study of applied electricity, showing unusual aptitude for matters of this kind. In 1886 he opened a branch office in Kansas City for the Heisler Electric Co., of St. Louis, maker of electric lighting machinery, but resigned this agency in 1887 to go with the Hawkeye Electric Co., of Oscaloosa, Ia. He severed this connection the following year and became superintendent of the Consolidated Electric Light Co., of Kansas City, Kan., and in this capacity built and operated a new plant, supplying current for city and commercial lighting. In February, 1889, the Hawkeye Electric Co., having reorganized and removed its factory to Davenport, Ia., Mr. Grover again became associated with this house, remaining until June, 1891, when he was made superintendent of the Kansas City Vine St. electric line, then operated by the South Suburban Railway Co. Upon the purchase of this property in June, 1894, by the Metropolitan Street Railway Co., he was made division superintendent, and later chief engineer of the entire system. Mr. Grover was married in 1889 to Miss Mary J. Link, of Linkville, Mo., and has three children.

Mr. D. W. Dozier, chief mechanical engineer, before he had become of age left his home in Richmond, Ky., where he was born Oct. 30, 1853, and started his business career as a steamboat hand on the Mississippi River. While still a youth his ability to understand and operate machinery won for him a position as chief engineer on one of the largest boats running from St. Louis. In 1873 he left boating and spent the next few years in the employ of the Jerome Wheelock Engine Co., of Worcester, Mass., the Barney & Kilby Engine Co., of Sandusky, O., and the William Wright Engine Co., of Newburgh, N. Y. During this time he assisted in the installation of engines and boilers in mills, power stations and isolated plants all over the United States. He left the Wright company to become erecting engineer for the E. P. Allis Co., retaining this position for seven years, when going to Kansas City in 1887 to erect a pair of Allis engines, he was invited by the



H. C. SCHWITZGEBEL,
Purchasing Agent.



E. C. HUGHES,
Chief Draftsman.



J. J. O'KEEFE,
Chief Inspector.



C. W. WADDELL,
Manager of Parks.

Holmes brothers to remain and take charge of their power stations, which he did. Both the Kaw River and the Blue River electric stations were erected and equipped under his supervision. In 1892 Mr. Dozier went to Washington, D. C., for a few months to superintend the construction of the Washington & Georgetown Electric Ry's. present power station.

Mr. J. W. G. Becker, master mechanic, was born in Springfield, Ill., Sept. 8, 1866, and received his preliminary education in St. Louis. Developing a liking for mechanics, he took lessons in the art of machine and pattern making, and studied drawing and civil engineering. He has been engaged on work at St. Louis, Denver and Kansas City, and for the past 12 years has been with the Metropolitan Street Railway Co., as machine shop foreman, car barn foreman, assistant in civil engineer's office, and finally as master mechanic.

Mr. Thomas Worthington, general claim agent, was born in Mason County, Ky., in 1852. He has been connected with the street railways of Kansas City since 1892, having been assistant claim agent of the old Metropolitan system which was then under the management of Mr. R. J. McCarty. Mr. Worthington was appointed general claim agent of the consolidated companies in March, 1900.

Mr. H. C. Schwitzgebel, purchasing agent, has lived all his life in Kansas City. He was born Jan. 4, 1857, and at an early age went into the banking business, following this line of work continuously for 27 years. In March, 1899, he accepted the office he now holds, in which capacity he purchases all supplies for the Metropolitan system and takes general charge of their distribution to the several departments.

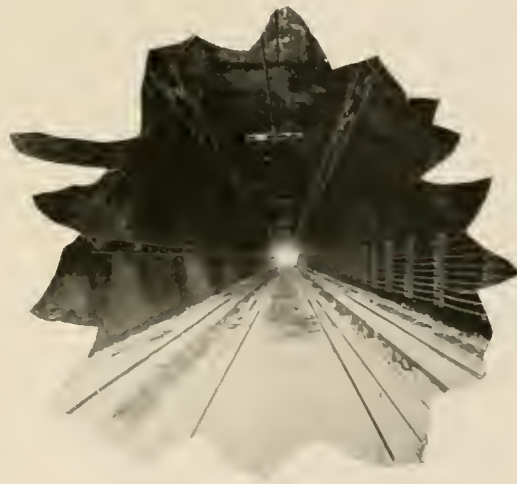
Mr. John J. O'Keefe, chief inspector, received his first experience in street railroading as a conductor on the old Kansas City Cable Ry., under the late M. K. Bowen. In 1889 Mr. O'Keefe was appointed chief inspector of the system and in 1890 was made claim agent, retaining both positions until 1892, when he went to Chicago to take the position of chief of special agents for the

Chicago City Ry. He was later appointed chief supervisor of that road, which position he held until 1900, when he again returned to Kansas City as chief inspector. Mr. O'Keefe was born in 1862 in New York City.

Mr. J. A. Harder, auditor and assistant treasurer, began work with the Metropolitan company in 1887, his first position being chief clerk in the auditor's office. In June, 1888, he was appointed auditor and cashier. Before going to Kansas City, Mr. Harder spent several years on the Pacific Coast in the employ of the Oregon Improvement Co. and the Columbia & Puget Sound Railway Co., at Seattle. He was born in 1855 at Logansport, Ind.

Mr. T. C. Hughes, chief draftsman in the civil engineering department, is a native of Plattsburg, Mo. He was born in 1859 and received a technical education at Liberty, Mo., and at the State University in Columbia, Mo. Mr. Hughes was associated with a number of experimental lines when electric traction was in its infancy, having been chief engineer of the Riverside & Suburban Ry., of Wichita, Kan., in 1887, and chief engineer of the West Side line in Kansas City, Kan., in 1889. Upon the completion of this latter road he became chief engineer for the Chicago & St. Louis Electric Railway Co., a corporation formed for the purpose of building a double track electric railway between Chicago and St. Louis, over which cars were to be operated at 100 miles an hour. When this project was abandoned he took up steam railroad work for a while, but a position in the engineering department of the Metropolitan Street Ry. offering itself he returned to Kansas City. In 1888, while engineer for the West Side Railway Co., Mr. Hughes visited and inspected all the then existing experimental electric lines in America.

Mr. C. W. Waddell, who has charge of the park properties and amusement features, was born in Gallipolis, O., in March, 1856, and spent the early part of his life in his native state. He went to Kansas City in 1878, where he spent eight years in the dry goods business and was afterwards connected with various corporate interests in the city. He has been engaged in park work for the past six years.



INTERIOR OF TUNNEL.

The East Side Electric Railway Co.

The only line in Kansas City not under the control of the Metropolitan Street Railway Co. is the East Side Electric Ry., locally known as the "Heim Line," running from the corner of Main and Fifth Sts. through the East Bottoms for a distance of three miles. On a portion of this route an experimental electric line was operated on the Henry system from 1884 to 1887, but was not entirely successful. From 1887 to 1892 steam dummies were run over the line, but these were also abandoned and the rails removed owing to lack of patronage.

In 1897, Messrs. Joseph J. Heim, M. G. Heim and Ferdinand Heim, owners of a large brewery and other property in the East Bottoms, recognizing the influence better transportation facilities would have on land values, determined to build a first-class electric line from Market Sq. into the district, and if necessary operate it at a loss until the region became more thickly populated. Accordingly a franchise was secured and construction work was commenced in June, 1899. The road was opened early in the present

stones of jasperite are laid on each side of each rail as on the other lines in Kansas City, to prevent the formation of wagon wheel ruts. There is one grade of 5.4 per cent for a distance of 300 ft., and one of 4.3 per cent for 1,800 ft.

The overhead work is span construction, with No. 0 trolley wire supported from 30-ft. wooden poles 8 in. in diameter at the top. The poles are set against the curb with oak plank, 4 x 6 in. x 3 ft., buried at the base under the curb line to keep the poles from displacing the curb stones. Trolley wire was furnished by the Roebblings company and overhead material by the Ohio Brass Co., through its local agent, the B. R. Electric Co.

The power station is at the northern terminal of the line and contains the following: One 350-h. p. simple non-condensing engine with double eccentric and cylinder 18 x 36 in. It was built by the St. Louis Machine Works. The engine is direct connected to a 10-pole 200-kw. Siemens & Halske generator which is guaranteed for 50 per cent overload for three hours. There is



ELECTRIC PARK ON THE HEIM LINE.

year, and, somewhat to the surprise of the owners, has paid not only operating and incidental expenses, but a considerable percentage on the money invested as well.

All of the construction work was carried on by the company itself under the supervision of Mr. W. O. Hands, the present general manager.

There are six miles of track, all laid with 6-in., 82-lb., Johnson center bearing girder rails, on best white oak ties, 6 x 8 in. x 8 ft., placed 26 in. c. to c. Joints were cast-welded by the Falk process and rails were cross bonded every 600 ft. with two No. 0 wires.

In preparing the roadbed, a track 16 ft. wide was excavated to a depth of 13 in. The bottom of this trench was rolled and a 3-in. bed of broken stone laid and rolled. The ties were then placed in position and ballasted with stone up to within 4 in. of top of ties, after which the rails were laid and the track surfaced and lined. The concrete was extended about 12 in. outside of each outside rail and up to 4 in. of the top of the rail. Most of the streets through which the line runs are paved with hard vitrified brick, grouted with imported portland cement grout. Tothing

also a reserve unit used for helping out on what is known as the park load. This unit consists of a 200-h. p. Armington & Sims engine with cylinder 14½ x 15 in., running at 260 r. p. m. and is belted to two T. & H. D-62 machines. For lighting the park owned by the company and operating an electric fountain, there is also one 200-h. p. Armington & Sims high speed engine belted to one 2,000-incandescent light, 110-volt, Siemens & Halske dynamo, and one 400-light, 110-volt, Edison machine.

Steam is taken at 120 lb. from one 350-h. p. and one 200-h. p. Heine boilers. Coal is Cherokee mill and on the average eight tons are consumed per day. The station is equipped with Crane valves.

One 450,000-c. m. feeder extends about one-half the length of the line. It then changes to a No. 0000 cable and continues to within one-half mile of the city terminal. Feeder taps into the overhead wire are made every 500 ft.

The company owns eight single truck open motor cars, and six double truck closed motor cars, the latter having been furnished under an order "to build the finest street railway cars that could

be made, regardless of cost." The short cars are mounted on McGuire No. 6 trucks with Westinghouse No. 3 motors, and the long ones on maximum traction trucks, with Westinghouse No. 49 motors. The rolling stock is equipped with Falk gears and pinions, the Grover trolley wheel, Meaker and Sterling registers, Consolidated electric heaters, sand boxes and Griffin 33-in. 350-lb. wheels.

All sand used on the system is dried in a steam dryer designed by Mr. Hands and for which application for patents has been made. The dryer consists of a box that may be built as large as desired, near the bottom of which is placed a coil of steam pipe heated by either exhaust or live steam. The sand is shoveled in at the top and gradually sifts down between the coils to the bottom, and is then removed by shovel or hoe through a small opening near the ground. This was the form first devised by Mr. Hands, but in service it was found that the steam from the moist sand condensed and dripped down on the dried sand below, defeating the purpose for which the contrivance was intended. When on the point of abandoning the scheme the inventor conceived the idea of placing a number of pipes in the interior to lead the steam arising from the sand adjacent to the coils at the bottom, up through the box and out at the top. This was tried and the dryer is now giving excellent results in every way.

Mr. Hands has also designed a rather novel bulletin board on which announcements are made to the employes. Referring to the accompanying sketch of the board, Webb is a regular motorman who has violated Sec. F, Rule 6, of the company's "Rules and Regulations" and has been laid off from the 6th to the 9th inst. Rodgers as the first extra man on the list is marked up to take his place. Oliver is sick and is replaced for the day by Rockhold. Biggs and Stewart are other extra motormen, and Duffy and Sinclair are extra conductors, who are marked up to take out extra cars to carry the evening traffic, Biggs and Duffy to take car 6, leaving at 5:30, and Stewart and Sinclair car 11, leaving at 5:40. Butchert and Harelson may be either over or short in their accounts, but do not know which until they call for their slips. Hedge is ordered to call at the office to answer for some misconduct.

The company employs 18 motormen and 18 conductors. The men are paid 17 cents per hour and average 11 hours per day.

The rules for employes on this road are very complete and quite voluminous. The following extracts will be of interest:

INTRODUCTION.

The trainman is a representative of the company to the public. The success and reputation of the road to a large extent, depend

Times of unusual danger require an unusual degree of care. Be cool and keep your head at all times.

CONDUCT OF TRAINMEN.

You must be temperate in the use of intoxicating liquors while in the service of the company. Be cleanly in your personal appearance and polite to passengers. Make use of no profane or improper language. Abstain from smoking, ungentlemanly conduct and unnecessary conversation with each other or with passengers when on duty. Employes of the company when off duty and using the cars must sit down on the inside of the car, when there are vacant seats, but they must not occupy seats to the ex-

Regular men	off	Extra men	Conductor	Trainmen
Webb	6 9	Rodgers	Duffy	Butchert
Oliver	7	Rockhold	Sinclair	Harelson
		Biggs		
		Stewart		

Remarks - Attention of trainmen is again called to Rule 12. We will give our patrons much better service if this rule is strictly followed. W.C. Hands, Gen. Man.

BULLETIN BOARD.

clusion of passengers. Do not expectorate out of the windows or through the gates.

TOOLS AND NECESSARIES.

Motormen are required to have the following tools in a neatly painted box: A pair of cutting pliers; a medium-sized screw driver; an 8-in. monkey wrench; a 1/2-pint oil-can always filled with oil; a 10-in. file; a screw wire connector; some tape; four fuse wires; a 20-ft. piece of 1/2-in. new rope and two carbon motor brushes.

Conductors must supply themselves with the following: A good broom; a feather duster; some good soft clean rags or chamouis; some polishing compound; a punch and not less than \$2.00 in change.

The company will furnish the screw wire connectors, the tape, motor brushes, the broom, the duster, the polishing compound and the punch.

SIGNALS.

Conductor to motorman. One bell, stop at next stopping place. Two bells, go ahead. Three bells, stop immediately. Four bells, back up.

Motorman to conductor. One bell, come forward. Two bells,



POWER STATION AND CAR HOUSE.



INTERIOR OF POWER STATION.

upon his civility, his honesty, his good judgment, his tact and his ability to get along with all sorts of people.

While the road is intended and expected to be a source of profit to the company, it was built for the convenience of the public, and each employe should endeavor to make the service so excellent that the public will find the road worthy of patronage. In this way the interests of the company, as well as his own, will be best served.

going to back, watch trolley. Three bells, set the rear brake. Four bells, sand track from rear end.

Superintendent or assistant to motorman or conductor. Swinging arm or light slowly across the track, prepare to stop. Swinging arm or light rapidly across the track, stop immediately. Swinging arm or light slowly from head toward feet, move cautiously. Swinging arm or light rapidly from head toward feet, all right, go ahead. Swinging arm or light over head, back up.

STRAIGHTENING OUT BLOCKADES.

When a car has been delayed at any point for 15 minutes or more the cars will become bunched. After the cause of the delay has been removed the first car should proceed immediately. The second car should remain until two-thirds of the schedule interval has elapsed. That is, on a 12-minute schedule the second car should wait eight minutes before starting, and the remaining cars should do the same.

When a blockade occurs, passengers on the rear cars should be transferred to the forward cars.

FOG OR SMOKE.

During a fog or when there is heavy smoke in the streets, motormen will run slowly enough to be able to stop their cars within the



J. J. HEIM,
President.



M. G. HEIM,
Vice-President.



W. O. HANDS,
General Manager.



W. W. MORGAN,
Chief Engineer.

distance they can see ahead. It is much better to be behind time than to run the risk of an accident. During a fog the bell should be kept ringing almost continuously, and if a car should be delayed for any reason, the conductor must go back at least three poles and flag the following car.

INSPECTION OF EQUIPMENT.

Before starting out in the morning, it is the duty of the motorman to thoroughly inspect the trolley wheel, the motors and bearings, brakes, brake shoes and sand boxes.

SANDING HILLS.

Sometimes when the car is going up a hill the wheels will slip. If the conductor will then open the rear sand box and the motor-

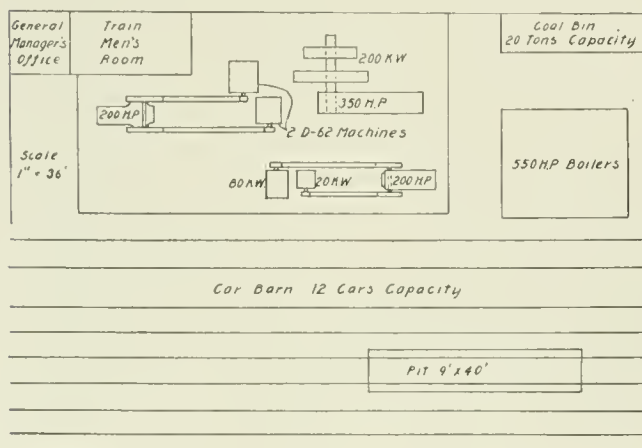


DIAGRAM OF POWER STATION AND CAR HOUSE.

man will permit the car to drop back on to the sand the car will often gather sufficient headway to climb the hill.

DAMAGE TO CARS.

Conductors will endeavor to obtain payment for glass broken or damages to cars caused by passengers or careless teamsters. If the guilty party refuses to pay take his name and address or his em-

ployer's name, and report the occurrence at the office. Side windows cost \$2.75 each, and end windows \$1.85 each.

To accommodate the patrons along the route the company does an incipient express business on the front platform. A trunk or large box is carried for 25 cents. A crate of berries or other small box for 5 cents. Lap dogs ride free and other dogs are carried on the platform for 5 cents each. Disabled bicycles when accompanied by the rider are taken on the front platform at a charge of 10 cents in addition to the rider's fare.

Transfers are interchanged with the Metropolitan Street Railway Co. at several points.

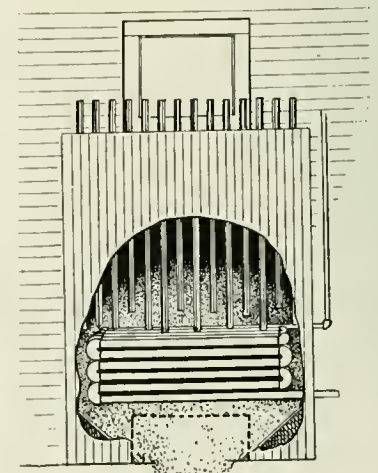
One of the principal features of the East Side Ry. is "Electric Park," which is located near the power house. This resort covers about 12 acres and is modeled somewhat after Sans Souci Park in

Chicago, which has been fully described in the "Review." The principal attractions are a well-built theater where vaudeville performances are given afternoons and evenings, an electric fountain, a cinematograph, bowling alleys, shooting gallery, pool tables, a ladies' orchestra and a beer garden which occupies one end of the grounds and is separated by a partition from the rest of the park. Great care is taken to preserve perfect decorum in the garden and the place is patronized by the best element in Kansas City.

Particular attention has been given to the lighting features. The fronts of the theater and other buildings are decorated with colored incandescent lights in artistic designs, tinted lights are scattered in the branches of the trees and in addition are lamps are placed at frequent intervals along the walks so that at night the place resembles the proverbial fairy land.

Admission to the park is 10 cents, and reserved seats in the theater are from 10 to 30 cents extra, depending upon the performance.

The resort has been a great success from the start, as is shown by the following statistics: From June 3 to Sept. 9, 1900, there were 273,700 people who paid admission into the park, and this number does not include 10,000 who entered on passes. During the last week an open air



SAND DRYER.

band concert and moving pictures were given and proved the best attractions of the season, 31,800 admission tickets being sold for the period. On the last Sunday, September 9th, there were 6,650 paid admissions. The electric road carried all of these people three miles with 14 cars without an injury to a passenger. It must be remembered when reading these figures that the entire population of Kansas City is but 200,000.

The officers of the company are: President, Joseph J. Heim; vice-president, M. G. Heim; secretary and treasurer, Ferd. Heim;

general manager, W. O. Hands; chief engineer, W. W. Morgan; electrical engineer, Harry Turner.

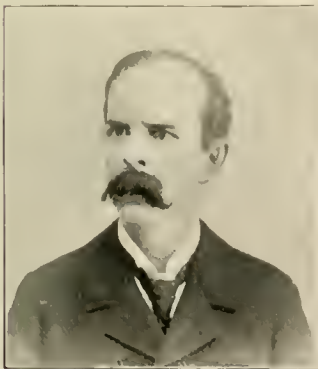
The Heim brothers, who own the East Side Electric Ry., "Electric Park," the Heim brewery and considerable property in the East Bottoms, are progressive business men in the fullest meaning of that term. They are sons of Mr. Ferd. Heim, who came from Germany in 1861, and after spending some years in St. Louis went to Kansas City in 1885, and recognizing the future possibilities of the city, determined to make it his home. He established the present brewery which has in later years been extended by the sons until it has become one of the largest institutions of its kind in the country. Mr. Joseph J. Heim was born in Germany in June, 1860. Mr. Ferd. Heim, Jr., was born Oct. 11, 1863, and Mr. M. G. Heim three years later.

Mr. W. O. Hands, general manager, has been identified with electrical and street railway enterprises for many years. From 1887 to 1890 he worked in the various departments of the Brush Electrical shops at Cleveland and was then employed by the Short Electric Co. For the next few years he supervised or assisted in the installation of street railways in Muskegon, Mich.; Rochester, N. Y.; Baltimore, Washington, D. C., and Beaver Falls, Pa. In 1894 Mr. Hands went to Kansas City and was made superintendent and purchasing agent of the Northeast Electric Ry., which is now owned by the Metropolitan Street Railway Co. In 1897 he became associated with the East Side Electric Ry., first as constructing engineer, then superintendent and finally general manager.

EARLY ELECTRIC RAILWAY EXPERIMENTS IN KANSAS CITY.

BY J. C. HENRY.

In 1884 and 1885 the writer constructed in the suburbs of Kansas City, an overhead wire electric railway which so far as he knows was the first trolley road built in the United States. Previous to that time a number of Kansas City capitalists had become interested in electricity as a means of propelling street cars and enough money was subscribed to build a short road on the Henry system.



J. C. HENRY.

Mr. W. H. Holmes then president of the Kansas City & Westport Horse Railway Co. offered the use of an old horse car and a section of track between the Kansas City Fair Grounds and the town of Westport, and also contributed financially towards the experiment. The road was equipped during the winter of 1884-85. We suspended a pair of hard drawn copper wires of No. 1 gage over the track at an elevation of about 14 ft. from the ground. This wire was supported from the brackets and span wires by thin metal straps, which left the underside of the trolley wire smooth providing an unobstructed runway for the trolley, which was a small carriage having grooved horizontal contact wheels which ran along and gripped the underside of the wire. The trolley was connected to the car by flexible wires leading from a pole or mast on the car roof, the object being to provide a flexible connection at all times with the wire which in several places was a dozen feet to one side of the track.

Our car was an open summer one with seats down the center facing outward. This construction permitted the motor to project up through the floor onto the front platform. The motor was of a machine similar to the generators which Mr. C. J. Van Depoele had used for arc lighting. It was supported in an iron frame with speed changing gearing somewhat similar to that used in lathes. The frame at one end had a bearing on the car axle, and was spring supported at the other. The motor was regulated with a rheostat.

The generator was a 10-light Van Depoele machine. The track rails which had been down a dozen years weighed but 12 lb. per

yd., so that our attempts at fast speed were usually followed by the car landing on the inside of a neighboring hedge or at the roadside. As we had connection with both wires and could change the gearing so as to get a tremendous leverage we were usually able to get back onto the track again.

In 1886 I converted the East 5th St. horse line in Kansas City (now the Heim line) to electric traction. The road did not have sufficient business to justify cable construction and its grades were too steep for animal power. The street was narrow and given over to heavy trucking and teaming. After the first day's operation I was badly discouraged and afraid we would have to give up. Many of the horses on the street went wild and during the afternoon it was necessary to carry police officers on the cars to go to the assistance of the drivers. The following day there was considerably less teaming on that thoroughfare and although the horses soon became accustomed to the cars, we were still bothered with teamsters who took great pleasure in blocking our way. I instructed the motormen to scare such fellows but to be careful not



EARLY OVERHEAD TROLLEY CAR IN KANSAS CITY, 1884.

to hurt them. As I remember them the results were often amusing. We soon had a free way and made good time.

This road had span wire, feeder and curve construction similar in many respects to the general types of today. The motors were operated from constant potential compound wound generators, arranged for 500 volts potential. When planning the station I hesitated whether to use high speed engines or to purchase a large second-hand slow speed throttling engine, and to control the latter with an electric governor which seemed easy to do. Our president, Mr. W. W. Kindall, favored the former and they were purchased. I have often wondered since that time that electric governors have not been used.

On the East 5th St. line we had four motor cars. The motors which we made ourselves in Kansas City were slow speed machines, and had 18-in. armatures with projecting teeth. Fields were wound with a lot of small wires in parallel. The resistance of the field was varied by coupling the wires together on a switch. The motors were connected to the car axle through a differential gear very similar to those now commonly used on automobiles. The armature ran continuously and was thrown into gear by a clutch.

As I look back to these early experiences I wonder how we ever pulled through. Keeping up our own courage and that of the men interested with us in the face of the most disheartening conditions, running cars in the day time and at night tearing them to pieces to get at some small defect, this was the program for years. But we lived through it and demonstrated the truth of our theories.

The report to the stockholders of the Consolidated Traction Co., of Pittsburg, for the month of August, 1900, shows gross receipts from operation, \$240,935; operating expenses, \$109,132; net earnings from operation, \$131,803; total net earnings and other income, \$159,788; surplus after deducting interest and dividends on preferred stock, \$8,906. For the five months of the current fiscal year the surplus is \$44,330, as against a deficit of \$4,107 for the first five months of the preceding year; this notwithstanding an increase in the dividends on preferred stock of nearly \$12,000 per month.

PERSONAL REMINISCENCES OF EARLY CABLE STREET RAILWAY WORK IN KANSAS CITY, MO.

BY E. J. LAWLESS.

The work of construction on the Kansas City Cable Ry. was completed in the spring of 1885, at which time the writer was engaged to come from San Francisco and take charge of its operation. This was the fourth city in the United States to operate street railways by cable propulsion and one of the first cities to depart from the regular practice in vogue in San Francisco, the cradle bed of cable roads, the result being novel, startling, but hardly surprising to an experienced man, with the final culmination of being obliged to change to San Francisco methods which should not have been departed from in the first instance.

The grades in Kansas City are numerous and as a whole very steep, one in particular running from the "Bluffs" to the "Bottoms" called the "Incline" (mostly trestle work) having a rise of 18½ ft. per 100 ft.

The cars were closed, single truck, vestibuled ends, having the grip hung between the axles, and operated by a wheel attached to a staff with hardly sufficient power to pull a baby carriage, to say nothing of hauling a car load of passengers. To overcome this obstacle a worm gear was attached to the grip staff which helped to further demonstrate the inefficiency of the grip. I shall never forget the first trip made over the road. The schedule time for the journey was 45 minutes, but we made it that day in about four hours. How the car ever managed to climb the Incline is still a mystery, but the writer can yet hear the echo of the sigh of relief from the occupants, when the top of the hill was reached.



E. J. LAWLESS.

A peculiar incident occurred in laying the track on this road, and who was responsible for the error could never be found out, but the rails were laid about an inch too far apart, with the result that the car wheels had a bad habit of dropping off the track on one side, which usually resulted in an argument between persons on either side of the car, one insisting that the wheels were off the rail, while the person on the opposite side thought the other either blind or a fool. It came about this way: The maker of the gage allowed for the play of the wheels. The contractor did the same. The track layer followed suit and the truck maker adopting the regular practice at the time of allowing this play, the results were as stated. Of course the rails had to be relaid to gage.

The double cable system was adopted, but with a city like Kansas City, having heavy grades and numerous curves, the cables were always interfering, so much so that when the reserve cable was wanted it was found to be in sections and absolutely useless. Another serious obstacle was the difficulty of getting trained gripmen. We got a few from Chicago, but as they were not experienced in operating cars on grades, they were not much better than green men.

Having fully demonstrated the utter impracticability of the original grip adopted; through the kindness of Mr. C. B. Holmes, then superintendent of the Chicago City Railway Co., a grip similar to that in use in San Francisco was borrowed. This grip demonstrated its superiority over the other by pulling the platform off the first trailer when hauling six cars up a heavy grade.

After three months of the hardest kind of work to perfect the system, a grand opening was given the public, with the privilege of riding free the first day. A grip car with two trailers containing the officials of the road and many prominent citizens led the van. Everything went well until we came to the head of the Incline. Here a stop was made preparatory to starting over the bluff. To many on the cars, that grade looked like a plunge down a cliff. When starting from the level down the steep grade the cars naturally give a heavy lurch. That was enough that day. In less

time than it takes to tell, only two were left on the train, one the gripman, the other the brakeman. It was on that occasion that a prominent citizen made his famous leap, the record for which has never been equalled in that district.

It would take too much time and space to relate the troubles and tribulations of the first few months of operation. As the men got experienced the system ran smoother, with the ultimate result that the financial success of the enterprise was so pronounced (net earnings 30 per cent for the first year), a regular epidemic of cable roads started throughout the city. I wish to state here that too much credit cannot be given to Mr. W. J. Smith, then president of the Kansas City Cable Railway Co., for his pluck in putting his hand down in his pocket and furnishing the money (about \$100,000) to make the changes necessary to success, in the face of adverse conditions and when financial aid was refused elsewhere.

The next cable move in Kansas City was the purchase of the Corrigan horse car system by a Boston syndicate, and a conversion of those lines to cable. No doubt many have still vivid recollections of their early experiences with the Corrigan horse cars, 10-ft. bobtails, with mules inured to all kinds of service. The tracks (what there were of them) were single with turnouts. These turnouts were, however, superfluous, as when the cars met, one simply turned towards the gutter and traveled along until it struck the track again. This, however, did not trouble the public any, as it was difficult to tell if the cars were on the tracks or not. The first step the Boston syndicate took was to have these cars washed, and it is said the price of soap in Kansas City advanced for the time being in consequence. During the conversion of the Corrigan system the Grand Ave. and Westport lines were also changed to cable, and this was followed by the construction of the 10th St. cable road, which paralleled the lines of the Kansas City Cable Railway Co., and proved immediately on its completion and operation that cable roads in Kansas City had been overdone. In a period covering little more than two years, about eight millions of dollars had been invested in the various systems throughout the city.

The cable craze ended in a grand flourish with the construction of a cable road in the northeast part of the city, under the Terry patents. This was to prove a revelation in economy of construction, and it did so, with a vengeance, as few working on its construction or furnishing material got any money; about \$50,000 actual cash paid represented an expenditure of \$250,000. The grip was constructed to occupy little space in the conduit and the cable was grasped by a series of perpendicular steel rollers placed loosely in the jaws which were tapered at each end.

After numerous delays and tribulations a start was effected, and only one trip made over the road. Such an experience has rarely if ever been equalled. The rollers in the grip jaws made a noise like a threshing machine, and when they did succeed in gripping the cable, the car shot forward with a jerk sufficient to throw you off your feet. In fact the entire trip was a series of jerks and jumps, the rollers slipping from one end of the jaws to the other. On the completion of that trial trip every creditor made a rush for his money. Liens were filed and suits instituted to such an extent that for years that road stood as a monument to the folly of the enterprise.

Too much tribute cannot be paid to the citizens of Kansas City for the hearty co-operation accorded the success of the roads. They quickly recognized what an important factor the cable system was in the development of their city, and did everything in their power to foster and encourage it. There is no portion of his life on which the writer looks back with greater pleasure than on his street railway experience in Kansas City.

“ALONG THE WAY.”

Under the foregoing title the Rapid Ry., of Detroit, has issued a handsomely printed and illustrated brochure telling of the charms and beauty and the opportunities for healthful enjoyment which are found along its line. The cover of the pamphlet is a startling poster effect in yellow and green. This company has also published a time table which is gotten up in the shape of a folder similar in every way to the form usually adopted by steam roads, with a lithographed map of the system, a description of the cars and route, and connections made at each station with other electric lines, steam roads and steamship lines.



JOHN M. ROACH,
President and General Manager Chicago Union Traction Co.,
President American Street Railway Association.

OFFICERS A. S. R. A.

President, John M. Roach, president and general manager Chicago Union Traction Co., Chicago, Ill.

First Vice-President, John A. Rigg, president and general manager United Traction Co., Reading, Pa.

Second Vice-President, H. H. Vreeland, president and general manager Metropolitan Street Railway Co., New York, N. Y.

Third Vice-President, Frank G. Jones, vice-president and general manager Memphis Street Railway Co., Memphis, Tenn.

Secretary and Treasurer, Thomas C. Penington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee, the president, the vice-presidents and—
Charles S. Sergeant, vice-president Boston Elevated Railway Co., Boston, Mass.

C. K. Durbin, ex superintendent Denver City Tramway Co., Denver, Col.

Nicholas S. Hill, jr., general manager Charleston Consolidated Railway, Gas & Electric Co., Charleston, S. C.

Charles W. Wason, purchasing agent Cleveland Electric Railway Co., Cleveland, O.

John R. Graham, president Quincy & Boston Street Railway Co., Quincy, Mass.

CONVENTION PROGRAMS.

The papers before the American Association are:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions." By N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

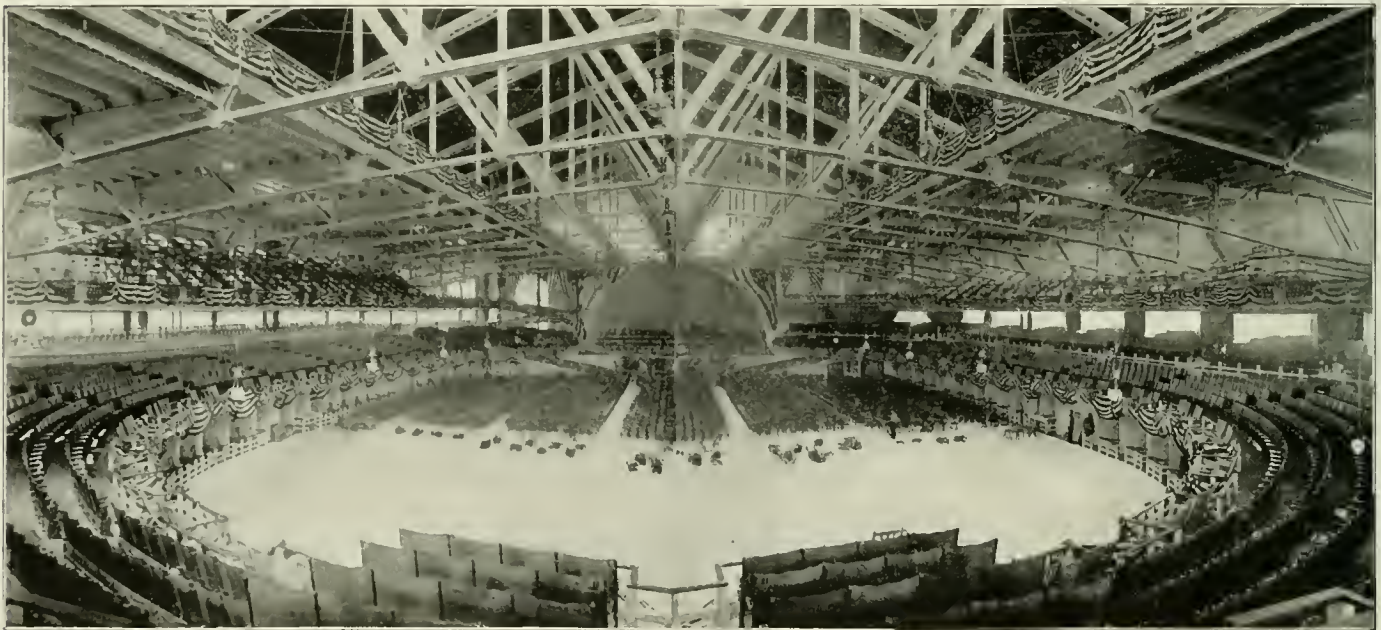
"Comparisons of the Various Systems of Electrical Distribution for Street Railways." By C. F. Bancroft, electrical engineer Massachusetts Electric Companies, Boston, Mass.

"Consolidations of Street Railways and Their Effect Upon the Public." By Daniel B. Holmes, counsel Metropolitan Street Railway Co., Kansas City, Mo.

"The Storeroom and Storeroom Accounts." By N. S. Hill, jr., general manager Charleston Consolidated Railway, Gas & Electric Co., Charleston, S. C.

"Painting, Repainting and Maintenance of Car Bodies." By F. T. C. Brydges, superintendent of car shops, Chicago Union Traction Co., Chicago, Ill.

Friday, October 10th, has been set apart as a day for examination of the exhibits. No session of the Association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.



INTERIOR OF CONVENTION HALL.

A complete list of the cities where the conventions have been held and the presiding officer is as follows:

Boston	Moody Merrill	1882
Chicago	H. H. Littell	1883
New York	William H. Hazzard.....	1884
St. Louis	*Calvin S. Richards.....	1885
Cincinnati	Julius S. Walsh.....	1886
Philadelphia	*Thomas W. Ackley.....	1887
Washington	Charles B. Holmes.....	1888
Minneapolis	George B. Kerper.....	1889
Buffalo	Thomas Lowry	1890
Pittsburg	Henry M. Watson.....	1891
Cleveland	John G. Holmes.....	1892
Milwaukee	D. F. Longstreet.....	1893
Atlanta	Henry C. Payne.....	1894
Montreal	Joel Hurt	1895
St. Louis	H. M. Littell.....	1896
Niagara Falls	Robert McCulloch.....	1897
Boston	Albion E. Lang.....	1898
Chicago	C. S. Sergeant.....	1899
Kansas City	J. M. Roach	1900

*Deceased.

The annual banquet will be held at the Coates House, Friday evening, when the officers elect will be installed.

The headquarters of the Association will be at the Midland Hotel.

The program of the Street Railway Accountants' Association aside from the routine business of the meeting includes the following papers and reports:

"What Does the General Manager Want to Know from the Accounting Department?" By C. D. Wyman, Boston, Mass., lately general manager of the New Orleans City Railroad Co.

Report of the Standing Committee on a Standard System of Street Railway Accounting. By the chairman, C. N. Duffy, auditor Chicago City Railway Co., Chicago, Ill.

"The Routine of a Street Railway, Electric and Gas Lighting Company." By C. O. Simpson, auditor Augusta Railway & Electric Co., Augusta, Ga.

Report of Committee: "Is a Standard Unit of Comparison Practicable?" By the chairman, H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

"Department Accounts." By H. L. Wilson, auditor Boston Elevated Railway Co., Boston, Mass.

"Material and Supply Accounts." By W. M. Barnaby, accountant Brooklyn Rapid Transit Co., Brooklyn, N. Y.

OFFICERS AND EXECUTIVE COMMITTEE OF THE AMERICAN STREET RAILWAY ASSOCIATION.



JOHN A. RIGG,
First Vice-President.



H. H. VREELAND,
Second Vice President.



FRANK G. JONES,
Third Vice-President.



T. C. PENINGTON,
Secretary and Treasurer.



C. S. SERGEANT.



C. K. DURBIN.



C. W. WASON.



JOHN R. GRAHAM

In addition to the names given on page 53t of the September issue of the "Review" the following exhibitors have reserved space in Convention Hall: C. M. Gest, Cincinnati, O., 100 sq. ft.; F. H. Newcomb, Brooklyn, 100 sq. ft.; Heywood Brothers & Wakefield Co., New York, 100 sq. ft.; Auto Appliance Co., Chicago, 50 sq. ft.; Crane Co., Chicago, 200 sq. ft.; St. Louis Register Co., St. Louis, 100 sq. ft.; Duff Manufacturing Co., Alleghany, Pa., 50 sq. ft.; Knell Air Brake Co., Battle Creek, Mich., 100 sq. ft.; J. W. Cramer, Kansas City, 50 sq. ft.; Tramway & Railway World, London, 120 sq. ft.; Burnham & Duggan Railway Appliance Co., Boston, 50 sq. ft.; Sterling-Meaker Manufacturing Co., New York, 200 sq. ft.; Star Brass Works, Kalamazoo, Mich., 120 sq. ft.; Phoenix Metallic Packing Co., Chicago, 120 sq. ft.; American Car & Foundry Co., St. Louis, 700 sq. ft.; McGuire Manufacturing Co., Chicago, 500 sq. ft.

LOCAL COMMITTEES.

ENTERTAINMENT AND BANQUET.

- W. H. Holmes, Chairman, Pres. Metropolitan Street Ry.
- L. E. James, V. P. Metropolitan Street Ry.
- D. B. Holmes, Counsel, Metropolitan Street Ry.
- Frank Hagerman, Counsel Metropolitan Street Ry.
- J. K. Cubbison, Attorney.
- Frank Walsh, Attorney, Metropolitan Street Ry.
- W. E. Kirkpatrick, Sec'y. and Treas., Metropolitan Street Ry.
- H. W. Wolcott, Gen. Mgr. K. C. & Leavenworth Elec. Ry.
- A. A. Lesueur, Managing Editor K. C. Times.
- A. M. Hopkins, Managing Editor K. C. World.
- H. Fleming, Managing Editor K. C. Journal.
- C. A. Snider, Evans-Snider-Buel Co.
- U. S. Epperson, Mgr. Geo. Fowler Packing Co.
- Hugh C. Ward.
- Jas. McGowan, Mgr. Barber Asphalt Paving Co.
- R. L. Gregory, Pres. Gregory Grocery Co.

EXHIBITS.

- W. A. Satterlee, Chairman, Gen. Supt. Metropolitan St. Ry.
- C. W. Waddell, Manager Fairmount Park.
- J. P. Loomas, Manager Convention Hall.
- H. C. Schwitzgebel, Pur. Agt. Metropolitan St. Ry.
- R. E. Richardson, C. E., K. C. Electric Lt. Co.
- F. M. Bernardin, B. R. Electric Co.

INFORMATION BUREAU.

- Jno. O'Keefe, Chairman, Metropolitan Street Ry.
- J. A. Harder, Asst. Sec'y. and Treas. Metropolitan Street Ry.
- E. R. Royer, B. R. Electric Co.
- J. W. Mason, Mgr. Electric Supply Co.

RECEPTION AND LADIES COMMITTEE.

- C. F. Holmes, Chairman, Gen. Mgr. Metropolitan Street Ry.
- Jno. A. Brown, Mgr. Equitable Life Assurance Society.
- G. T. Stockham, Mgr. Midland Hotel.
- C. F. Morse, Gen. Mgr. K. C. Stock Yards Co.
- Hy. H. Meday, Mgr. K. C. Car & Foundry Co.
- W. T. Osborne, Mgr. Electric Supply Co.
- Jno. W. Speas, Secy. and Treas. Monarch Vinegar Works.
- F. C. Peck, Pres. Stewart-Peck Sand Co.
- Henry Evans, Pres. Evans-Smith Drug Co.
- Robt. M. Goodlett.
- S. H. Velie, Treas., John Deere Plow Co.
- Jas. A. Reed, Mayor.
- Lathrop Karnes, K. C. Electric Light Co.
- Harry Friedberg, Div. Supt. K. C. Electric Light Co.
- Hugh McGowan, Pres. K. C. Gas Co.
- W. H. Lucas.
- Mrs. C. F. Holmes.
- Mrs. G. T. Stockham.
- Mrs. W. H. Holmes.
- Mrs. W. A. Satterlee.
- Mrs. W. E. Kirkpatrick.
- Mrs. A. M. Crow.
- Mrs. J. H. Durkee.

The entertainment committee announces the following program:
 Tuesday night, reception at Midland Hotel.
 Wednesday afternoon, trip to Armour Packing Houses.
 Wednesday night, theater party.
 Thursday afternoon, trip to Ft. Leavenworth.
 Friday, examination of exhibits.
 Friday night, banquet at Coates House.

OFFICERS ACCOUNTANTS' ASSOCIATION.

President, C. N. Duffy, auditor Chicago City Railway Co., Chicago, Ill.
 First Vice-President, William F. Ham, comptroller Washington Traction & Electric Co., Washington, D. C.
 Second Vice-President, W. G. Ross, comptroller Montreal Street Railway Co., Montreal, Can.
 Third Vice-President, Edwin M. White, cashier Hartford Street Railway Co., Hartford, Conn.
 Secretary and Treasurer, W. B. Brockway, assistant secretary and auditor New Orleans & Carrollton Railroad Co., New Orleans, La.
 Executive Committee, the officers and—
 John F. Calderwood, auditor Twin City Rapid Transit Co., Minneapolis, Minn.
 C. K. Durbin, ex-superintendent Denver City Tramway Co., Denver, Col.
 C. L. Wight, auditor Toledo Traction Co., Toledo, O.
 C. O. Simpson, auditor Augusta Railway & Electric Co., Augusta, Ga.

A list of the cities where the Street Railway Accountants' Association has held meetings and the presiding officers is as follows:
 Cleveland*Morris W. Hall, Chairman..1897
 Niagara FallsC. N. Duffy, Vice-President..1897
 BostonH. L. Wilson1898
 ChicagoJ. F. Calderwood.....1899
 Kansas CityC. N. Duffy.....1900
 *Deceased.

MORTUARY LIST SINCE LAST CONVENTION.

The list of prominent street railway men who have died since the convention in Chicago a year ago comprises:

Philip T. Begley, superintendent of the Lowell (Mass.) & Suburban Street Ry. December.
 Capt. Thomas H. Browne, secretary and treasurer of the Havana Street Railway Co., and previously connected with the street railways in Boston and with the Metropolitan Street Railway Co., New York. December.
 Charles R. Brown, manager of the railway department of the Michigan Malleable Iron Co., and previously connected with the Illinois Steel Co. Detroit, March 11th.
 Joseph H. Brown, formerly a director of the Lowell (Mass.), Lawrence & Haverhill Street Ry. Lowell, March 26th.
 John R. Bullard, for years a director of the Norfolk Suburban, West Roxberry, Roslindale and Norfolk Central companies. Boston, March 16th.
 William Bacon Crittenden, vice-president of the Duplex Car Co., of New York. Brooklyn, June 6th.
 Isaac Engle, chief engineer of the City Railway, Dayton, O. June 14th.
 Dr. E. J. Finney, a well-known inventor of electrical devices. Fox Lake, Wis., December 19th.
 Allen Follick, master mechanic of the Oakwood Street Railway Co., Dayton, O. March 14th.
 Robert F. Fox, general manager of the Wilmington (Del.) & Chester Traction Co., Meadville, Pa. November.
 James H. Frothingham, for many years treasurer of the Kings County Elevated Railway Co., and later receiver of that line. Brooklyn, April.
 Lieut. S. Dana Greene, general sales manager of the General Electric Co., drowned in Mowhawk River at Schenectady, N. Y., January 8th.
 Capt. C. E. Hall, for many years connected with the Chicago City Ry. Chicago, October 26th.

Hon. Garrett A. Hobart, vice-president of the United States and president of the Paterson (N. J.) Railway Co. November 21st.

John Quincy Adams Hoyt, one of the promoters of the elevated railway system in New York. January 12th.

George C. Herschell, treasurer of the Armitage-Herschell Co., North Tonawanda, N. Y. January 11th.

A. S. Hallidie, the inventor of the cable street railway system. San Francisco, April 25th.

G. E. Herrick, a promoter of the first street railways built in Cleveland. New York, May 28th.

John Love, the patentee of the Love underground conduit system. March.

W. K. McAllister, superintendent of the Atlantic City (N. J.) Ry. January.

John McLeod, receiver of the New Albany (Ind.) Street Ry. Louisville, Ky., January 22d.

Gen. John McNulta, receiver of the Calumet Electric Street Railway Co., of Chicago. Washington, D. C., February 22d.

Frank O. Mason, superintendent of the New Castle Traction Co. and the New Castle Electric Co., of New Castle, Pa. March 22d.

Dr. Truman W. Miller, surgeon in chief for the Chicago Union Traction Co. May 21st.

F. J. O'Donoghue, superintendent of the Nashua (N. H.) Street Ry. November 10th.

John D. Oxner, connected with the street railways in New York City. Rome, N. Y. December 21st.

Cornelius Pierpont, who built some of the horse car lines now forming part of the Fairhaven & Westville Electric system. New Haven, Conn., March 20th.

Salvator Potis, chief engineer of the West and North Chicago Street Railroads. Chicago, April 17th.

William R. Prall, paymaster of the Staten Island (N. Y.) Rapid Transit Co. March 19th.

Addison C. Rand, president of the Rand Drill Co. New York, March 9th.

J. R. Rand, July 18, who shortly before his death succeeded his brother, Addison C. Rand, as president of the Rand Drill Co.

Herbert A. Reeves, of the Manville Covering Co. of Chicago. California, January.

Bernard M. Shanley, president of the Consolidated Traction Co., of Jersey City, N. J. Newark, March 19th.

George E. Newlin, formerly treasurer of the West Chicago Street Railway Co. and later associated with the Chicago Union Traction Co. April 2d.

George T. Smith, secretary and cashier of the San Mateo & San Francisco Electric Ry. June.

Winfield Smith, connected with the early street railways of Milwaukee. London, England, November 8th.

H. J. Termohlen, chief electrician of the Rockford (Ill.) Railway, Light & Power Co. Freeport, Ill., May 15th.

Frank Tryon, jr., superintendent of the Huntington (N. Y.) Street Railway Co. January.

V. C. Turner, formerly president of the North Chicago City Ry. Chicago, December 2d.

J. H. Vanderveer, superintendent of the shops of the Brooklyn Heights Railroad Co. Bay Ridge, N. Y., December 3d.

Russell Wiley, electrician of the Kankakee (Ill.) Electric Railway Co. August 13th.

F. W. Wood, manager of the Los Angeles Railway Co. California, May 19th.

I. A. Kelsey, a director in several New England street railway companies. September 24th.

STREET RAILWAY MEN IN POLITICS.

Among the street railway men in politics whose names we now recall are:

M. A. Hanna, president of the Cleveland City Railway Co., who served as chairman of the Republican National Committee in 1896 and this year was again chosen by Mr. McKinley to manage his campaign. Mr. Hanna's career in politics is quite remarkable; prior to 1896 he was known only as a successful business man and his first public office was that of United States Senator from Ohio to which he was chosen in 1897 when Senator John Sherman resigned to enter the cabinet.

OFFICERS OF THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.



W. F. HAM,
First Vice-President.



C. N. DUFFY,
President.



W. G. ROSS,
Second Vice President



E. M. WHITE,
Third Vice-President.



W. B. BROCKWAY,
Secretary and Treasurer.



J. F. CALDERWOOD.



C. K. DURBIN.



C. L. WIGHT.



C. O. SIMPSON.

Henry C. Payne, vice-president, of the Milwaukee Electric Railway & Light Co., has long been active in state and national politics and this year is vice-chairman of the Republican National Committee.

M. S. Quay, lately United States Senator from Pennsylvania, is a director of the New Castle Traction Co., of which his son, R. R. Quay, is vice-president.

C. L. Magee, president of the Consolidated Traction Co., of Pittsburg, has for years been a member of the state senate and is a political power in Allegheny County.

Thomas Lowry, president of the Twin City Rapid Transit Co., of Minneapolis, is active in state and national politics though he has not aspired to office.

E. F. C. Young, president of the North Jersey Street Railway Co., has served as presidential elector and as state railroad director.

David Young, vice-president of the North Jersey Street Railway Co., was president of the Jersey City Council for four years and served also in the New Jersey Legislature.

John D. Crimmins, who is a director of the North Jersey Street Railway Co., of Jersey City, and was for several years president

of the Metropolitan Street Railway Co., of New York, is prominent in Tammany Hall. Mr. Crimmins has for many years been a contractor, much of his work being street railway construction: he built the Broadway cable line in New York.

E. P. Shaw, for several years treasurer and receiver general of Massachusetts, has been interested in many of the interurban lines of New England, and is a partner in the firm of James F. Shaw & Co., which has built many of these roads.

Arthur Kennedy, president of the Indiana Railway Co., South Bend, Ind., has served in the Pennsylvania Senate but is now out of politics.

John F. Hill, governor-elect of Maine, is secretary of the Norway & Paris Street Railway Co., Norway, Me.

Edward Louderbach, who was largely interested in the Third Avenue Railroad Co., of New York City, is a prominent Republican politician.

Hugh J. Grant, ex-mayor of New York, was early in the year receiver of the Third Avenue road and the allied companies.

L. E. Magann, ex-congressman, and now Commissioner of Public Works of Chicago, was the successful promoter of the Chicago General Railway Co.

the criticism mentioned, but in each of these cases the causes are found to be very unusual. Seldom do such fires as burned the ocean liners at their docks, occur; seldom also do conditions arise as have prevailed in China the past three months.

The steady tendency has been and will continue to be in favor of more and more safeguards in the operation of our cars. Our tracks, and cars and apparatus are better than ever before, and in the hands of more skilled operators than five years ago. In the interurban service, where the two most serious accidents of the year occurred, the operation has been with a remarkable freedom in the aggregate from accidents and fatalities. Telephone and automatic signal systems, air brakes, are headlights, good roadbed, all these insure the largest degree of safety to the passenger. Even when an occasional car has left the track through some unpreventable cause, the present construction of the car body is such that unless it suffers a long drop, the occupants receive little more than a jolting.

The almost universal use of side bars, or their equivalent, on open cars running on double tracks, has made a notable difference in the number of injuries formerly incident to the use of summer cars. The growing tendency also toward long open cars on double tracks in place of the short cars, reduces the work of the conductor and by seating passengers who would otherwise ride on the foot-board lessens the number of injuries arising from personal carelessness of the victim.

What the daily press is pleased to term high speed, is by no means dangerous if conducted under our present improved methods; on the contrary fewer passengers are hurt in getting off the car as they are content to wait until it stops when moving at high speed, instead of taking the apparently slight risk of jumping from a car going say six miles an hour.

The railway managers of the country are most certainly alive to their responsibilities and will neglect no opportunity to avail of every possible means which can make for the safety and comfort of their passengers. Of these things, however, their practical experience makes them far better judges than editors of daily press or the average legislator.

In a certain western city the old settlers were planning a grand celebration and reunion. It was intended to make the event one which would attract people for miles around, and possibly some from distant portions of the state. Celebrations, as our readers are not unaware, cost money, and this money must be raised by "voluntary contributions." The street railway in the place was requested to chip in, and did so by planking down \$500 in cold cash. Thereupon the local press, which stands to make a great deal more out of the event in paying contracts for extra advertising, attacks the company for what it calls a "niggardly," "beggarly" contribution. One paper even intimates if the company paid all the bills, that it would be nothing to mention.

But why, in all reason and fairness, should the street railway be held up for \$5,000 which is the minimum amount which the editor has decided the company should pay? Steam railroads, hotels, restaurants, and business of every kind will expect to derive a good profit from the scheme and the influx of visitors. They should all pay their share, and simply because the street railway is easy to reach and in the public eye is no reason why it should be held up. The probability strongly is that if the others named paid in the same proportion of their anticipated receipts the company's proportion would not be one-half the amount it has given.

A street railway management is justified in chancing a certain sum on the expectation of increased revenue growing out of a special occasion, but the earnings created by the special event are by no means all profit. Indeed the experience of not a few managers has made them feel like paying something not to have the celebration. The extra cost for labor, the time and money lost by blockades from marching bodies, the damage to cars from overloading; and by no means least, the frequent damage claims from people who are injured by reason of not knowing how to use a car, or getting hurt while intoxicated: all these combine to constitute conditions which the subscription committees fail to take into account. The receipts from 100,000 extra passengers,—and this number constitutes the entire population of a large city—is only \$5,000, and a bad accident to one passenger is liable to cost this amount plus the court expenses.

Street railway companies with possibly a very few exceptions, indeed we do not call any such to mind,—are liberal contributors to

all public movements, and we are convinced that were the truth known it would be found the street railway does far more than its share at such times. It is proper, however, to explain these conditions to subscription committees who perhaps in the absence of such information may feel disappointed where they should be satisfied with the contribution.

"How shall I administer a reprimand?" is a question that frequently confronts the manager and it is one that oftentimes requires a deal of careful thought, for a reprimand unjustly or too harshly given, nine cases out of ten, makes a dissatisfied employe who down in his heart will never forget what he looks upon as an insult, and he will grasp the first opportunity of getting square. A little group of such employes means before long unions, grievance committees and a generally unsatisfactory relation between company and men, and it sometimes means a strike. On the other hand, if the boys get the idea that the "Old Man" is easy and that a "walk on the carpet" signifies nothing more than a pleasant chat and some good advice, the general discipline on the road drops to a low standard and accidents, and complaints from the public will surely follow.

We have heard the point made that it does not pay to warn employes; that the company should have but few rules and when those rules are violated in any degree, suspensions or discharge should follow. This practice would perhaps be a good one if the road is to be run on the theory that the men are machines, and in exchange for their wages must do their work as accurately and well as a machine or give way to others. But we believe the country's largest employers of labor now go on the principle that it is far better, for business reasons alone and aside from humanitarian ideas, to deal with their men, as such, giving them full opportunity to clear themselves of any charge, showing them leniency when there are extenuating circumstances and letting them feel that the management has the welfare and prosperity of its employes in mind.

How then is the best way to deal with a man who has been guilty of some slight infraction of the rules, as missing a fare, running by people who wish to ride or some other small offense that in the first or second instance does not require severe punishment. We believe there is a way of so speaking to an employe in a case of this nature that the man will recognize his fault and the possible consequences without getting "sore" against the company. It is better to keep the good will of every man on the road if it can be done without sacrificing discipline and the rights of the stockholders or the public, and it is even permissible to wink at trivial offenses at times, rather than make an enemy in your employes' ranks.

The best reprimand we ever heard was given recently in the office of one of the largest street railway systems in existence. A motorman had been told to report to the manager, an inspector having stated that the man was in the habit of not stopping for passengers whenever he was a trifle late. The manager turned as the motorman entered and remarked, "Good-morning, James, you ran by three passengers yesterday on your afternoon run. What have you to say in regard to the matter?" The man replied, "Well, sir, I was behind my schedule and I didn't really see the people until it was too late to stop." "All right, James," the manager replied, "but you know we are in the business of carrying passengers, James, that is all, good-morning." The man was heard to remark as he passed from the building, "The super is all right." The motorman had recognized his fault, and its effect on the company, and he felt he had been treated fairly and squarely, and the chances are that he will never again be guilty of the same offense, for he also understood from the manager's tone of voice and actions that on the next occasion he would not get off with simply a warning. It should be added that this general manager always addresses his men by the first name on occasions of this kind, and if he can not keep the name in mind, he obtains it from the payroll just before the man is ushered in.

The subject may be summed up as follows: It is better not to lay a man off when a reprimand or warning will secure the desired result. Show the employe in as few words as possible how his offense injures the company's business and appeal to his judgment and manhood. If he has no manhood to appeal to, discharge him at once. Let the man understand by manner and voice, that the management is in earnest and will brook no trifling, and always live up to your promises of rewards or punishments.

Conditions of Operation of Street Cars in the City of Quebec.

Read before the Canadian Electrical Association by D. E. Blair, Electrician Quebec Railway, Light and Power Co.

Of all financial undertakings, none perhaps depends more upon the nature of local conditions than does the successful development of a city street railway system, and for this reason it may be of interest to give a more or less general description of the difficulties encountered and overcome by those responsible for the development of the Quebec street railway.

PHYSICAL FEATURES.

Quebec, as a city, has many distinctive features that are not to be found in any other city in America, and the stranger within its fortified walls is very soon struck with the unique fashions, methods and temperament of the quiet people who make up what may be called the native population, numbering about 75,000, and of whom about 65,000 are French-speaking. When the construction of the road was first contemplated by those responsible for the promotion and fulfillment of the scheme, there existed certain unpromising conditions which tended to arouse the doubts of many as to the feasibility and possible financial success of the enterprise. Of these I might mention a few at random. Business in general is carried on in a very quiet and matter-of-fact way, and an observant critic does not notice the hustle and bustle so common in most modern cities of this continent. The salary of the clerk and the wages of the laborer are moderate, and the average individual very seldom appears inclined to do any more than he is paid for. The natural result of this was that the electric street car could not be looked upon as a valuable and indispensable time-saver, as well as a welcome convenience, but rather as a luxury to be enjoyed by those who could afford it.

The manufacturing interests of the city are limited and further development along this line is hindered by the conservatism of capital. Further, the average laborer or even expert workman is the proud possessor of a large family, several of whom are perhaps engaged in the same work as himself, and he finds it convenient and economical to live near his work, as rents in the manufacturing districts are very reasonable. The city is very compact and densely populated; furthermore, it is divided into certain sections which are practically self-contained municipalities. Public entertainments and social functions were very little appreciated or patronized, and the principal streets seemed almost deserted after 9 p. m. Although these conditions may have no direct bearing on the practical expenses of construction and operation, they were certainly not in favor of the credit side of the prospective railway company's cash book.

The more formidable objections, however, were of a practical nature. Five years ago, and even less, it was considered impossible that anything that looked like a street car could ever climb the steep, narrow and winding thoroughfares that lead from the water's edge to the highest points of the mass of solid rock upon which the city is built. Besides this the heavy snowfalls and the narrowness of the streets were likely to be a great hindrance to the service, but in spite of everything the road was completed, and it has now been proved that the limiting conditions of street railway operation were not overstepped in the bold undertaking which has given the people of Quebec a reliable and efficient means of transportation. The city has improved wonderfully since the opening of the road, and promises to become, before long, as wide-awake and progressive a center as any in the country. Even theatrical entertainments have become more or less popular, and everything seems to be moving at a faster pace than heretofore.

On Nov. 1, 1896, was commenced the laying of the rails through the main streets of the city, and on July 1, 1897, the road was opened to traffic.

The track is of standard gage; the rails are of steel, 72-lb., 6-in. T-section, in 30-ft. lengths, and were made by Cammell & Sons, England. The ties are 7 ft. long and spaced 2 ft. c. to c. Each joint is bonded by two No. 00 solid copper wires in "Eclipse" copper bonding caps made by the Ohio Brass Co.; these are tinned and ends of wires riveted on outside of rail. Double cross bonds were placed at every fifth joint, 150 ft. apart. There are 7.28 miles of single track and 5.14 miles of double track, a total of 17.56 miles.

Tubular poles 28 ft. long, weighing 700 lb., and spaced 90 ft. apart, are used throughout for the overhead construction. The insulation is of the "Dirigo" type, and the trolley wire is No. 00 hard-drawn copper. The span wires are of stranded galvanized steel three-eighths of an inch in diameter. Lightning arresters of the Wurts non-arcing type are used. All construction is pleasing in appearance and of a substantial nature. Altogether there are 10 miles of span wire construction and 2½ miles of bracket.

There are two car sheds—one in Upper Town, 210 x 120 ft., having 14 tracks and 7 doors, where all cars in service are housed at night, and the other in Lower Town, the latter being used for storage purposes only. The capacity of the working car shed is 52 cars, and here all repairs are made. There are seven floored pits communicating with the machine and blacksmith shops underneath.

When the road was built all streets without exception were covered with a generous layer of macadam. Within the last two years, however, a great improvement has been made in this respect on nearly all the streets through which the lines run. All macadam was removed to a depth of about 12 in., leaving the ties completely exposed, and these were then filled in with concrete to within about 4 in. of the top of the rail. The facing of the new pavement through the city now consists of scoria blocks between and 8 in. beyond the rails, while the remaining strip of roadway is filled either with asphalt, asphalt brick or scoria blocks, according to the grade of the street.

In Upper Town, the residential district of the better class of people, the streets were nearly all wide enough to permit of a double track, but even here it was found necessary to run through certain sections on single track. Lower Town, the business section of the city, is a semi-circular strip of ground of varying width and practically level, which is surrounded on the outer edge by water, and lies beneath the cliffs which mark the boundary of Upper Town. Here the lines are all single track with the exception of one section where two parallel streets converge into one wide street one-quarter mile in length. The main street which runs through the entire length of this section is about 2½ miles long and is so extremely narrow in places that there is hardly room for an ordinary vehicle to squeeze past on either side of a car on the single track in the center of the street. The return line is through a maze of narrow and unsymmetrical side streets which seem to run in almost any direction until they form a junction, at an oblique angle, with one of the larger arteries, thereby losing their identity.

On one section of the line, one mile in length, there are no less than eleven curves of from 35 to 40 ft. radius at intersections of about 90 degrees, and one that requires a reverse curve of 40 ft. radius. On all these streets the inner rail is placed within two feet of one sidewalk in order to leave room for single vehicles to pass a car on the other side.

The Upper and Lower Town lines are connected by two cross-town lines which ascend obliquely along the face of the cliff. One of these, the Green Line, runs through the public thoroughfare, which, though very steep, is yet practicable. The actual length of this line is 3,440 ft. and the difference of level between junctions is 172 ft., which is equivalent to an average grade of 5 per cent. The total length is made up of sections of 200 ft. 12½ per cent, 100 ft. of 10 per cent and 600 ft. of 9.5 per cent grades, the rest of the line being nearly level. All these grades have sharp curves in their length, but the most difficult to operate is the first, which begins to rise at a gradient of 11½ per cent and terminates at 14.15 per cent. There is a 40-ft. radius curve at the top, of which one-half is on the heaviest part of the grade.

The second cross-town line runs for a distance down Palace Hill on an average grade of 11 per cent and then turns off the public street at an angle of 90 degrees onto a steel trestle which runs parallel with the face of the cliff on a gradient of 7.5 per cent for 800 ft. The total length of this line is 1,300 ft. with average gradient of 6.85 per cent and a maximum of 12 per cent, the difference of level being 89 ft. One disadvantage in the operation of

this line is that when a car leaves the trestle to take the 11.5 per cent grade it is running at half speed and must be accelerated on the grade. This means a very heavy load on the motors for the first fifty feet of the climb.

CAR SERVICE.

The Upper Town system consists of a double belt line, 3½ miles in circumference, with from 4 to 7 cars running in each direction on a headway of four minutes in summer and five minutes during the winter. Schedule speed on all lines is approximately eight miles per hour. Except for a few short stretches of level the total length of this belt is on streets having gradients of from 4 to 8 per cent.

In Lower Town there is but a single belt line, both branches of which are intersected by the cross-town lines. Cars running west are for most of their run within one block of those running east. Here also cars are run at intervals of four minutes, and the service requires from eight to twelve cars. Free transfers are issued from one belt to the other over the cross-town lines. These are run separately in winter, but form two sides of a double rectangular belt line in summer. Both tracks are single, and the cars pass at turn-outs.

Strict regulations govern the operation of cars on grades and sharp curves. On some of the grades stop-boards are placed at the top and bottom, and the motorman may not proceed until signalled by the conductor. The speed down grades must not exceed four miles per hour. As a result of these precautions runaway cars are very rare and have never yet been attended by any serious consequences. The average number of cars in regular service during the summer months is about 35, and in winter about 30. In a city of heavy grades, such as Quebec, the system of braking should be of special interest. Hand brakes are used throughout, the effective leverage being 100 to 1. The brake shoes in use are of very soft cast iron, and it has been found that the retarding force due to the application of this shoe is much more evenly applied, and that the coefficient of friction is higher under all conditions than when hard cast iron is used. This is especially the case in frosty or snowy weather. New shoes weigh 19½ lb. and wear down to 4½ lb.; the average life is 6,150 miles, or 410 miles per pound of wear.

All wheels used are of ordinary chilled cast iron, 33 in. in diameter, weighing 425 lb. each, and are mounted on a 4-in. steel axle. Of the wheels removed from cars during the first three years of operation there is not a great proportion of "flats," as will be noticed from the following table:

	Pairs.	Per Cent.
Total wheels removed.....	125	....
Worn out	94	75.2
Flats	23	18.4
Broken flanges	8	6.4
Average life, 24,800 car-miles.		
Maximum life, 49,000 car-miles (reached by to pairs).		

The rolling stock comprises: Thirty-five 28-ft. double vestibule closed cars, which weigh 14,500 lb. when fully equipped and seat 30 passengers; 24 double-end open cars weighing 16,500 lb. and seating 50 passengers; 6 double-ended snow sweepers; 2 double-ended wing plows; 1 street sprinkler; 1 converted horse car. All cars are equipped with single trucks having a 7-ft. wheel base.

The electrical equipment is standard on all rolling stock and is of the Westinghouse make. It consists of 124 No. 12 A 30-h.p. motors, 124 No. 28 A controllers and 62 sets of controlling resistance. All closed cars are fully equipped and in service during twelve months of the year, and the extra equipment required for sweepers and snow plows during the winter are borrowed from the open cars.

The sweeper and plow equipments are necessarily very much overloaded at times, and it will be of interest to know how they have stood the hard usage. An overload of 100 per cent for several minutes at a time has often been carried by these motors during heavy snowstorms, and a sweeper will sometimes burn five or six No. 13 B. & S. copper wire fuses, or in other words, draw from 200 to 250 amperes at 520 volts, before it can get past a difficult spot. This extremely hard usage does not seem to have any very bad effects beyond a temporary softening of the armature insulation and sometimes the loss of a certain amount of

solder from the commutator connections, and the management is proud to say that there has not been a single armature burned out since the road has been in operation; in fact the only trouble ever had with armatures was in two cases the insulation was scraped off the wires by rubbing against the pole pieces in consequence of a defective bearing. This is not a bad record considering that there were 124 of them in use. There has never yet been a commutator lost, nor has it been necessary to even repair one—apart from resoldering a few melted connections—and the heaviest wear on any diameter up to date is ¼ in. The average wear taken from the first 28 closed cars in operation is .22 in. on the diameter after having made an average run of 71,800 miles. There has not been a commutator "flashed" or "bucked" in the past eighteen months, and this perhaps is largely due to the excellent quality of brushes used, as well as to the constant care that they receive.

It has always been the practice to send an armature to the lathe at the first sign of a "buck," and it has been found that this is absolutely the only way to prevent a recurrence of the trouble. A sharp eye is kept on the brushes to see that they do not wear down too far or become gripped in their holders, and the commutators are cleaned and sandpapered about once a week with No. 0 sandpaper, although it is quite common for a commutator to keep a nice chocolate glaze for over a month without being touched.

The commutator is the most delicate and troublesome part of any electric equipment, and there are two or three more points which ought to be strongly recommended in its care:

1. To send it to the lathe before it has worn down too far. Just as soon as a slight shoulder is formed at each side of the wearing surface the brush is lifted by the end play of the armature and unnecessary and expensive sparking is the result. Further, the copper segments are rarely of a uniform hardness throughout, and the least inequality of wear soon develops into a low spot on the commutator.

2. It is very important that the brush springs be set at the proper tension, and it is easy to make a rough comparative test of this statement with no other tools than a pair of calipers or steel tape line and a spring balance. It will be found that too light is just as serious a defect as too heavy a tension, if not more so. In one case excessive wear is due to sparking and probable "flashing," and in the other to actual friction.

3. See that the brush-holders are accurately aligned so as to divide the current equally between the two circuits of the armature. If the brushes are but the thickness of one segment out of place, one is liable to be notified of the fact at the first heavy overload on the motor.

Of course a great deal depends upon the quality of brush used and cost price of this article should not be considered. The brushes used here have an average life of 12,600 car-miles and cost 15 cents each, which is more costly than most brushes of this size on the market. But let any one make a simple calculation to see how many times the difference in the price of the brush goes into the saving effected by prolonging the life of a commutator several years. The cost of renewing one commutator would keep a 50-car equipment in brushes for two years.

Some trouble has been experienced during the snowstorms of winter by the grounding of field coils, but means have been found to effectually prevent this in future. It might here be mentioned that during twelve hours of a cold dry snowstorm, when light particles of snow are flying about, two or three gallons of water are sometimes collected in the bottom of the motor casings. Water and slush in the spring have given no trouble.

A word about controllers. Aside from the burning out of a couple of magnetic blow-out coils there have never been any repairs made on any of the 124 controllers in service beyond the renewing of the sparking tips of the drum, which is done about once in two years at cost of about 50 cents for each controller.

Here again are the results attained by rigorous inspection and careful cleaning each night. Apart from the nightly inspection it is the practice of the road to thoroughly overhaul every car once in every six weeks. This work is done during the day. Bearings and armatures are examined, brush springs set, brake rigging adjusted, and journal boxes examined and renewed if necessary.

As a result of this routine work, which costs but little, it is seldom that the service has to suffer the annoyance and blockade of traffic caused by a disabled car on the road. It can be safely said that there are not more than two or three cars ever taken out

of service for any reason whatever from early spring until late in the fall. In winter the number is somewhat greater.

CURRENT REQUIRED ON GRADES.

The current required to get a loaded car up the steepest grades on a good summer rail is practically constant and well within the overload capacity of the car motors. The maximum amount usually drawn from the line at 520 to 540 volts, under such conditions, is rarely above 125 amperes, and that for a short time only. The average current is from 60 to 80 amperes per car.

Just as soon as the appearance of snow or ice on the rail has to be considered, the ascent becomes a more serious question. Wheels begin to skid and the car loses momentum, then sand is applied and the sudden overload on the motors as the wheels take a grip, is often beyond the capacity of the heaviest fuse wire it is safe to use on the car equipments, No. 14 B. & S. This wire will carry 180 amperes for several minutes in winter time and 200 amperes for about 10 seconds and this will give a rough idea of the power required. The rated capacity of the motors is 50 amperes, so that when running on the parallel connection the rated load per car would be 100 amperes. In other words every equipment on the road has frequently to stand each day an overload of from 50 to 120 per cent. The figures, however, are yet too low for the current consumed at times by the driving motors on the sweepers. On these there has been frequently measured an overload, lasting an appreciable time, of 180 to 200 per cent. Apart from these sudden maxima, the average load distributed between the two motors is sometimes as much as 150 amperes for hours at a time, including several short periods of comparative rest. Some I know will say that it is extremely bad practice to strain an equipment to such an extent, but, without denying the charge, it may be said that these sweepers have cleaned over 6,000 miles of track every year for the last three years, and the only mishap which occurred to any one of them was the grounding, during the third year of their operation, of one field coil, this, too, in spite of the fact that they were on one occasion running for 106 hours continuously, each one wearing out three or four sets of brooms during that time. On several occasions they have run continuously for two or three days except for an occasional stop of an hour to renew the brooms.

Fig. 2 shows the average energy required by each car in service during each month of the year. These curves are calculated from the readings of an integrating wattmeter in the central station. These results agree closely with the tests of individual cars that have been made.

The total cost of maintenance of electrical equipment per car-mile per year is 0.17 cent. This account includes all renewals.

The car service calls for a working staff of 70 conductors and as many motormen. All motormen, before being accepted on the road, must go through a period of training averaging from three weeks to a month. Part of this time is spent on the road in the company of a good regular motorman and at least a week is spent in the car sheds where the novice acts as helper at nominal wages. He is then examined as to his knowledge of the road, car equipment and regulations. Very little technical knowledge is required of him beyond a thorough understanding of the different parts of the equipment. As a result of this discrimination against the blockhead and the fool, it is a marked fact that on every car in service, "the man behind the gun" knows his business and uses his brains to the advantage of the company.

The greatest difficulty encountered by the company in its efforts to provide a regular and efficient car service during the winter months is the clearing away of the snow from the tracks. It is not so much that the snowfall is somewhat heavier than in the Montreal and Ottawa districts, as that the extremely narrow strips of roadway, either on one side of the track or the other, soon become piled up with snow to such an extent that all snow removed by a passing sweeper immediately slides back on to the rails and blocks the passage of the following car.

Another serious disadvantage is that all cars in the city have to run over some sections of single track. This fact requires, of course, that cars shall meet regularly at certain points, and if one car should be late for—or worse still, not reach—its meeting point, several of the following pairs of cars which pass at the same point will be stalled there until the tangle is straightened out.

A delay of this sort is disastrous in many ways because the leading car, when it gets away, has sometimes to plow its way through

a heavy accumulation of snow until it is possibly extricated from its sorry plight by a passing sweeper which has to be signalled and shunted past the waiting cars before it can be of any service. Matters are soon straightened out, but then that sweeper should have been somewhere else and there is more trouble ahead. Just as long as all cars make their proper meeting points, no matter if they be a few minutes behind scheduled time, everything works smoothly, and, after that, complications seem to increase in geometrical progression.

It is the practice to send out the wing plows as soon as a certain amount of snow has fallen and these follow the sweepers around the whole length of track, at regular intervals, pushing the snow piles back as far as six feet from the rail, where it is possible, although there are miles of track to be kept open where there is less than that distance between the rail and the buildings, to say nothing of the sundry poles and sidewalks that necessarily intervene.

As the day wears on, and the snow still continues to fall, the swing of the plows is limited to two feet and possibly to one foot, after which it is a hard struggle to keep everything moving through the rectangular channel four or five feet deep which has

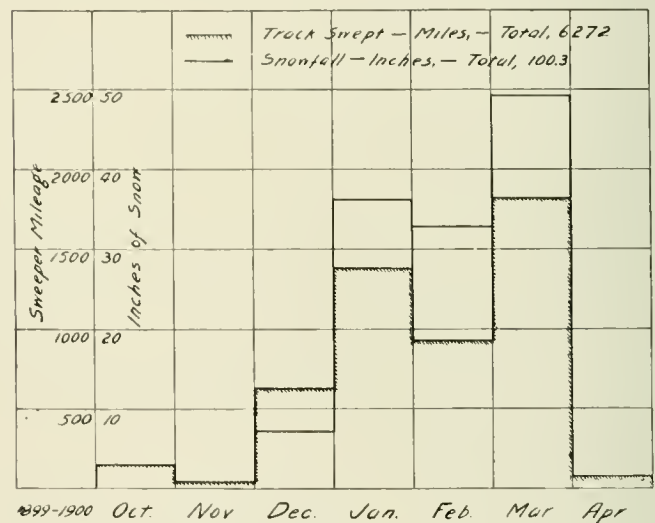


FIG. 1.

been formed by the wing plows in their endeavors to clear the right of way.

There are several bad spots at which it is absolutely necessary to keep gangs of snow shovellers at work, as soon as the storm reaches any more than even moderate proportions. It has further been necessary on two or three occasions to take all cars out of service in order to give the sweepers a chance to keep the road open, but only once in 1898, and once in 1899, has the service been entirely blocked, and that for one day only.

Nearly all cars in service now carry side brooms or flangers about three feet in length which are set obliquely across the rails about one foot ahead of the front wheels. These consist of cast iron frames into which are fastened a number of cuttings from the sweeper brooms about 10 in. in length. They cost very little and have proved invaluable in keeping the rails clear of snow during the half-hourly or hourly intervals between passing sweepers; in fact the car service very often depends entirely upon these to get through a light snowstorm, a couple of sweepers being sent out, after it is all over, in order to clean up. These long brooms have another great advantage over a narrow steel wire brush in that they keep the snow and ice at each side of the rails at an easy slope toward the bottom instead of cutting a deep rectangular trough which remains filled with snow after the sweeper brooms have gone over the track.

Since adopting these brooms on the road, a marked decrease in the power consumed by the rolling stock during storms is noticed and a great saving has been effected in the quantity of rattan used by the sweepers for each mile of sweeping. This results from the fact that when the transverse section of the winter roadbed is properly graded the sweeper brooms need not be let down so far in order to clear all snow from the rail, thus saving a great deal of breakage.

The total snowfall in Quebec for the last three winters has been as follows:

1897-98	104.6 in.
1898-99	120.6 in.
1899-1900	100.3 in.

Fig. 1 shows the proportion of last year's total fall during each month, also the number of miles covered by the sweepers during each month of the same year. The total cost of removing snow last winter was \$16,335.08 which is \$2.60 per sweeper-mile; 1.473 cents per car-mile; \$1,089 per mile of track. These include all costs of sweeping, shovelling and carting away of snow, as well as the interest, depreciation and maintenance of the necessary equipment.

With reference to the removal of snow, the city by-laws provide that "proprietors or occupants shall remove the snow and ice from their roofs and from the streets, from the street line to the center of the street and keep the same within two inches of the pavement."

The by-law granting a franchise to the Quebec Railway, Light & Power Co., provides that "the company shall remove the snow from their tracks and two feet on either side thereof." As the company could not see its way to carry out this regulation, without having trouble with the proprietors or tenants, it every year makes an arrangement with the tenants on that side of the street on which the company throws its snow, to remove the same, paying them at the rate of 10 cents per lineal foot of their frontage, except in places where the snow is known to accumulate, where they pay at the rate of 15 cents per lineal foot. Consequently, all the company has to do is to throw the snow off the tracks, leaving the proprietors to remove it along with their own. With this arrangement the proprietors seem very well satisfied. One can better appreciate the relative magnitude of the snow expenses when told that \$1.54 has to be deducted from the daily gross earnings of every car in service during the year in order to make up the amount.

All closed cars in service are heated electrically during six months of the year, the heaters being divided into four sections, two on each side of car, each pair being separately controlled. The current consumed by each pair is 4.9 amperes and it therefore requires 9.8 amperes at 520 volts, equal to 5.1 kw., to heat a car during four months of the year, when both sides are in use, but during the months of November and April, one side is quite sufficient to maintain a comfortable temperature within the car body.

Taking the average time of service of car at 18 hours per day and the actual cost of the extra current required at 0.65 cent per kilowatt-hour, the cost of heating one car is 3.32 cents per hour, 60 cents per day or \$90 per year. This is equivalent to 0.204 cents per car-mile. The interest on first cost, depreciation and maintenance of the heating equipment would not add more than 2 or 3 per cent to these figures.

POWER STATION.

The electric railway, as well as nearly all lights and motors in Quebec, are operated, through a sub-station within the city, from a power house situated at the Falls of Montmorency. The power house is 150 ft. long and 50 ft. wide, and contains the following equipment: Three 600-kw. and one 750-kw. two-phase, 5,500-volt S. K. C. alternators; one 600-kw. double current 273,500-volt Westinghouse generator; two 30-kw. bipolar exciters.

All the larger machines are direct connected to 52-in. water wheels of 1,000-h. p. capacity each and operating at a speed of 286 r. p. m. They were built by the Stillwell Bierce & Smith-Vaile Co., Dayton, Ohio.

The current is transmitted to the city over 16 wires, carried on two separate pole lines. Each machine is fed into a separate circuit at Montmorency, but may be connected in parallel at the sub-station in the city.

The sub-station consists of a substantial stone building containing the following machines: Two 600-kw. two-phase S. K. C. synchronous motors, taking current at 5,000 volts, direct connected to two 500-kw. 550-volt G. E. railway generators. Two 200-kw. two-phase, 5,000-volt synchronous motors, direct connected to four 125-light multicircuit Brush arc machines.

Besides these are the direct connected starting motors required for the motor-generators, two exciters driven by induction motors,

and all necessary transformers and switchboards for distributing the current to its various uses.

The railway switchboard contains, besides switches, circuit-breakers, voltmeters, ammeters and field resistance, one Thomson integrating wattmeter, two Bristol recording ammeters and one Bristol recording voltmeter.

From the daily readings of the wattmeter has been prepared the curve shown in Fig. 2 which gives the current consumed by the railway cars during each month of the year. It will be noticed how much more power is required during the winter than in summer, in spite of the fact that fewer cars are in service, and the car miles run by each are fewer than in summer. It will also be seen that, during the month of February, each car requires an average of 24 h. p. during a whole day's run.

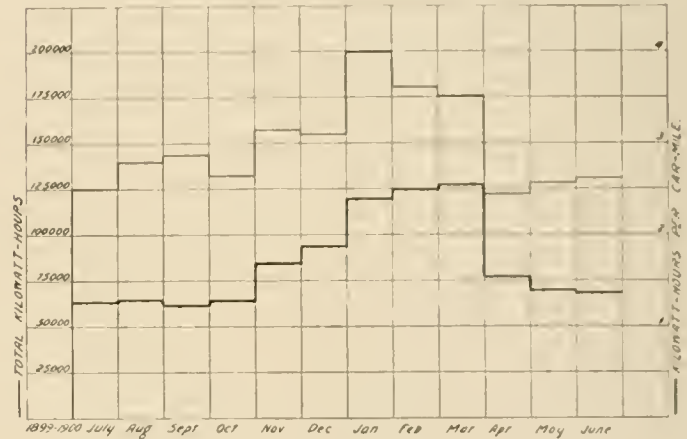


FIG. 2.

Month	Total Car-Miles	Cars in Service	Av. H. P. per Car.
1899-1900			
July	98,070	32.6	11.6
August	107,862	32.9	12.8
September	119,850	35.8	12.9
October	105,360	30.2	13.6
November	97,920	29.9	17.6
December	84,710	26.4	18.3
January	82,914	26.2	23.0
February	74,186	25.9	24.0
March	69,060	22.7	23.2
April	76,260	24.2	13.7
May	93,851	29.1	13.6
June	99,228	33.3	13.0

The maximum overload capacity which the station is ever called upon to furnish the railway, is about 900 kw. and a yearly average is about 350 kw. The peak of the summer load very rarely reaches 550 kw. and is easily handled by one generator, although a 20 per cent increase upon this load would be very liable to pull the synchronous driving motor out of step, if of long duration.

Before closing it will be in order to mention the conversion of the old Quebec, Montmorency & Charlevoix Ry. to an electric suburban line. This excellent roadbed now serves to carry a fast service of electric cars—interspersed with steam trains, which handle the heavy traffic—between Quebec and the shrine of Ste. Anne de Beaupre.

A figure 8 trolley wire is suspended at a height of 22 ft. above the rail by stranded steel span wires hung from wooden poles and the rails have been connected with single bonds of No. 00 wire for a distance of 26 miles. A copper cable of 300,000 c. m. area runs parallel with trolley wire for most of its length and is connected to the trolley every quarter mile.

This cable is fed at a pressure of 560 volts at three points, at Quebec, at Montmorency, seven miles away, and at St. Anne's, 21 miles away from the city, all current of course being generated at Montmorency and transmitted to far ends of line at a high alternating tension.

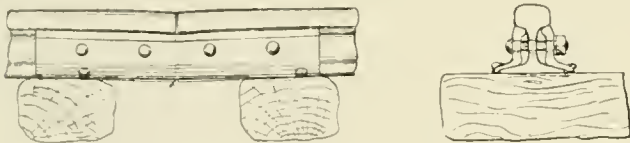
The cars used are 50 ft. over all, weighing 49,000 lb., each equipped with four Westinghouse 38-B motors geared to a speed of 45 miles an hour. A recent test showed that a loaded car took 1.6 kw. h. per car-mile when fully loaded with passengers. The cars make 160 miles per day. On account of the many stops to be

made in the length of the line, 18, a schedule time of 21 miles in 60 minutes has been adopted. This is quite satisfactory and fast enough, because the line is a very busy one, in two ways. The number of passengers carried is beyond the highest hopes of the management and it would be impossible to run any more trains over a single track and on train orders, than are operated at present. There is every prospect of a second track being laid in the near future. The plan of running steam and electric cars is a novel one, in this country, but it is highly successful in every respect.

ATLAS RAIL JOINTS.

In developing both the steam and the street railways the problem of securing an efficient and continuous track has been an important one and the joint, the weakest point of a railway track, has received much attention. As a solution of the joint question the "Atlas" rail joint has been designed to withstand the greatest stresses and insure a smooth, silent, economical, simple and permanent track. It is the proud boast of the maker that the "Atlas" joints have given perfect satisfaction wherever tried and that no complaint has ever been received concerning the hundreds of thousands of them in use.

The first indication of weakness in a rail joint is the vertical play between the splice bar and the rail; this is due to elongation of the bolts and loosening of the nuts, to the fact that the bolts are smaller



POSITION OF RAILS WITH SPLICE BAR JOINT.

than their holes, and to the absence of adequate support for the rail base. This vertical play grows greater as time goes on and the result is pounding at the rail ends which prematurely wears out both joints and rolling stock till finally the splice bars crack or break. The points where the wear takes place indicate the needs to be a greater bearing surface to resist pounding and greater vertical strength immediately at the joint. These needs are met in the "Atlas" joints by providing a plate for the rail base to bear upon, and a double truss immediately beneath the joint. The bearing plates are continuations of the angle bars and give a bearing surface on each tie that is over twice as great as that afforded by the rail base alone; being one piece with splice bars no opportunity is given for relative motion between the several bearing surfaces



ATLAS RAIL JOINT.

that receive the rail. The two truss-pieces are clamped together by two transverse bolts and hold the rail ends firmly while permitting the rail movements due to changes of temperature. The angle bars and the lower rail flanges being wedge shaped any wear of the rail due to sealing is readily taken up by tightening the transverse bolts.

In this type of joint the lateral force tending to displace the rail ends is resisted by the continuous strip of metal extending around and beneath the lower flanges, by eight braces extending from the top of the splice bar to the edge of the bearing plates, and in suspended joints by a truss. Creeping of the rails is resisted by bearing the joint has on the sides of the ties.

The Indianapolis Street Railway Co. installed "Atlas" joints on a section of track laid with 70-lb. girder tram rails, and Mr. Miller Elliott, superintendent of the road, states that the condition of the track is becoming better with use; before the joints were applied the rails were so badly battered at the ends that it had about been decided to scrap them.

The claims of the maker are that the "Atlas" joint is the strong-

est and simplest and best; fulfills all the requirements of a joint; it combines the angle bar, tie and bed plate and brace, and gives five times as much bearing surface as the same length of angle bar; it makes in effect a continuous track; it adds very greatly to the life of the rail; it does not break or get down in service. The joints are made of malleable iron either of the supported or suspended type, in eight different styles, adapted for all kinds of rails.

AIR STORAGE SYSTEM OF BRAKING.

The rapid development of electric interurban railways with the constantly increasing speeds and the heavier cars that are now becoming accepted as standard on such roads as well as city lines have made it extremely important that great precautions be taken to insure the safety of passengers, and one of the improvements is the introduction of power brakes. The requirements of a good brake may be enumerated as follows: It should be efficient in action; reliable; simple; easy of operation and not liable to act when it should not. In addition it is desirable, from railway's standpoint that the cost of the apparatus be not excessive in the first instance and that the maintenance account should be a minimum. To meet these requirements many experiments have been made in power brakes both electric and air, and it has been the desire of the street railways to obtain a powerful, simple and practical brake that would meet the requirements of high speed and heavy tonnage.

In looking over the various power brakes now in use upon electric railways, we have with much interest watched the developments of the storage system of air brakes and have noted with pleasure the satisfactory workings of the G. P. Magann air brake, which is a storage system.

A main air compressor and a large storage tank are provided at some convenient central point; separate storage tanks carried on the cars are charged in a few seconds from the main tank at the compressing station. The initial pressure in the main reservoir on the car is usually 300 lb. per sq. in.; by a reducing valve this is lowered to 50 lb. or less, according to the speed and weight of the cars, at which pressure the air enters the auxiliary reservoirs on the cars. From the auxiliary reservoir to the brake cylinder the air is controlled by the engineer's valve. The brake cylinder is finely machined and provided with two pistons movable therein and adapted to be pressed towards each other through the agency of a spring, or other similar means; means are provided by the motorman's valve for connecting the air supply or reservoir to the space between the pistons whereby the pistons may be separated against the tension of the spring to apply the brake when it is desired.

To release the brake a controlling valve is operated to cut off the space between the pistons from the air supply reservoir, and to connect it with the air space of the cylinder behind the pistons whereby the pressure on the opposite side of the piston is equalized and the springs permitted to return to their normal positions.

By this arrangement of exhaust, fresh pure air is always supplied behind the pistons thereby overcoming the danger of accumulating dust in the cylinder, and by connecting the compressed air between the pistons with the cylinder behind the pistons when releasing the brakes, the pressure on both sides of the piston is rapidly equalized and the springs at once force the pistons together.

The advantages claimed for this system are: the absence of a noisy air pump on the car to annoy passengers; the saving of all labor and expense incident to keeping in continual operation a pump on the car, whether electric or axle driven; greatly reduced possibility of breakdowns while in use and avoidance of maintenance and repair account by removing costly and complicated apparatus from the car.

The G. P. Magann storage system is adapted to any condition of service, as the storage capacity on the car has been proved from experience to be sufficient for from 300 to 500 stops. Cars are now running from New York over the Brooklyn Bridge, through Brooklyn and out to Brighton Beach, and making five round trips without the necessity of recharging.

The new division of the Seaview Electric Ry. between Wickford, R. I., and East Greenwich was opened last month. This branch completes a through electric line from Narragansett Pier to Providence.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

NO PRESUMPTION OF FREEDOM FROM CONTRIBUTORY NEGLIGENCE.

Citizens' Street Railroad Co. v. Wagner (Ind.), 57 N. E. Rep. 49. Apr. 26, 1900.

There is no presumption, the appellate court of Indiana holds, that one claiming damages for an injury caused by the negligence of another was himself free from fault, as, for example, that one was without contributory negligence in attempting to board a slowly moving car, or in taking hold of same, where he charged that he was injured by the negligent, sudden starting ahead of the car.

MAY CORROBORATE EVIDENCE OF HIGH SPEED BY QUESTION ON DISTANCE FOR STOPPING.

McDonald v. Brooklyn Heights Railroad Co. (N. Y.), 64 N. Y. Supp. 480. May 8, 1900.

The question was asked in this case as to the distance in which a car, with its brake and appliances in order, going 8 miles an hour, as required by a city ordinance, could be stopped. The answer was, "12 feet." The appellate division, second department, of the supreme court of New York holds that there was no error in admitting this evidence, there having been evidence that the car was going at a much greater speed. It considers that it was material to corroborate the evidence of high speed, as witnesses had testified that 80 ft. had been in fact needed in which to stop the car in question.

BICYCLIST'S DUTY TO LOOK BOTH WAYS NOT CHANGED BY APPARENT SOUNDS.

Bennett v. Detroit Citizens' Street Railway Co. (Mich.), 82 N. W. Rep. 518. Apr. 24, 1900.

In this case, a man was riding north on his bicycle at a speed of from four to six miles an hour in a street that crossed at right angles one in which there was a double-track electric railway, and while attempting to cross the tracks he was struck by a car coming from the west. He sought to excuse his failure to look to the west by saying that he heard a noise seemingly coming from the right, and that he thought the noise indicated that a street car was coming from the east. The trial court held that he was guilty of contributory negligence, and the supreme court of Michigan affirms its judgment in favor of the company. It says that it is a matter of common knowledge that waves of sound are diverted when striking buildings, and holds that there was no sufficient reasons shown why he did not look both ways, as it was his duty to look both ways.

OMISSION OF WORDS "IN VALUE" DID NOT CHANGE CONSENT REQUIRED.

In re Rochester & Lake Ontario Railway Co. (N. Y.), 64 N. Y. Supp. 429. Apr. 10, 1900.

Section 100 of the New York railroad law provides, among other things, as to consents, that a change may be made in the motive power on a street railroad when "consented to by the owners of one-half the property bounded on that portion of the railroad." In preparing this section, the revisers omitted the words "in value," which occurred in the old law after the word "property." Nevertheless, the appellate division, fourth department, of the supreme court of New York, thinks that the intention of the legislature was to conform the practice in obtaining the consent of the property owner's to a change of motive power to that prescribed for obtaining their consent to the original construction and operation of the road; and it does not think that a change of this intent was manifested by the omission of these words, under the circumstances. Wherefore, it holds that the consent required by this section is that of the owners of one-half in value of the property

bounded on that portion of the railroad where it is desired to change the motive power.

CHARGE OF NEGLIGENCE CANNOT BE PREDICATED UPON UNEXPLAINED ACCIDENT.

Smith v. Kansas City Elevated Railway Co. and others (Kan.), 60 Pac. Rep. 1059. May 5, 1900.

A charge of negligence, the supreme court of Kansas says, cannot be predicated upon an unexplained accident. In this case a little boy, about 6 years old, was run upon and killed by an electric street car. Two witnesses saw the accident at the moment of its occurrence. But they did not see enough to enable them to tell how it occurred. How the child happened to be upon the street car track was not told. What he was doing the moment before, from whence he came, in what direction he was going, or what he was doing, was unknown. The accident occurred in daylight upon one of the principal streets of Kansas City. The track, however, was level, and the street clear of vehicles and pedestrians. No bell or other alarm was sounded by the approaching car. The usual rate of speed of cars was 10 miles an hour, and, running at that speed, they could be stopped in 57½ ft. These statements are made by the supreme court to explain the case. It adds that from the fact that the accident occurred in daylight, upon a straight, level track, without obstructions to the view of the motorman, and that no alarm was sounded, it was contended that a presumption of negligence arose, and that the case should have been submitted to the jury. But the supreme court declares that it cannot concur in that view, and affirms a judgment sustaining a demurrer to the plaintiff's evidence.

OLD COMPANY MUST BE PARTY TO SUIT OF MORTGAGEE TO ENJOIN CONDEMNATION OF TRACK.

Old Colony Trust Co. v. Atlanta Railway Co. (U. S. C. C.), 100 Fed. Rep. 798.

This suit was brought by the Old Colony Trust Company against the Atlanta Railway Company and the Consolidated Street Railway Company to enjoin the former company from enforcing a right which it said it had obtained by an ordinance of the city to condemn a certain portion of the track of the Consolidated Street Railway Company, which the city had authorized it under a certain reservation to do; that is, to allow the new company to use a certain part of the track of the old company under certain circumstances. The bill sought to prevent the new company from proceeding to condemn the track of the old company, to obtain the right to use it. Now, in such a suit, the United States circuit court holds, the old company is an indispensable party, it being absolutely necessary to have it before the court in order to determine and fully dispose of the issues presented. But it further holds that it should be put on the side with the complainant, rather than on the side of the new company, as a defendant, a change which, in this case, ousted the federal court of jurisdiction, the two railway companies being citizens of the same state, and the court declaring that it would have no jurisdiction on the ground of diversity of citizenship, under the statute, if all of the parties on one side were not citizens of different states from all the parties on the other side.

WHEN BROKER ENTITLED TO COMMISSION FOR SALE OF STREET RAILWAY PROPERTY.

Henry v. Stewart (Ill.), 57 N. E. Rep. 190. Apr. 17, 1900.

In an action brought to recover commissions claimed on the sale of the capital stock and property of a street railway company, the supreme court of Illinois holds that the law was correctly stated by an instruction to the effect that, if the jury believed from the evidence that the party sued employed the party suing as his agent to negotiate the sale of his street railway property, that the party suing undertook said employment, and was instrumental in bringing together the buyer and the party sued, then

and in that case the party suing was entitled, as a matter of law, to recover from the party sued compensation for his services, regardless of the fact that the party sued himself concluded the sale, and upon a price less and upon terms different from those at which the party suing was authorized to sell. To this, the supreme court adds, that if the party suing, as agent for the party sued, offered the property to a certain third party, and thereby brought about a sale, it was wholly immaterial whether such third party acted for himself, or for himself in connection with others, or for a syndicate. In other words, whether he, the third party, was himself the purchaser, or an agent of the real purchaser, the court holds, was, in this action for commissions, a matter of no concern to the party sued therefor. It was sufficient that the party suing found a buyer whom the party sued was willing to accept and did accept, whether such buyer was acting for himself or others.

LIABILITY FOR NEGLIGENTLY KILLING DOGS.

Smith v. St. Paul City Railway Co. (Minn.), 82 N. W. Rep. 577. Apr. 19, 1900.

In Minnesota dogs are made personal property by statute, they are taxed as such, and, the supreme court of that state holds, an action will lie in favor of the owner of a dog, having a substantial money value, for its destruction through the negligence of a third party.

Here was an action brought to recover for the killing of a valuable, highly bred, large dog by a street car negligently run. It appeared that on the day of the accident, in the absence of the owner from home, his wife had a number of dogs (among them the one killed), for exhibition to third parties, in the yard of the family residence, which adjoined the street upon which this car was run. The dogs escaped from the yard and control of the woman, and went to the opposite side of the street, followed by a child. At this, she became very much excited, and did her utmost to recall the dogs and child to the yard, for fear that they would be injured by the street car, which was approaching something more than a block distant. The dogs and child started to return to the yard, and on their way back all got safely across the street car tracks, except the animal in question, which was struck and killed by the approaching car.

This car, the court goes on to say, was one of the usual passenger cars on that line, operated by a motoneer, who could and did, upon his own admission, discover the danger of a collision in sufficient time to stop the car, notwithstanding which, as the plaintiff's evidence tended to show, he ran the same at a dangerous rate of speed, estimated by the plaintiff's witnesses to be over 20 miles an hour, and 10 miles faster than was authorized by the city ordinance, until he struck and killed the dog. Nor did he then stop, but continued on his way, without giving the accident any further notice.

That such conduct on the part of the company's servant operating its car was negligence, the court declares, does not seem to admit of doubt; and it says it was a question for the jury whether, under all the circumstances of the case, the dog would have escaped if the car had been run at a legal and proper rate of speed, or, in other words, whether the negligence of the defendant company was the proximate cause of the loss of the dog, for which damages were awarded. The jury returned a verdict in favor of the owner of the dog, and, after considering the facts in the case, the court holds that the evidence supported the verdict of the jury, and their finding that the collision between the street car and the dog was actionable negligence, for which the owner might recover its value from the street railway company.

The supreme court says that it does not hold that a street car company must stop its cars, when running at a legal or reasonable rate of speed, to avoid collisions with dogs. Ordinarily, it thinks, dogs may be presumed to take care of themselves, and the motoneer may act on such presumption. To this, it adds that it places this decision upon the ground that it was for the jury to say whether the dog could have escaped if the car had been running at a proper rate of speed. But upon the improper speed of the car from which the collision resulted, as found by the jury, the verdict, determining that there was actionable negligence, it holds, should be sustained.

A municipal ordinance authorizing a police officer to destroy a dog which is unlicensed, or not wearing a collar or muzzle as

required thereby, the court further holds, does not authorize a third party to kill such animal, or relieve him from damages for negligently destroying the same, and was no defense in this case.

NOT LIABLE TO PERSON INJURED ON FENDER EXTENDING FROM REAR OF CAR.

Gargen v. West End Street Railway Co. (Mass.), 57 N. E. Rep. 217. May 17, 1900.

This was the case of a woman who was injured by coming into contact with a fender extending from the rear end of a street car. Fenders were attached to both ends of the cars, but were usually so adjusted that they projected only from the front end. This fender, however, had in some way become so disarranged that it projected from the rear end of the car without the knowledge of the company's employes who were in control of the car. The woman had just left the car, which had stopped about opposite her dwelling, by the gate on the opposite side from the house, because the other gate was closed. It was quite dark, and she turned at once, upon reaching the ground, and began to walk towards the other side of the street, on the crosswalk, which was about seven feet wide, but a portion of which was occupied by the rear end of the car, from which at the time the fender mentioned projected about two feet. She did not notice the fender, but struck it, and fell.

It was admitted that when the woman left the car she ceased to be a passenger of the company's. The supreme judicial court of Massachusetts says that when she began to walk towards her house, she was merely a traveler upon the highway. The respective rights and duties pertaining to her and the company were not those of a passenger and a common carrier, but those of a pedestrian crossing a public street in which was a street railway track then occupied by a street car, and of a street railway corporation lawfully using the same street in its traffic.

It could not be contended, says the court, that the presence of the car in the street, or its stoppage to allow passengers to leave, was unlawful. Nor was it claimed that the stoppage was too long, or that the woman expected that the car would move on to allow her to cross the street. What was contended, was that the presence of the fender projecting from the rear end of the car was such a negligent occupation of the highway by the street railway company as to make it liable for the personal injury sustained by the woman.

Now, any vehicle stationary upon a highway over which travelers are passing and repassing, the court continues, may be an occasion of injury to them if they come in contact with it in consequence of their own motions. In such cases the test of the liability of the owner of the stationary vehicle to compensate for his injury the traveler who walks against it is not the probability that the traveler will be hurt if he walks against the vehicle, but is whether its owner was within his right in having such a vehicle or load stationary upon the street.

Again, the court points out that the fenders at each end of the car were not like a cutting instrument, or an apparatus so dangerous that it ought not to be transported upon a public way without unusual care for the safety of travelers, but were appurtenances of the car, with which the law required it to be equipped. That fenders do not usually so project, it holds, bears on the question of the company's care or negligence, but does not make it unlawful to propel in the street a car with a fender so projecting.

Nor does the court think that it makes any difference in a case of this character that it was in the night time that the traveler walked against the obstruction, not seeing it on account of the darkness, if the owner of the vehicle had complied with such requirements as to lights as were in force at the time when the collision occurred. It adds that it knows of no requirement anywhere that a street car or other vehicle used at night upon a highway shall be so lighted that every part of it shall be plainly visible to those who come upon it in the rear as well as in front.

Wherefore, the court holds that, irrespective of the question whether the plaintiff in this case could be found to have been in the exercise of due care in walking against the fender, a verdict should have been ordered for the defendant company, because, upon the undisputed evidence, the obstacle against which the plaintiff walked was part of a vehicle lawfully using the street within the defendant company's right.

KANSAS CITY PLANT OF THE GRIFFIN WHEEL CO.

In line with its general policy of extending the scope of its business and enlarging its facilities for furnishing the best car wheels that can be produced in the shortest time possible and at reasonable prices, the Griffin Wheel Co., of Chicago, in December, 1899, purchased and assumed control of the extensive foundry and shops owned by the Kansas City Car & Foundry Co., and located at 12th St. and the Kansas City Belt R. R., Kansas City, Kan. The plant has been changed and improved, new buildings and machinery added, and the total capacity increased 50 per cent.

The buildings and grounds cover an area of 13 acres, giving ample room for storage purposes, and spur tracks and switches direct to the foundry and shops from both of the belt railroads, furnish the best of facilities for handling the pig and coke, and shipping the finished products to any desired point. The works can turn out 5,500 wheels a month, requiring the services of about 150 men.

At the foundry, which is an iron sheathed building, the pouring is done on 11 straight floors, having 22 wheel molds to the floor. The hot metal is carried from the cupola by pneumatic hoists running on overhead tracks above each floor and but 10 seconds are required to complete a cast from the time the metal flows into the ladle. The wheels are left in the mold for 18 seconds, they are then covered with sand, after which they are immediately removed to the annealing pits, where they remain for five days.

The machine shop is 50 x 80 ft. and is equipped with three wheel horers, three axle lathes, two wheel presses made by the Niles Tool Works, one planer and two machine lathes, all tools being operated from shafting driven by an electric motor. Here wheels are bored and pressed onto axles when customers so desire.

The company has its own power plant for generating electricity for lighting the grounds and buildings, and driving tools and machinery in the foundry and shops, and for supplying compressed air with which to operate hoists, elevators, etc. The power station is a brick structure 30 x 140 ft. and contains a double battery of Stirling water tube boilers rated at 250-h. p. each, one 150-h. p. Bates tandem corliss engine belted to a 100-kw. Triumph generator and also driving the air compressor, and a 150-h. p. Atlas engine belted to a 100-kw. Triumph generator. The total output of this station is not ordinarily required, but all machinery has been installed in duplicate to provide against a break-down and insure a liberal supply of power under all conditions.

Seven fire hydrants, each equipped with 250 ft. of hose, are placed at convenient points, and fire drills given at frequent inter-

vals, so that the possibilities of a fire getting sufficient headway to do much damage are extremely slight.

The Griffin Wheel Co. owns six car-wheel plants, the largest at Chicago, and others at Detroit, Denver, St. Paul and Tacoma, in addition to the Kansas City works. At none of these plants are wheels made by guess work, but on the contrary the managers in each city know absolutely from the time the ore is purchased till



KANSAS CITY PLANT GRIFFIN WHEEL CO.

the finished products have been placed on the cars, just what materials have gone into every wheel sold, what processes it has passed through and what workmen have taken any part in its making. At the local plants tests for composition, chill and strength are made on samples from each pouring, and in addition fragments and samples are sent for chemical testing at frequent intervals to Chicago, where the Griffin company has a fully-equipped laboratory in which tests and experiments are constantly under way to determine improved compositions and methods. Each

wheel made is given a serial number, stamped into the metal and a record is kept of the date it was cast, the name of the foundryman that did the work, the formula by which it was made and when and where it was shipped.

The selling of all products made by the Griffin Wheel Co. is under the general supervision of Mr. F. L. Whitcomb, of Chicago, general sales agent, assisted by Mr. C. K. Knickerbocker. The Kansas City works are under the management of Mr. Hy. H. Meday, whose territory covers parts of Nebraska, Kansas, Oklahoma, Texas, Arkansas, Missouri and Iowa.

CHICAGO ELEVATED ROADS.

The reports of the four elevated railways of Chicago for the year ending June 30, 1900, have been made to the Illinois Railroad and Warehouse Commissions, and show the following statements of gross earnings:

	1900.	1899.	Gain.	Per ct.
Metropolitan	\$1,603,461	\$1,336,799	\$266,662	19.9
South Side	1,258,379	1,061,656	196,723	18.5
Lake Street	727,587	653,299	74,288	11.4
Northwestern.....	65,487	(May 31 to June 30, 1900.)		

The Metropolitan carried 31,008,186 passengers; the daily average is 84,954, which is 14,176 more than for the preceding year. The operating expenses, including rentals and taxes, were 55.6 per cent of the total income; the surplus for stock was \$302,856.

The South Side carried 24,349,868 passengers; the daily average is 66,712, which is 10,477 more than for the preceding year. Operating expenses, including rentals and taxes were 56.6 per cent of gross receipts; the surplus for stock was \$510,572.

The Lake Street carried 14,269,506 passengers; the daily average was 39,094, an increase of 4,062. The operating expenses, including rent and taxes were 66.1 per cent of gross earnings. This road has increased its mileage, as compared with 1898-99, which so increased the operating expenses and rentals that notwithstanding the larger traffic there was this year a deficit of \$16,628, as against a surplus of \$5,591 for 1898-99.

The Northwestern gives its report for 30½ days; total passengers, 1,300,748; daily average, 42,942. Operating expenses, including interest and taxes, were 52.7 per cent of gross receipts; the surplus for stock was \$10,055.

The Union Traction Co., of Philadelphia, laid in 125,000 tons of coal in anticipation of a famine caused by the strike.



KANSAS CITY PLANT—GRIFFIN WHEEL CO.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

Mr. A. E. Le Rossignol, corporation tramways engineer for Newcastle-upon-Tyne, England, in commenting on American street railway practice, writes of the modern power station as follows:

"As economy in current generation is greatly influenced by the expenditure on labor in the station, central station practice in America rightly tends to the introduction of very large steam power units, but these are all of the open slow-moving type, and so require a larger amount of attendance than would the same size units, if enclosed and provided with automatic lubrication, such as have been largely adopted in this country. A system of mechanical oil supply to these large open engines has been adopted; but if the enclosed type were made as strong in proportion and as reliable in operation as the large open type, there is no doubt that increased economy in labor would be obtained, and doubtless English manufacturers will awaken to this fact in a short time. Due to the heavy strains encountered in direct-current traction work, American steam units have gradually grown to huge proportions of the strain bearing part, the shaft, and even though the strains probable in alternate current work will be very much less, the same proportioned engines are being installed in the three-phase plants. Owing to the adoption of large steam units the question of provision of adequate boiler power in a reasonable amount of floor space to correspond with the engine floor space has been met by the adoption of two or more boiler floors one above the other, surmounted by huge coal bunkers at the top, and exemplify the trust placed by American engineers in steel-framed buildings.

"The question of control of the large amount of electric power generated by the large units is now being taken into adequate consideration; up to the present switchboards have always been strongly suggestive of the instrument making days, but in the new power station of the Metropolitan Traction Co. the switches are built on engineering lines of generous proportions, and are worked by pneumatic power and controlled electrically. Three large galleries at one end of the engine house are given up entirely to the switches, each in a brick cell of its own, while the actual controlling boards take up very little space."

A GRAVITY LUBRICATING SYSTEM.

The cost of properly lubricating the machinery in a large electric station is small indeed when compared with the damage that will result from an insufficient supply of the lubricant. If the lubricant be supplied with regularity a very little will suffice, but to guard against the injury consequent upon a stoppage of the oil it is necessary to supply much more than is really needed; when this is done economy dictates that the excess be filtered or cleaned and used again. By this method the cost of lubrication is actually lower than when less oil is used, but not filtered for reuse. Further there is a greatly decreased liability of the bearings heating, as the excess oil will carry away considerable heat.

Where a large amount of the lubricant is fed to each bearing a filter that will clean the oil quickly is necessary; otherwise too large an amount must be carried in the storage tanks.

The purpose of this article is to describe and illustrate a system that has been used in a large power station in New England, and has given the best of satisfaction.

A journal oil is used costing 14 cents per gallon. All the oil cups about the engines, excepting on the valve gearings, are connected by piping to an elevated tank, so that the oil flows by gravity to each cup. A general view of the engines thus piped is shown in Fig. 1.

Three streams of oil are led into each main shaft bearing, a stream to each eccentric, and a stream to each crank and crosshead

pin; two cups furnish fast-fed drops to the crosshead slides. Furnishing so large an amount of oil serves the purpose of reducing the total friction load of the engine and also the tendency of the parts to heat and wear. After passing through the bearings, the oil is carried through pipes placed just under the engine room floor, to a filter in the basement. The general arrangement of the filters is shown in Fig. 2.

Duplicate filters are shown, one being in use at all times, taking care of about 100 gallons of oil per hour. In operation, the

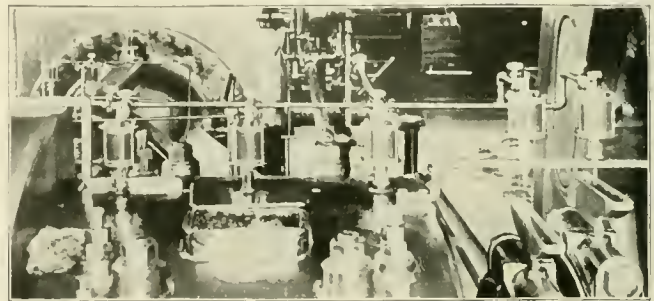


FIG. 1—OIL PIPING OF ENGINE.

oil comes from the engines through the pipe A and enters compartment B of the filter tank, where it passes through wool waste by gravity, down through pipe C and outward over the flange D, and up through wool waste in compartment F. The filter tank is partly filled with water, so that the wool waste in compartment F is partly submerged, the object being to separate any dirt or entrained water in this compartment. The oil then passes through the pipe G to the storage tank, where it runs through the compartment H filled with wool waste and is then pumped to the elevated tanks in the engine room. The wool waste is taken out after about two weeks' use, washed and then used over again. The

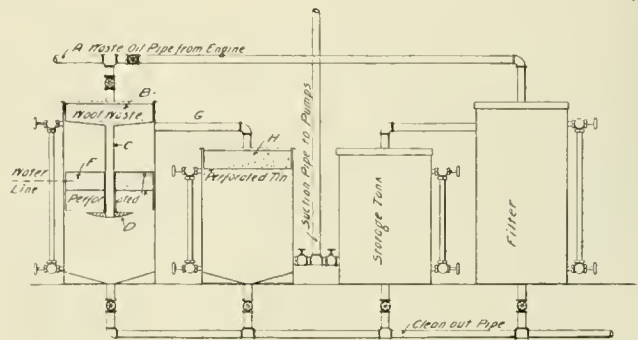


FIG. 2—ARRANGEMENT OF FILTERS.

arrangement of valves permits a quick change from one set of filters to the other and also for washing out the tanks when necessary. The advantage of using wool waste, instead of cotton waste or sponges is, that wool waste does not pack down or plug with dirt until practically filled with it.

A special oily waste press is used to extract the oil from all the waste used to wipe the engines and the mops used on the floor or cellar. The waste comes from the press dry enough to use for wiping, but the oil is dirty, as it contains all the drip from the stuffing boxes and moppings from the floor and cellar. Fig. 3 is a shop drawing showing all the parts. The bed plate is a cast iron

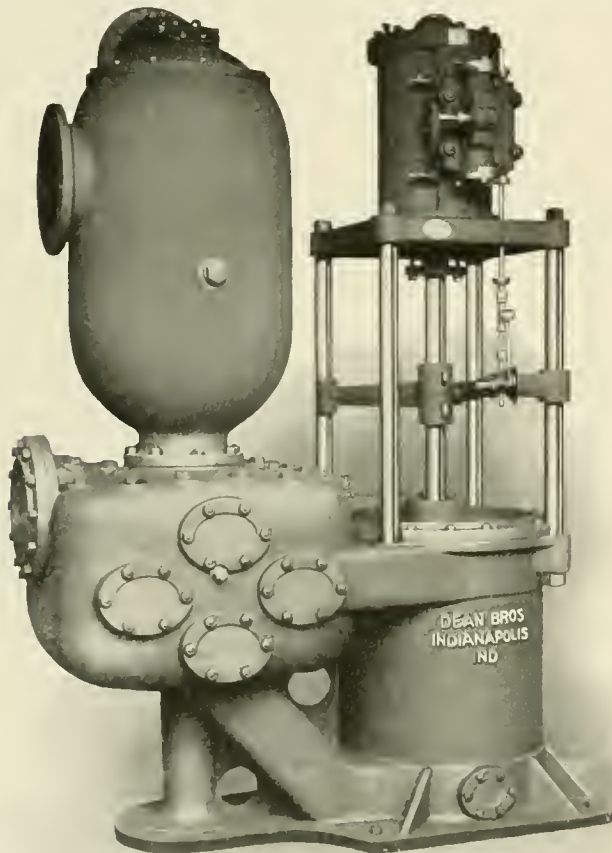
the engraving. Fig. 5 shows a plate (excepting the supporting lugs) and a distance piece with dimensions. The filter plates are covered with one thickness each of two kinds of filter cloth (mat and chain) on which the dirt and impurities are gathered. To clean the press the plates are removed, and the earth and dirt scraped off the cloth; the plates are again assembled and the press is then ready for operation.

The object of adding fuller's earth to the oil is that it acts as a filtering medium, separating the particles of dirt and absorbing any water. As the oil emerges from the press it is free from all dirt and is but little discolored.

During the process of filtering, some cylinder oil finds its way into the engine oil, which discolors it, from an amber to a deep wine color. This cylinder oil increases the specific gravity of the oil but after it has passed through the filter press, the gravity test is the same as for new engine oil, the press having removed some of the residuum, tar, wax, etc.

IMPROVED AIR PUMP AND CONDENSER.

The accompanying illustration shows the latest design of the jet condensing apparatus for street railway power plants, that has been developed by the Dean Bros. Steam Pump Works, of Indianapolis, Ind. The power required for the operation of this pump is given as one-half of one per cent of that developed in the engine, while the steam consumption of the latter is reduced 30 per cent. This air pump can be speeded to deliver just the amount



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DEAN AIR PUMP AND CONDENSER.

of water required for condensation. It is started before the engine and the vacuum obtained is used to assist in the first revolutions. This feature is important with compound engines, as the full power of the low pressure cylinder is secured at once.

It was formerly supposed that a vertical air pump must be single-acting, but the manufacturers have designed a double-acting, vertical air pump that is believed to be entirely successful. The vertical type of air pump is said to be much more durable than the horizontal type, because there is no side wear in the cylinder and

stuffing boxes. In horizontal pumps, especially large sizes, there is a constant downward wear of piston and rods, due to their weight. Any sediment in the water will settle on the lower side of the cylinder, where this pressure is greatest, causing the piston and cylinder to wear rapidly. The vertical air pump occupies but little floor space, and it is much more convenient to set down into a pit, should it be necessary to lower the air pump, so as to reduce the vertical lift of injection water.

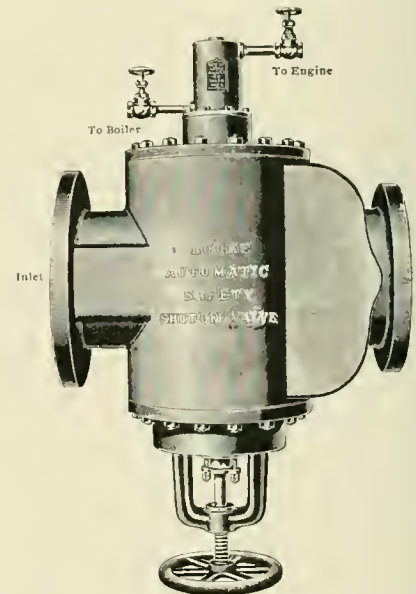
The piston rods are separable at the cross heads, tapering keys being used to hold them in place. The cylinder head can be easily removed and taken entirely out of the way, for inspecting the interior of the cylinder or for repacking the piston. The piston rod stuffing box is provided with a water seal to prevent air from entering. The cylinder is lined with bronze and the piston rod and all valve seats are of bronze.

AUTOMATIC SHUT-OFF VALVE.

The Locke Regulator Co., of Salem, Mass., as the name indicates, makes a specialty of regulating devices for steam plants though it is also an extensive manufacturer of steam appliances

other than regulators and governors. The illustration shows the Locke emergency or automatic shut-off valve which has been extensively used in New England power plants and in a number of instances has averted serious accidents by promptly closing down the steam supply. The valve proper is actuated by a piston in the cylinder mounted on top of the valve casing, the lower end of this cylinder being connected with the boiler and upper end with the steam main near the engine. So long as the pressures

are normal the valve remains open but a reduction of the pressure on the upper side of the piston such as would follow a break in the piping, permits the piston to rise, closing the valve. A screw and wheel are provided for operation by hand after the manner of ordinary valves. When desired electric attachments are furnished making the valve a perfect engine stop that can be operated from any point in the station. Among the other Locke specialties are hydraulic damper regulators, water pressure regulators, reducing valves, pump governors, open and closed float traps, relief valves, etc.



SUNDAY CARS IN ST. JOHN, N. B.

An attempt by the Sabbath Observance Association of St. John, N. B., to prevent the running of street cars on Sunday, has failed, because of an adverse ruling by the police court. Complaint had been made against several motormen who were operating cars carrying passengers, and the street railway company moved for their dismissal on the ground that the street railway was exempt under the Sabbath Observance Act. Section 1 of this act provides that it shall not apply to persons carrying travelers, and the case turned on whether street railway passengers could be considered travelers within the meaning of the act. The principal difficulty was to determine the length of a Sabbath day's journey. The local authorities in matters ecclesiastical could give no assistance, but finally a case was found in the law books where a Sabbath day's journey was defined as 2,000 paces, or about three-quarters of a mile. Under this ruling the judge dismissed the complaints, holding the company's point as to passengers being travelers to be well taken.

ELECTRIC STREET RAILWAY TRACK DRILL.

A tool of this kind taking its power from the trolley wire and doing the work in a fraction of the time required by hand, should certainly appeal to every one interested in street railway construction.

From the fact that this device is used on a grounded circuit and usually handled by unskilled workmen, the motor requirements are very exacting. It must be practically dust and water proof and unbreakable, simple in construction but of high efficiency, in fact

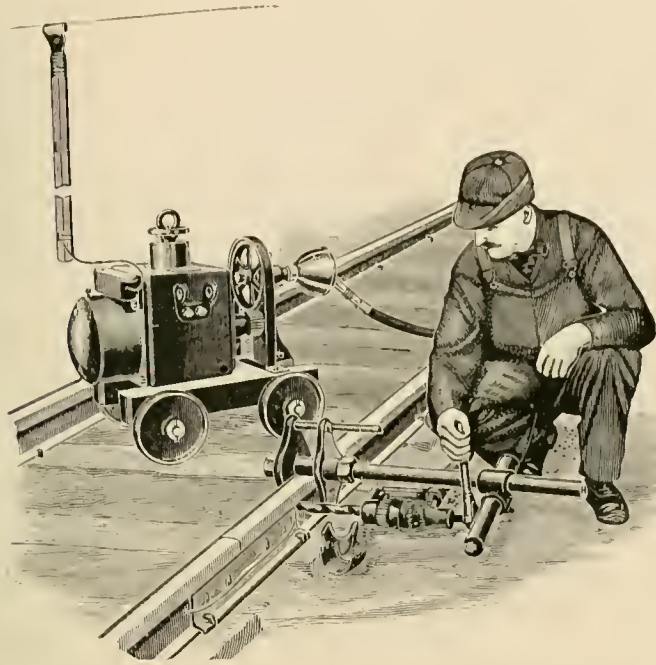


FIG. 1.—PLANT IN OPERATION.

constructed specially for this kind of service. The Stow Manufacturing Co., of Binghamton, N. Y., has been working along this line for years, some of its earlier designs having been previously illustrated in these columns. Several of the more primitive type have been in active service for the past four years and are still in good working order, but practical use has from time to time developed faults in construction which, as fast as discovered, have been corrected. The invention of the Stow multi-speed motor has aided greatly in perfecting this plant, and while no doubt further improve-

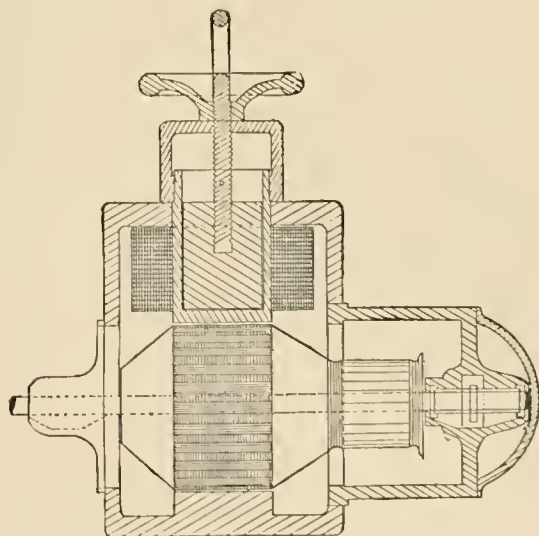


FIG. 2.—SECTION OF MOTOR.

ments will suggest themselves, the Stow Manufacturing Co. has no hesitation in stating that in its present form, the combination of Stow flexible shaft and ironclad electric motor is as near fool proof as any electrical device on the market, and that no appliance used in street railway construction will pay a larger dividend than this.

Fig. 2 shows the extreme simplicity of motor construction and also method of speed regulation. By simply raising and lowering the soft iron plunger in the hollow field by means of the hand-wheel on top of motor, the speed can be varied even to the fraction of a revolution. The motor is self contained, no outside speed

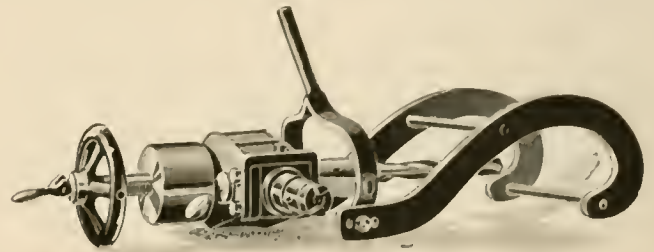


FIG. 3.—TRACK DRILL PRESS.

regulator or starting box being required,—a most desirable quality in a portable motor.

The automatic track drill press, Fig. 3, is a most valuable tool to use in connection with this plant for rebonding. If the road is in operation, this drill can be adjusted and detached in a moment. Catalogs, discounts and other information desired will be furnished on application.

GRAPHITE PAINT.

Within the last few years a great deal of experimenting has been done in endeavors to find a satisfactory paint for use on metal surfaces exposed to the weather, or to the action of corrosive gases such as locomotive fumes, and one result has been a greatly increased use of graphite paints. It is believed an ill-judged demand has arisen for paints containing no other pigment than graphite, due to too much stress being put on chemical specifications and mechanical specifications ignored. The Detroit Graphite Manufacturing Co., of Detroit, Mich., states that its experience shows that graphite alone is not a good and reliable pigment, as it does not mix well with oil and lacks body and binding qualities to give it permanence and effectiveness. Its own product, known to the trade as "Superior" graphite paint, is made from amorphous graphite, in which there are other ingredients that give the paint body, weight and hardness. The greatest care is taken in the manufacture and the result is a product that can be relied upon as of uniform quality. The claims made for "Superior" graphite paint are that it is suitable for wood and all metals; that it will last five times longer than other paints, and will cover two to four times more surface; that it is easier to apply than other paints and can be used on either new or old work; that it has twice the bulk of mineral and four times the bulk of lead paints; that it is practically fire, water, acid and weather proof. It is particularly recommended for bridges and viaducts, especially where exposed to the fumes from locomotives; a viaduct over steam railroad tracks in Detroit given one coat of this paint in 1894 is reported to not yet need attention.

MELBOURNE TRAMWAYS REPORT.

The statement of the Melbourne Tramway & Omnibus Co., Ltd., of Melbourne, Australia, for June 30, 1900, shows a total income of £426,234, of which traffic receipts were £415,024. The expenses were £360,069. The balance carried forward from the preceding year was £30,420 and the profits amounted to £57,165; it is proposed to pay dividends at 8 per cent on the capital stock of £480,000 and set aside £20,000 for depreciation and sinking fund, leaving a net balance of £29,185. Mr. F. B. Clapp is chairman, and Mr. W. G. Sprigg is secretary of the company.

WAGES INCREASED AT TORONTO.

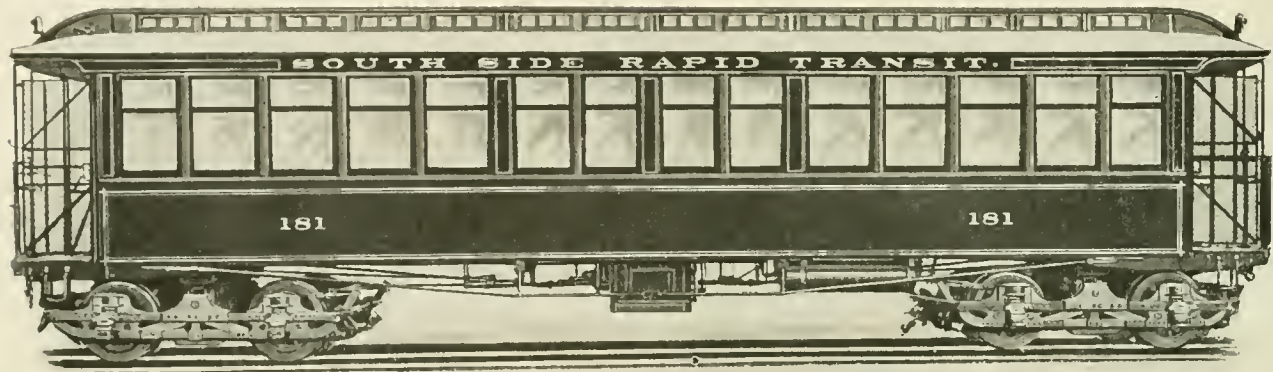
The Toronto (Ont.) Railway Co. on Sept. 17th announced the following rates of wages for trainmen: First year, 15 cents an hour; second year, 16 2-3 cents; after the second year, 17 cents; after the fifth year, 18 cents. The rate heretofore in effect was 15 cents. Men who have been more than five years in the service will receive 18 cents per hour.

NEW ELEVATED CARS IN CHICAGO.

The accompanying engraving shows one of the new cars built for the South Side Elevated Ry., of Chicago, by the Jewett Car Co., of Newark, O. An order for 30 of these cars was placed in February, 1900, through Hanna & Gray, of Chicago, who represent the Jewett company.

The cars are 46 ft. 5 $\frac{1}{4}$ in. over the platforms and 39 ft. 4 in. over the sills, and weigh approximately 50,000 lb.; the truck centers are 32 ft. 10 in. apart. The seats are arranged as in the other cars of the company, cross seats at the center and side seats at the ends. The interior finish is in mahogany except the headlinings which are of three-ply oak; the doors, sash, seat frames, etc., are mahogany.

These cars are the handsomest ever seen in Chicago and embody several new features. The windows have double drop sash, so



JEWETT CAR FOR SOUTH SIDE ELEVATED, CHICAGO.

that in summer the cars may be made practically open ones, a design which will be greatly appreciated by the traveling public. The gates extend from the platform to within 6 in. of the hood and are covered with wire netting of $\frac{1}{2}$ -in. mesh; this arrangement will effectually prevent attempts of passengers to climb over the gates, which is sometimes done with the lower gates. The motor-man's cab is entirely within the car instead of on the platform, and is a model of compactness and convenience.

The equipment includes Van Dorn automatic couplers, Christensen air compressor, Westinghouse brake cylinder and valve, Peckham 14-A-X-L special trucks and electric heaters.

LUMEN BRONZE.

"Lumen" is the name given to a special bronze which was patented by Prof. R. C. Carpenter, of Cornell University, and is made by the Bierbaum & Merrick Metal Co., of Buffalo, N. Y. This metal was carefully tested and found to give satisfaction in practical use, before being put on the market. A particularly low coefficient of friction is claimed for it.

The physical properties of lumen are: Specific gravity, 6.9; tensile strength, 30,000 lb. per sq. in.; compressive strength, 75,000 lb. per sq. in.; torsional strength, 35,000 lb. per sq. in.; coefficient of linear expansion, .0015 per 100° F.; electrical conductivity about the same as brass. The metal is said not to deteriorate in remelting, and the tensile and compressive strength are reported to increase with the temperature to 350° F.

Lumen has been used in the construction of the "Ideal" trolley wheels recently put on the market by the Bierbaum & Merrick company. The flanges are of soft cold-rolled steel which it is stated does not scale and is not blistered by an electric arc, nor does it wear the trolley wire more than a soft bronze. The wearing tread is of pure lake copper slightly hardened. The flanges are held together by a hub of lumen bronze cast in place. A graphite bushing is used with these wheels. A number of large railways are using the "Ideal" wheel exclusively.

F. N. Rowley, of Kalamazoo, Mich., is seeking a street railway franchise at Jackson, Mich.

NEW YORK STATE MEETING.

The 18th annual meeting of the Street Railway Association of the State of New York was held at Buffalo on September 18th and 19th, the sessions being at the Iroquois Hotel. At the opening meeting Tuesday morning there were over 100 delegates present. After a brief response to the address of Mayor Diehl, who welcomed the association to the city, President Rogers delivered his annual address.

Mr. Rogers believes that before any improvement in the condition of the railways of the smaller cities and towns of the state can be expected, the present paving law must be amended; he suggests that paving requirements should in each case be made the subject of special agreement between the municipality and the railway. Reviewing the last report of the Railroad Commissioners, he said that of the 94 electric roads in the state, 41 show a deficit for the

year and only 14 declared dividends; of the latter 4 were in smaller cities, being operated partly as interurban roads. The gain in receipts for the surface roads of the state was 7.1 per cent over the preceding year; the roads of Greater New York carried 55 per cent of all the passengers in the state, their increase being 74 per cent of the total increase for the state. The good will of the people being necessary for the success of a street railway, Mr. Rogers believes that the management should take the municipal authorities into its confidence and appeal to their sense of justice. The excessive taxes imposed on American street railways were mentioned and also the injustice of the present law taxing street railways 1 per cent of their gross receipts and other corporations only $\frac{1}{2}$ per cent. The municipal ownership agitator, Mr. Rogers thinks, is wending his way westward.

Speaking of transfers, he states that there is no obligation, except on the newer roads, to give transfers and recommends that the points of issuance of transfers should be limited and designated by the Railroad Commissioners. In conclusion Mr. Rogers noted the extensive improvements in the street railways of the state during the past year.

The papers read at the two sessions of Tuesday were:

"Accidents on Street Railways; Methods Employed in Handling Them and Preparing for Trial," by D. W. Patterson, of the legal department of the Metropolitan Street Ry., New York City.

"How Can We Increase the Efficiency of Our Employees," by E. G. Connette, vice-president and general manager Syracuse Rapid Transit Ry.

"Railway Power Transmission," by J. H. Armstrong of the General Electric Co.

"The Use of Storage Batteries on Small Roads," by B. B. Nostrand, jr., president Peekskill Electric Light & Power Co.

"Storage Batteries," by Thomas Henning, superintendent of power house, Buffalo Ry.

"Rochester & Sodus Bay Ry.," by T. J. Nicholl, vice-president Rochester Railway Co.

"Test of the Buffalo Railway Power House," by Prof. H. H. Norris, Cornell University.

After the business session the delegates visited the Cold Spring power house of the Buffalo Ry. and the Pan-American Exposition grounds. The annual banquet was held at the Ellicott Club on

Tuesday evening, President Rogers presiding and Mr. Ely acting as toastmaster.

On Wednesday the following papers were read:

"Precision in Steam Power Making," by A. S. Mann, assistant engineer, Metropolitan Street Railway Co., New York City.

"Compressed Air Motors," by H. D. Cooke, president Compressed Air Co., New York City.

"Snow Plows," by R. E. Danforth, superintendent Buffalo Railway Co.

"Rotary Transformer Stations," by R. E. Danforth, superintendent Buffalo Railway Co.

General discussion followed on "Repair Shop Methods," "Efficiency of Employees," "Pavements" and "Snow Plows."

The officers and executive committee chosen were: President, G. Tracy Rogers, president Binghamton Railroad Co.; first vice-president, John W. Boyle, president Utica Belt Line Street Railway Co.; second vice-president, E. G. Connette, general manager Syracuse Rapid Transit Railway Co.; secretary and treasurer, H. A. Robinson, solicitor Metropolitan Street Ry., New York City; executive committee, the president, H. H. Vreeland, C. L. Rossiter, T. J. Nicholl, W. Caryl Ely. The next meeting will be held at Rochester.

THE EXHIBITS.

About 25 exhibitors made a display of appliances, among which were the following:

Harold P. Brown, New York, specimens of the Edison-Brown plastic bond with demonstration of same.

The Mayer & Englund Co., Philadelphia, a line of its "protected" rail bonds.

The G. P. Magann Air Brake Co., Detroit, had car No. 607 equipped with its brake, which passed the hotel at frequent intervals from 8:15 a. m. to midnight.

Speer Carbon Co., St. Marys, Pa., displayed a fine line of carbon brushes.

The Keystone Electric Instrument Co., Philadelphia, had a handsome line of meters.

J. W. Gorman, Boston, used a fine collection of photographs to illustrate the extent of his business in supplying attractions for pleasure resorts.

The Edison-Johnson Co., New York, exhibited its new form of trolley harp which allows the trolley wheel a wide play preventing its leaving the wire.

The Morris Electric Co., New York, had an extensive display of many of the numerous specialties handled by this concern.

The Consolidated Car Heating Co., Albany, presented an attractive and timely collection of electric car heaters.

The Bliss Manufacturing Co., Pawtucket, R. I., showed its car gate to advantage.

The Weber Rail Joint Co., New York, had a full line of joints for use on various sections and types of rail.

Hale & Kilburn, Philadelphia, showed several samples of cross seats.

The Atlas Railway Supply Co., Chicago, exhibited its combined rail brace and tie plate, and samples of joints for different rail sections.

The H. W. Johns Co., New York, many of the numerous specialties made by it for line and overhead work.

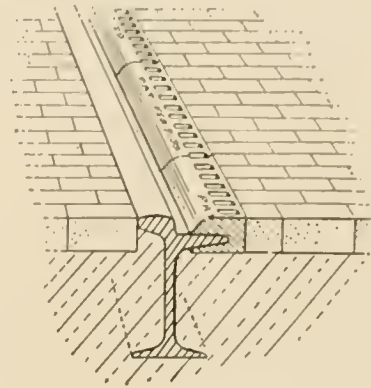
The Chisholm & Moore Manufacturing Co., Cleveland, had track specialties, and pictures of its appliances for handling heavy machinery in the power house.

The Bierbaum & Merrick Metal Co., Buffalo, showed its "Ideal" trolley wheels, and samples of "Lumen" bronze.

Other exhibitors were: Couch & Seely Co., Boston; Gold Street Car Heating Co., New York; Cutter Co., Philadelphia; P. H. Alexander, New York; G. S. Allison, New York.

CONVERTING TRAM RAILS INTO GROOVED RAILS.

The accompanying illustration shows the method of attaching a block of cast iron to the flange of a tram rail by means of which it is converted into virtually a grooved rail; this is designed for use



where city authorities or the courts have condemned tram rail and require a change. This device has been used very successfully on the lines of the Springfield Street Railway Co., Springfield, Mass., and has now been in service for more than two years on about two miles of track in the city streets and during that time not one of the blocks has ever been broken from the traffic and none have got out of alignment. The blocks are cast in lengths of one foot,

each, with a groove, which fits over the flange of the tram and is held in place by the paving blocks and grouting. It is readily attached and serves equally well with granite, brick or asphalt paving and in the case of Springfield has given entire satisfaction to the street railway management and city authorities. All the tram head rail in the city has been thus fitted.

The blocks weigh, for 5-in. tram rails, about 7 1/2 lb. each, making 15 lb. per foot of track, one for each rail; for girder rails that measure only 4 1/2 in. across the top the blocks weigh only 5 lb. per foot of length. The cost is estimated from \$1,200 to \$1,700 per mile, where it is necessary to take up and replace the paving.

The device is the invention of Seth J. Buckland, a former councilman in Springfield, and is being made by the American Street Railway Paving & Improvement Co., of Springfield, Mass.

PROTECTING ALUMINUM CONDUCTORS.

Lord Kelvin, in a recent paper on "Distant Electric Power Transmission," says of aluminum conductors:

The weight of aluminum required is almost exactly one-half of the copper which would produce the same effect. The diameter of cable is 28 per cent in excess of one made of copper, and the cost of insulation for an underground cable is increased in about the same proportion when we pass from copper to aluminum.

Aluminum is not a pleasant metal to deal with, but its high conductivity will make it invaluable for overhead transmission. It is true also that the weight to be supported on posts is half of copper, but the surface exposed to the wind is greater, and its strength is not great. The chief drawback to its use, especially overhead, is its liability to become rotten. This defect does not exist if the metal be pure, and especially if free from sodium. But exposure to the atmosphere, especially near the sea, induces deterioration. The fact that aluminum is easily oxidized ought not to condemn it. The same is true of iron and steel, and yet we do not hesitate to place structures of these metals in exposed positions. Only we paint them; so I propose that we paint or varnish our aluminum conductors wherever necessary. We have had little experience in this direction. I laid out a few hundred yards of 1/4-in. aluminum wire on a Scotch estate a year ago, and am watching the effects of weather.

HALF FARE IN MASSACHUSETTS.

The Massachusetts Legislature at its last session passed a law requiring street railways to transport school children at half rates, and pending a judicial decision as to the validity of the law the Consolidated Street Ry., of Worcester, has decided to put on sale books of school tickets. The tickets are issued in books of 10 for 25 cents and 40 for \$1, good for the transportation of pupils in the grammar and high schools. The company formerly sold high school pupils tickets at the rate of 33 for \$1.

The Springfield (Mass.) Street Railway Co. intends to increase its capital stock from \$1,550,000 to \$2,300,000, the proceeds to be used in making extensions, purchasing additional real estate and adding to the equipment of the road.

Residents of St. Joseph, Mich., have asked the street railway company to inaugurate an ambulance service over its lines. It is probable an old single truck car will be fitted up to carry injured persons and a spur track will be built into the hospital yard.

ELECTRIC INTERLOCKING ON THE TOLEDO, FREMONT & NORWALK ELECTRIC RY.

The accompanying illustrations show the signal and interlocking apparatus recently installed by the Taylor Signal Co., of Buffalo and Chicago, at Fremont and Genoa, O., where the Toledo, Fremont & Norwalk Electric Ry. crosses the main line of the Lake Shore & Michigan Southern R. R. The two installations are similar. Figs. 1 and 2 are diagrams of the crossing and Figs. 3 and 4 show two views of the motor and mechanism for operating the derails. Fig. 1 shows the normal positions of the signals and derails and Fig. 2 their positions when an electric car is crossing the track.

On the Lake Shore track are two home signals, D and D', 600 ft. from the crossing, which stand normally at clear, and two distant signals, E and E', each 1,200 ft. from the home signal, and these are also normally at clear. On the electric line are two dwarf signals, F and F', which are normally at "stop", and four derailing switches, two of which, C and C', are normally closed, and two, B and B', are open. A is the tower; this tower is no necessary part of the installation, but the employment of a watchman was insisted upon by the Lake Shore as a condition of its consent to make the crossing.

A rail circuit extends to a point 500 ft. outside the Lake Shore distant signal, 2,300 ft. from the crossing, and the presence of a train on the rails within this distance locks the signals F and F' on the electric line. When this lock is released, that is, when no steam train is within 2,300 ft. of the crossing, and an electric car reaches the point indicated in Fig. 1, the towerman at A sets signals D, D', E and E' against approaching Lake Shore trains and this in turn closes the derails B and B' and opens the derails C and C' on the electric line. The electric car can then cross the track and continue until it is stopped by the open derail C'.

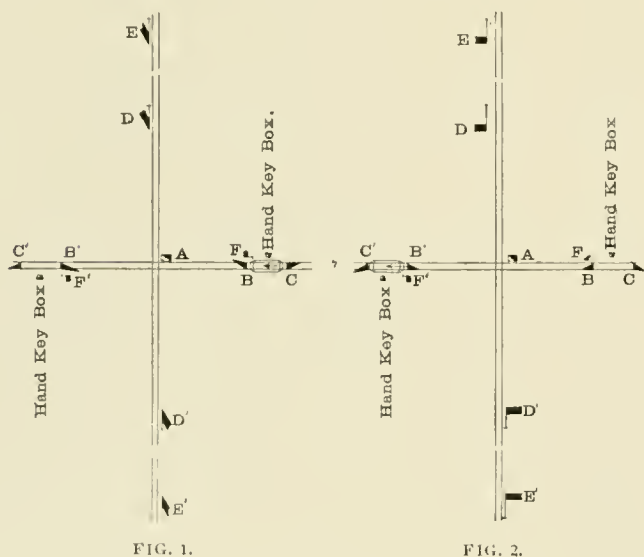


FIG. 1.

FIG. 2.

This being closed by the towerman at the same time opens the derails B and B' and sets the Lake Shore signals at clear. The object of having the outlying derails C and C' is to prevent the Lake Shore signals being set against the trains when there is no necessity for it; the steam road signals must be restored to normal position before the electric car can proceed. This overcomes one of the most annoying objections that has been found to some other interlocking systems, that the trainmen on the electric cars would proceed and leave the signals for the steam road at "stop." It is a notable improvement over the clumsy device of locking the operator in the cabin until he has properly set the signals.

When the towerman goes off duty he connects the controlling circuits to hand key boxes located on the electric line and the signals are then operated by the conductors of the electric cars. It is quite evident that if it is safe to leave the operation of the signals to the electric railway employes part of the time it is equally safe at all times and a towerman is unnecessary. Thus this system is entirely automatic and affords complete protection without the continuing expense of a man to operate the signals, which

is a point of great superiority over mechanically operated interlocking signal systems.

The interlocking board and the mechanism for moving the sig-

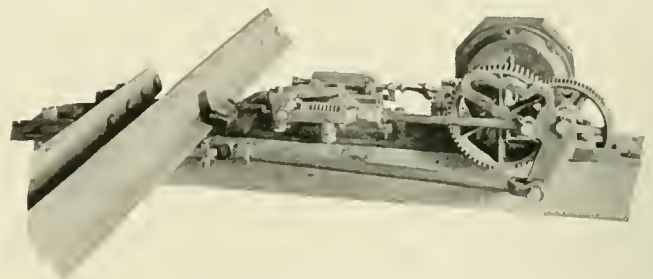


FIG. 3—DERAIL OPEN.

nals and derails have been very carefully designed. Current for operating is supplied at 60 volts from a storage battery. At crossings with electric lines current to charge the battery is taken from

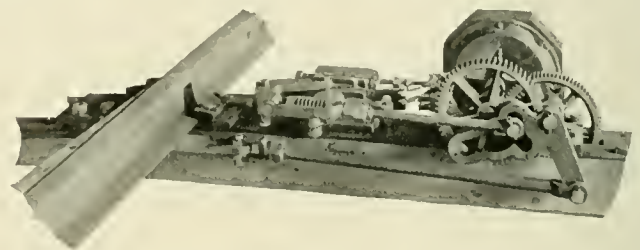


FIG. 4—DERAIL CLOSED.

the trolley line; at steam crossings a small gasoline engine drives a dynamo which charges the battery.

The president and general manager of the Taylor Signal Co. is Mr. A. W. Hall, 1318 Monadnock Bldg., Chicago.

SAVING MONEY ON TIES.

Perrizo & Sons, who are among the largest producers of railway ties in the country, operating yards at Daggett, Mich., Marinette, Wis., Nathan, Mich., and Pembina, Mich., in an interview with a "Review" representative made the following suggestion:

"Interurban and city electric lines will do well to investigate the merits of the white cedar timber that cedar dealers in northern Wisconsin and Michigan have commenced to make during the past five years. In our judgment these ties fully answer the purpose of more expensive woods and in many cases last even longer. These ties are made from commercially standard white cedar timber, and furnished either hewn or sawed on two sides, as desired. They are made in 5 x 6 in. x 7 ft., and 6 x 6 in. x 7 ft. and longer. As these 7-ft. ties are smaller and shorter than the regular standard 8-ft. tie they are sold cheaper and cars can be delivered to long distances at a minimum price, and there is no reason why electric roads should not use more of this class of ties than they do. It is conceded that the white cedar tie is as good if not better in durability than the white oak, and where roads are built on solid ground,—as is usually the case with electric roads—in clay or gravel this size of tie will not only last but will sustain any ordinary traffic as well as if they were 7 x 7 in. x 8 ft.

"The cost would be about half of what the larger size ties are worth, and except in a swampy or spongy soil, where they have been used they have been found to answer the purpose just as well; and the economy in construction cuts a very large figure. As we previously remarked, it will pay any manager to carefully investigate this tie question, and our experience has been that where they do so it is almost certain to result in the adoption of the white cedar 7-ft. tie."

September 11th was "Trolley Day" at Wichita, Kan., and the Wichita Railroad & Light Co. devoted the entire receipts of the day to charity. Of the \$200,000 taken in, \$108.87 was presented to the King's Daughters, \$108.97 to the Children's Home, and \$72.66 to the Wichita Hospital.

MECHANICAL DEPARTMENT

SPLICED CARS AT TOLEDO.

By courtesy of Mr. Thomas H. McLean, vice-president and general manager of the Toledo Traction Co., we have received a drawing showing the plan adopted by the company for making long

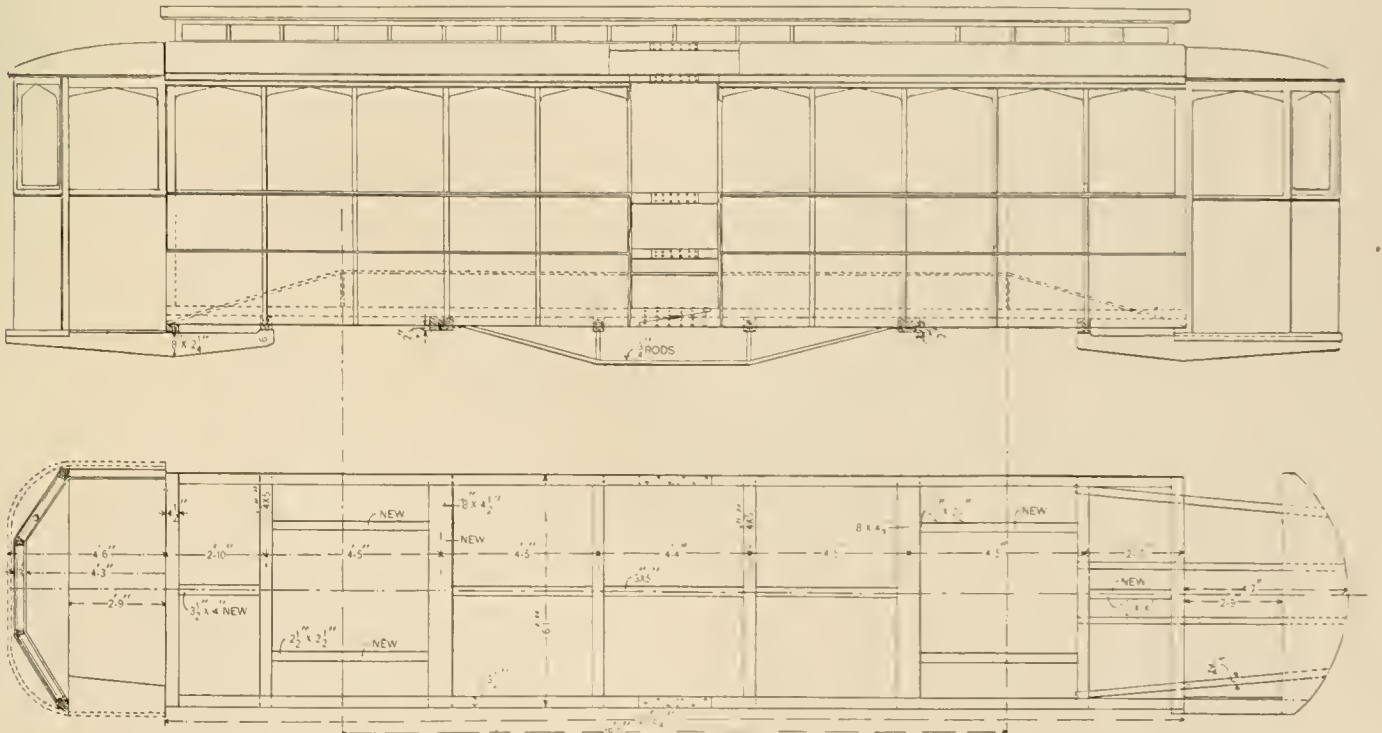
cluding the 4 1/2 x 8 in. cross piece, and the 3 1/2 x 4-in. longitudinal from the trap framing to the end sill are new. New vestibules were put on the spliced cars and these are somewhat wider than those on the smaller cars. When finished they present a very attractive appearance, as shown by the half-tone engraving



SPLICED CAR, TOLEDO TRACTION CO.

cars by splicing two shorter cars. The old cars were 16 ft. long in the body and when spliced made a body 28 ft. 8 1/4 in. long. Very little new framing was used; the framing around the trap doors in-

The company last year made 12 long cars out of 24 short ones and this year has made 7 additional long cars by splicing; the later ones are 1 ft. longer than those first spliced.



SIDE ELEVATION AND FLOOR PLAN.

BAYLEY HEATING AND VENTILATING APPARATUS.

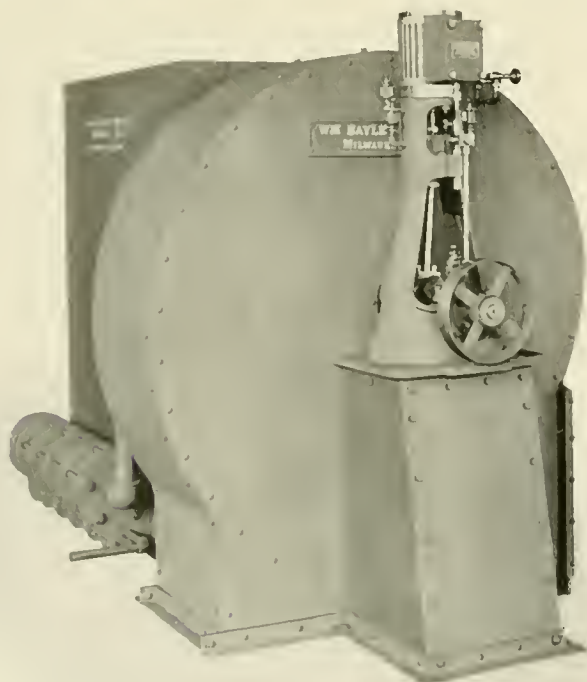
There are many places about a street railway system where blowing apparatus may be used with advantage, but it is important that the blowers installed be properly designed for the work they have to do and particular account must be taken of the surrounding conditions. Mechanical draft in the power house, heating and ventilating systems for the car shops and barns, and exhausters for those shops where there is much dust or shavings to be removed, are some of the applications most extensively used.

In a boiler plant with chimney draft, blowers properly installed will enable a given boiler equipment to carry a temporary overload, or the number of boilers may be increased without enlarging the existing stack or stacks. In building new plants the advantages of a forced draft system are carefully weighed; these include reduced first cost, the ability to regulate the draft to suit all conditions, reduced temperature of the escaping gases, and the facility with which additions may be made to the original installation.

For car barns it is quite important to have some method of heating the pits so that ice and snow can be readily removed from the cars and trucks in winter. The peculiar advantages which a hot air system of heating offers for such a purpose have already been recognized by railway men and some of the largest car barns recently built have been so equipped.

The paint shops must be thoroughly ventilated at all times and in winter heated also. If wood working machinery is used to any extent an exhausting system for removing shavings and dust is almost a necessity.

The William Bayley & Sons Co., of Milwaukee, has perfected a system of hot blast apparatus including fans, ventilating wheels and planing mill exhausters; in all the different types the design has been carefully worked out to suit the various conditions. The planing mill exhausters are made in sizes ranging from 30 to 80-in. with capacities at 1 ounce pressure of from 1,250 to 11,000 cu. ft. of air per minute; at a pressure of 6 ounces the corresponding capac-



BAYLEY STEAM FAN WITH HEATER.

ities are 3,200 and 26,000 cu. ft. per minute. These are all made with outlets and pulleys arranged so that the proper direction of discharge can be secured without the necessity of using crossed belts.

For use with boilers, forges, heating furnaces, etc., a special type

known as the volume blower is recommended; these are so called because designed to move large volumes of gases against comparatively small pressures.

Our illustration shows a Bayley steel plate steam fan with sectional heater; the discharge is known as "right hand up," right hand meaning that when standing so as to face the discharge pipe the driving mechanism is on the right hand. The heater comprises 2,200 ft. of 1-in. steam pipe over which the fan draws the air discharging it through ducts which are built into the walls or carried through the rooms. The steam pipes are arranged in sections one or more of which receive the exhaust steam from the fan engine, the others being supplied with the exhaust from other steam apparatus or with live steam. The temperature of the air moved may be regulated by cutting sections in or out, and the volume by throttling the air pipes or by reducing the engine speed. The heaters may also be motor driven.

This type is extensively used for factory and public buildings and is admirably adapted for railway shops and car barns.

EFFECT OF TEMPERATURE ON THE FRICTION OF BRAKE SHOES.

In the "Review" for July, 1899, page 477, we published a comprehensive digest of the experiments heretofore made on brake shoes for cars, but this did not include data as to the effect of heat on the coefficient of friction. At the September meeting of the Western Railway Club, Prof. R. A. Smart, of Purdue University, presented a paper giving the results of various tests of brake shoes that have been made at Purdue since the Master Car Builders' brake shoe testing machine was installed there. Prof. Smart discussed three points: The variation of the coefficient of friction with speed, braking pressure being constant. The variation of the coefficient of friction with braking pressure, speed being constant. The variation of the coefficient of friction with the temperature of the shoe.

The experiments on the first two of these points confirmed the results of the M. C. B. tests made in 1896, and we do not give them here; that portion of the paper dealing with the effect of temperature is as follows:

The investigations on the effect of temperature were undertaken for the purpose of finding a partial explanation for the very considerable variations which frequently occur in the results of brake shoe tests under identical conditions and which it has seemed impossible to avoid even when exercising the utmost care. Such differences often amount to 2 or 3 per cent, with a value of the coefficient of friction of, say, 25 per cent, and as has been stated, they have been attributed to two causes, namely, variations in the temperature of the rubbing surfaces and variations in the comparative roughness or smoothness of those surfaces.

So far as the writer is aware, no reliable information has been obtained heretofore on the effects of temperature, a fact which is easily explained by the difficulties attending such investigations. In fact, it is well nigh impossible to carry out the experiments with a great degree of refinement or to arrive at other than general conclusions. This, however, has been done in the investigation under consideration, and the general conclusion reached is put forth with confidence as one which is accurate for all practical purposes.

The tests upon which the conclusion is based involve ranges of temperature of the shoe up to 1,500° F., speeds of from 40 to 60 miles per hour, and normal pressures of from 2,800 lb. to 6,840 lb. They also involve continuous runs of about five miles in length and from five to ten minutes in duration. It is believed that the range of temperature mentioned is sufficiently high to embrace all but the most extreme conditions of service. The term "temperature of the shoe," as here used, is more accurately defined as the temperature of two points on the center line of the face of the shoe and near either end. It is obviously impossible to measure the average temperature of the whole shoe while running. Two points of measurement, as just noted, were chosen to represent the average temperature of the shoe.

(The paper included four diagrams showing the temperature of

shoe and the coefficient measured at short intervals during four continuous runs at 40 miles per hour and 2,868 lb. braking pressure; two were for soft cast iron shoes and two for hard cast iron shoes, a chilled wheel being used in all four runs. The temperature of the shoe rose from about 100° or 150° F. at starting to about 1,000° F., and in one case 1,400°, at the end of the test. The coefficient of friction rose and fell irregularly, the maximum variation being about 5 per cent and the average value of the coefficient about 20 per cent.)

Both shoe and wheel were cold at the start. Successive readings were taken, during the run, of the temperature of the trailing end of the shoe, and these are plotted with the coefficient of friction for the same instant. It was found that the curve of temperature of the shoe rises during the run to several times its original value, while the coefficient of friction changes but little. The curves show that the coefficient of friction is practically a constant, while the temperature of the shoe varies through a wide range.

The curve representing the coefficient of friction does not, in these diagrams, start at the axis of ordinates. The readings obtained at the beginning of an application are always more or less irregular, and were, therefore, omitted when plotting the curves. The lines showing the coefficient of friction are not straight, but the variations are not greater than the variations found in ordinary stop tests under identical conditions. Their character and direction warrant the general conclusion which has been drawn.

It should be said that at no time did the shoe heat up uniformly over its entire rubbing surface. The point of maximum temperature during the first part of the tests, particularly, shifted from the center to either end and back again for no apparent reason and with no observable regularity. Readings taken from both ends in quick succession would sometimes show the leading end hotter and sometimes the reverse, although at any time the difference between them was not great. The general form of the temperature curve may be explained as follows: Immediately after the shoe is applied to the wheel, its temperature rises to about 500° F. In this time the wheel, being of greater mass, has remained practically cold. At this point the shoe begins to impart heat rapidly to the cold wheel, thereby keeping its own temperature down, until the wheel has been heated up and the tread has acquired a comparatively high temperature, after which the temperature of the shoe again increases.

In the continuous tests just described, the initial temperature conditions of the shoe and wheel were the same. Both were cold. To show that variation in the initial temperature does not lead to different results 15 stop tests were made in which the wheel was brought to rest from a 35-mile speed under a continuous brake shoe pressure of 6,840 pounds. The initial temperature of the shoe varied from about 200° to 600° F. The temperature of the wheel varied also, following approximately the temperature of the shoe. The tests were run in several series, each series consisting of three or four tests run after the other, the final temperature conditions of one being the initial conditions for the next, and so on.

The conclusion drawn from these results confirms the one already stated, i. e., that within the limits of the tests the temperature of the rubbing surfaces does not affect the coefficient of friction.

A number of series of stop tests were made in addition to those the results of which have just been presented. The results from these tests were irregular and unsatisfactory and no conclusion could be drawn from them.

DECISION ON POLYPHASE MOTOR PATENTS.

The Westinghouse Electric & Manufacturing Co., in August last brought suit against the New England Granite Co., for infringement of the Tesla patents covering the polyphase system of transmission. The case was heard by Judge Townsend, sitting in the United States Circuit Court for the District of Connecticut, and the entire field of power transmission was thoroughly covered by the experts employed on the case, and much interesting matter relating to the early days of alternating current work was brought to light. The Westinghouse company sends us the following data concerning the most important citations bearing upon the case, which were those which related to the Deprez, Bradley, Siemens, Gramme and Bailey apparatus, all of which were taken up in detail.

Deprez' invention related to the use of an annular electro-magnet wound with two coils at right angles to each other. Cur-

rents of different strengths being sent through the two cells, the resultant polarity of the magnetic field would of course depend upon the ratio between the two current strengths. It is important to note that Deprez designed his shifting magnetic field for use in combination with a magnetic needle suspended in the center of the annual magnetic field. The direction of the magnetic needle was to be controlled from a distance by simply varying one or both of the currents in the two different field windings, direct currents of course being used.

The next point brought up by the defending company bore upon the invention of C. V. Bradley, who in 1887 applied for a patent on a dynamo electric machine, in which two currents were generated in separate windings. The complainants showed, however, that Bradley had no conception of the use of these two currents for the purpose of driving a motor, the sole object of the invention having been "to obviate difficulties in prior constructions."

The defendants then took up the case of Bailey, who had, as suggested by Arago, effected the rotation of a disk by means of rotating electro-magnets. It was, however, shown, as indeed the defendants admitted, that Bailey's apparatus was merely for a laboratory experiment, and that the inventor had not used alternating currents.

The Siemens and Gramme multiple circuit machines were next considered, and the defense set up the point that these machines might have been used as motors, since they contained the necessary elements for such use. Judge Townsend ruled, however, that such use was at no time developed, and that its development would have called for distinct invention.

The evidence all showed that, while many earlier inventors had at one time or another touched upon the general field of magnetic rotation, no one had ever evolved a machine embodying the principle of magnetic rotation by means of alternating sine currents differing in phase, and that Tesla's conception of the rotating field, as applied to the induction motor, had produced a sweeping change in the electrical industries. The court declared that Tesla was therefore entitled to the protection of a patent, quite as much as were the inventors of electric telegraphy and telephony. Judge Townsend spoke eloquently of Tesla's achievements, and his decision in favor of the Westinghouse company concluded thus: "It was he (Tesla) who first showed how to transform the toy of Arago into an engine of power; the 'laboratory experiments' of Bailey into a practically successful motor; the indicator into a driver; he first conceived the idea that the very impediments of reversal in direction, the contradictions of alternations, might be transformed into power producing rotations, a whirling field of force. A decree may be entered for an injunction, and accounting as to all the claims in suit."

PHONO-ELECTRIC WIRE.

"Phono-electric" wire is a product of the Bridgeport Bras Co., and is described by the maker as follows: "This wire is the result of a demand for a material that would stand up under all sorts of trying conditions, endure extraordinary stress without yielding, and prove absolutely trustworthy in all extremes of wear and weather. It is a special copper alloy designed to give the best possible combination of strength, toughness and conductivity. Phono-electric wire is nearly twice as strong as annealed copper, and nearly 50 per cent stronger than hard-drawn copper, and its good properties are permanent; it is as tough as mild steel, vastly more durable, and four times as good a conductor. It is a homogeneous metal, while hard-drawn copper is only hard on the surface."

We have made inquiries of Mr. J. R. Chapman, electrical engineer of the Chicago Union Traction Co., as to the service he had been getting from this wire, and he states that the Traction company has been using it for about two years and is putting up more of it nearly every month. Phono-electric wire has been adopted as the standard trolley wire to be used at all points where the service is particularly severe.

The Jackson (Mich.) Street Ry. was sold at auction on Sept. 13th. After spirited bidding by W. A. Boland, representing the Michigan Traction Co., J. D. Hawks, of Detroit, president of the Detroit & Ann Arbor Electric Railway Co., C. D. Beebe, of Syracuse, N. Y., and others, the road was struck off to Mr. Boland at \$153,500.

RAIL BOND TESTS.

Made by Experts of the French Government in July, 1900, at the Ecole d'Electricite, Paris.

To determine which was the best method of rail bonding, very careful and thorough tests of the leading types of rail bonds were made in July by experts of the French Government at the Ecole d'Electricite in Paris, and the formal report has just been issued. To insure fairness each bond was applied by one of its representatives, who was present at the test. In each case the current and potential difference were measured from which the resistance was calculated. In each test the same pair of grooved girder rails were used, weighing about 80 lb. to the yard, and joint plates were not used.

1. Edison-Brown plastic copper rail bond; size, No. 0000; length 76 mm.; height 38 mm.; thickness 3.2 mm. This bond was merely laid by its own weight so that one-half touched the amalgamated spot upon one rail and the other half a similar spot upon the other rail. A current of 1.915 amperes was passed from rail to rail through this bond with a difference potential of 0.0234 volt; calculated resistance 0.0000122 ohm. After five minutes the current was 1.806 amperes; difference of potential, 0.0233 volt, and calculated resistance, 0.0000129 ohm. After the passage of the current for five minutes through this bond the finger could be held upon it without discomfort.

2. Conditions the same as in the first, except that two No. 0000 Edison-Brown plastic copper rail bonds were used. In this case the current was 1.915 amperes; difference of potential, 0.0127 volt, and calculated resistance, 0.0000666 ohm. No apparent heating above temperature of room.

3. Conditions the same as before, except that one Edison-Brown plastic copper rail bond, No. 000000 size, was used. Length, 89 mm.; height, 44.5 mm.; thickness, 4.7 mm. The current was 1.910 amperes; the difference of potential 0.0114 volt, and the calculated resistance 0.0000598 ohm. No appreciable heating above temperature of room after five minutes' passage of current through the bond.

4. Conditions the same as in No. 3, except that two Edison-Brown plastic copper bonds, No. 000000, were used. The current was 1.880 amperes; difference of potential, 0.00678 volt; calculated resistance, 0.0000036 ohm.

5. Copper bond of No. 00 size set in rails by driving steel pin in the longitudinal hole in the terminals. Diameter of conductor,

peres; difference of potential, 0.1213 volt, and calculated resistance, 0.0000659 ohm. Bond became very hot.

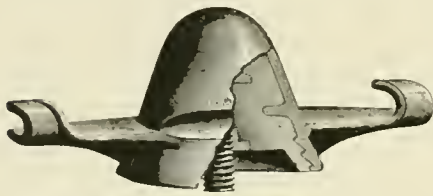
8. One end of a permanent copper bus-bar on switchboard in the laboratory of Ecole d'Electricite was connected to adjoining bar by the experts of the school, in the best French manner. The other end of the same bus-bar with contact of the same area and with the same number and size of bolts, was made up with the Edison-Brown contact alloys. With a current of 1,760 amperes the loss at the first joint was 0.048 volt; the loss at the plastic alloy joint in series with the first was 0.0008 volt, or only 1-60 as much.

9. A current of 202 amperes was passed through a copper rod 11 mm. in diameter. Difference of potential measured between two points about 10 cm. apart on the rod was 0.0038 volt; calculated resistance, 0.0000188 ohm. The rod was then sawed in two, the ends of the rails were amalgamated and a small amount of plastic alloy was placed between the ends in contact with each other. With a current of 206 amperes the difference of potential was .0045 volt, and the calculated resistance, 0.0000218 ohm. The length of a bar of unbroken copper to give the same resistance measured 11.5 cm. Resistance of the rail per metre, 0.0000564 ohm.

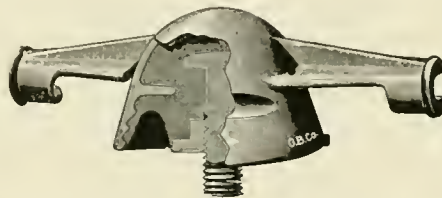
ROUND TOP HANGERS.

The comparative simplicity in design of the round top form of trolley wire hanger, has led many street railway companies to prefer this type of hanger to the other standard forms now on the market. To meet the demand for hangers of this form, the Ohio Brass Co. has recently brought out, as an addition to its Type R hanger, a variety of round top hangers, which it designates respectively as the Types J, N and N-W straight line hangers. The various styles are shown in the accompanying cuts, which illustrate not only the general form of each hanger, but also their internal construction. They are made in either bronze or malleable iron, galvanized or Japanned, and are regularly fitted (with the exception of the Type N-W) with a $\frac{5}{8}$ in. stud bolt to fit the standard forms of ears and clamps. Where special sizes of stud bolts are desired, these are furnished to order. The Type N-W hanger is almost a duplicate of the Type N, and is designed especially for use with the D-W trolley clamp, made by the same company, and, in place of the regular $\frac{5}{8}$ in. stud, is provided with a conical stud bolt, internally threaded to fit the stud bolt in the clamp.

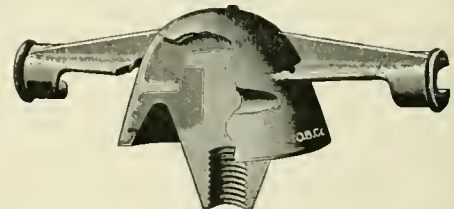
For insulation the Ohio Brass Co's. well known "Dirigo" is used



TYPE J.



TYPE N.



TYPE N-W.

ROUND TOP HANGERS—OHIO BRASS CO.

9.3 mm.; diameter of terminals, 16 mm. In this case the current was 1,610 amperes; difference of potential, 0.75 volt, and calculated resistance 0.00046 ohm when the circuit was closed. After five minutes the current was 1,530 amperes; difference of potential, 0.83 volt, and calculated resistance, 0.00054 ohm. After the current had passed for two minutes it heated the bond to redness.

6. Two copper bonds aggregating the same section as in test No. 1; these bonds were set by driving steel pin in the longitudinal hole in the terminals. The diameter of each bond was 9.3 mm.; diameter of bond terminals, 16 mm. In this case the current was 1.805 amperes; difference of potential, 0.278 volt, and calculated resistance, 0.000154 ohm at the start. After 5 1-3 minutes the current was 1,620 amperes; difference of potential, 0.37 volt, and calculated resistance, 0.000219 ohm. Bond became very hot.

7. In this test the leading type of flexible copper bond with solid terminals was used, which had exactly the same section as the bond in test No. 1, viz.: No. 0000; diameter of terminals 22 mm. The current was 1,830 amperes; the difference of potential, 0.119 volt, and the calculated resistance 0.000065 ohm when the circuit was closed. After five minutes the current was 1,750 am-

peres, and is molded directly in the body casting of the hanger. The interior ribs and corrugations on the body casting, which project inwardly into the insulation, serve to hold it securely in place. As will be noted the stud bolt is furnished with a flanged head, which in like manner secures a firm anchorage in the insulation. This form of construction prevents all possibility of the insulation becoming loose in the shell, or the stud bolt pulling out. The Types J and N hangers are fitted with a circular washer, which is set flush with the lower face of the insulation, and furnishes a bearing surface for the boss of the trolley ear or clamp used in connection with it. The body casting entirely envelops the insulation and serves to protect it, not only from rain and moisture, but also from accidental blows of the trolley wheel.

On Oct. 1st a new scale of wages went into effect on the lines of the Pueblo (Col.) Traction & Electric Co. Trainmen that have been with the company for one year will hereafter receive 19 cents per hour instead of 18; two-year men will receive 20 cents instead of 19; and three-year men will receive 22 cents.

CORRESPONDENCE

TRAMWAYS IN HONOLULU.

Honolulu, H. I., Sept. 13, 1900.

Editor "Review": It may interest your readers to know that we are about to commence active construction work on the first electric railway built in the Hawaiian Islands. Contracts for the material to be used on this road were let some time ago but various unfavorable conditions have prevented work from progressing more rapidly.

You are probably aware that building a railway in Honolulu is a somewhat different matter from building one in Chicago, as there you are close to and in constant touch with the various points of manufacture, while we are a very long distance away and we have no cable. In the manufacture of our material, for instructions as to any particular point, it is necessary to communicate by mail with Honolulu, and by the time the reply has been received, practically a month has gone by, and then the reply may not be satisfactory and further delays are caused.

The matter of transportation is a very serious one, as the steamship companies between the coast and the Islands have a habit of exercising their own judgment as to what they will load, regardless of what the fellow at this end may particularly require. In the United States an engine, for instance, loaded at the machine shop, would be shipped to any part of the country and delivered complete, whereas with us we are apt to get the beds in one shipment, probably all the wheels in another, mixed up with various smaller parts, and the rest following in the third shipment, the first being useless until we have received the whole outfit.

However, we are glad to be able to say that while our stuff has not arrived in its entirety, still we have on hand materials for a complete railway system of 20 miles, including power plant, road-bed and overhead material. If all goes well, we shall have part of the system in operation during the earlier part of next year.

Yours truly,

C. G. BALLENTYNE,

Manager Honolulu Rapid Transit & Land Co.

NEW YORK STREET CAR BRAKE TESTS.

Editor "Review:" The comments made in your August, 1900, issue, page 422, upon the New York street car brake tests seem to us eminently just and proper, although we do not think your strictures are nearly as severe as the incompetency displayed and inconclusiveness of the tests deserve.

These tests were made primarily for the purpose of showing the relative efficiency of the different styles of brakes. Extreme accuracy is presupposed from the fact that the figures given are carried in all cases to several places of decimals. Times of stops are indicated in hundredths of a second, while the figures in other cases are carried out to 4 or 5 places. Upon an inquiry into the facts connected with the tests the absurdity of the figures becomes astonishing.

Then the question of skidding wheels is one where the most accurate figures are given, the allowance here being carried out to five places of decimals. It was a standing joke among engineers some years ago that in one of the old handbooks data were given with figures extending to six decimals and foot notes were added saying the figures were probably within 25 per cent of truth. In this table of skidding we have five places of decimals which are correct within 50 per cent, for according to headings of the table skidding to which these long decimals belong varies by one-half.

As you intimate, the utter worthlessness of these figures is best shown by the fact that the cars frequently ran further in the given time than they would have gone in the same time at the given speed. From this we may derive several conclusions; we may believe that some of these brakes when applied to the wheels greatly increased the speed of the car, or that the recording apparatus of the New York State Railroad Commission produces a great acceleration, or we may reach the less charitable but more practical conclusion that the Commissioners paid so little attention to the matter that the car was accelerating with great rapidity

when the required speed was reached, and this acceleration accounts for the seemingly impossible figures. Such reports are a waste of good printing paper.

Railroad men are deeply interested in the question of brakes and their relative merits, but they have no practical interest in comparing brakes with the incident of skidding wheels nor of the personal equation of the operator in manipulating the brakes. They have no interest whatever in the operation of brakes before they are properly adjusted to the car and before they have run long enough to obtain contact of the shoes with the wheels.

We do not think there is a brake man in the country who can look over these figures and feel that he has learned anything. Some of the best brakes are put at the foot of the list. Some of the brakes which made the most absurd stops have received a high position, while others making good stops seem to have been ranked very low. The advantages which a power brake has over even an expert motorman were not shown. Mr. Thomas Millen's operator with the Sterling brake, if we understand the figures, made better stops than any of the power brakes, and in fact should have been placed at the head of the list. At the highest speed his stops were practically equal to the best.

But one conclusion can be reached from looking over the table and reading your remarks, and that is that tests of this kind are in the highest degree desirable and they should have been put in the hands of an expert mechanical engineer, and an electrician might have been with advantage associated with him as consulting engineer, but an electrical engineer is out of place when taking charge of a matter purely mechanical like these tests. Yours truly,

J. G. BRILL CO.

THE LAST HORSE CAR IN SYRACUSE.

With the turning on of the current on the Lodi St. line of the Syracuse (N. Y.) Rapid Transit Ry. early in this month, one more of the few remaining horse car lines in the United States passed out of existence. Another horse car is for sale cheap and the two



LAST HORSE CAR IN SYRACUSE.

faithful servants that drew it have ended their labors in that field. Through the kindness of Mr. E. G. Connette, general manager, we are able to reproduce herewith a photograph taken of the last car as it stood at the corner of James and Lodi Sts. ready to make its last run. The fog at the end of the white horse is due to the fact that the photograph was taken in fly time.

The latest thing in trolley wheels is one having the harps extended into outwardly flaring wings which make it more difficult for the wheel to leave the wire and greatly facilitate replacing the wheel when it does jump.

As a result of the coal miners strike in Pennsylvania several street railway companies, including the Scranton Ry., were forced to shut down part of their power stations and run on longer schedules for a number of days.

Washington, D. C., has a novel advertising scheme. In several places along the street railway lines the ordinary bill posters' signs have above them a reflector, containing incandescent lamps. An overhead line taps the trolley feeder and supplies current to the lamps, which at night light up the signs for the benefit of the trolley passengers.

The Great Storm at Galveston, Texas, September 8, 1900.

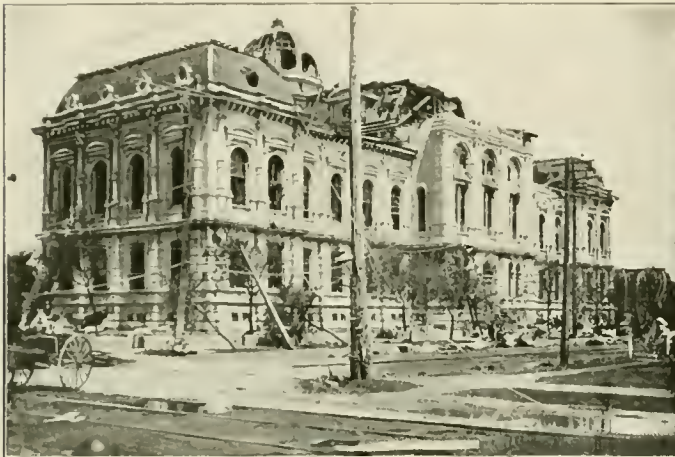
Loss of Life Estimated at Between 7,000 and 8,000—No Person Escaped Property Loss—Total Property Loss from \$25,000,000 to \$30,000,000.

BY CHARLES B. WOOLVERTON, GALVESTON.

The story of Galveston's storm tragedy can never be completely written. Since the terrific gale of Saturday night September 8th, an army of faithful men have been struggling to restore the afflicted city to something of its previous condition, while others have worked as faithfully trying to convey to humanity some of the particulars of the tragedy. They have told much, but they could not tell all, and even at this late date it is impossible

The strongest wind blew late in the evening when it shifted from northeast to southeast and attained a velocity of about 110 miles per hour. The exact velocity was not recorded owing to the destruction of the wind gage of the United States Weather Bureau after it had registered 100 miles per hour for two minutes at 5:10 p. m.

The poles of the East Broadway street railway line are standing



CORNER 22d ST. AND AVE. H.



WRECK OF POWER HOUSE.

to give a full description; only those who lived through the awful experience can imagine how terrible the whole thing was.

Over four miles of the beach were swept clean of buildings. Some idea of the destructive path of the hurricane can be had from a view of the beach from Tremont St. east. Standing on a pile of debris 20 ft. high that marks the line of devastation extending from the extreme east end to Tremont St., an unobstructed view of the awful wreckage is presented. A line from Tremont St. and Ave. P straight to Broadway and 13th, where stands the demolished Sa-

but the lines are all down as a matter of course as far east as 14th St.; beyond that there is not a pole left standing and the tracks are all filled with wreckage. The line of wreckage crossed Broadway between 13th and 14th Sts. and in it at this point were a number of bodies which could not be got out for several days owing to the great piles of lumber. The great bulk of this lumber is unbroken and represents sides or roofs of houses still intact.

The entire plant of the Galveston City Railroad Co. was demolished but fortunately none of the employees of the company were in



WRECK OF A VESTIBULED CAR.



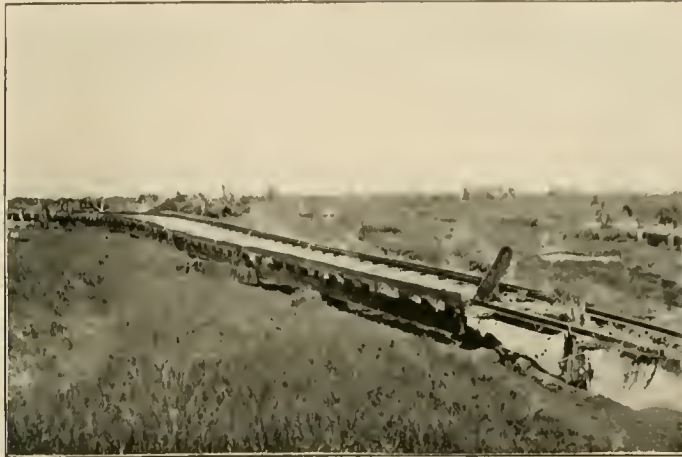
BRIDGE AT 43d ST. AND AVE. R.

cred Heart (Jesuit) Church, is now as accurately marked by the ridge of wreckage that once stood as homes, as if staked out by experienced engineers. All the houses to the south and east of this line were razed to the ground. This territory embraces 70 blocks and was thickly populated. Not a house withstood the storm and those that might have held together if dependent only upon their foundations, were buried beneath the stream of buildings and wreckage that swept like a wild sea, from the east to the west.

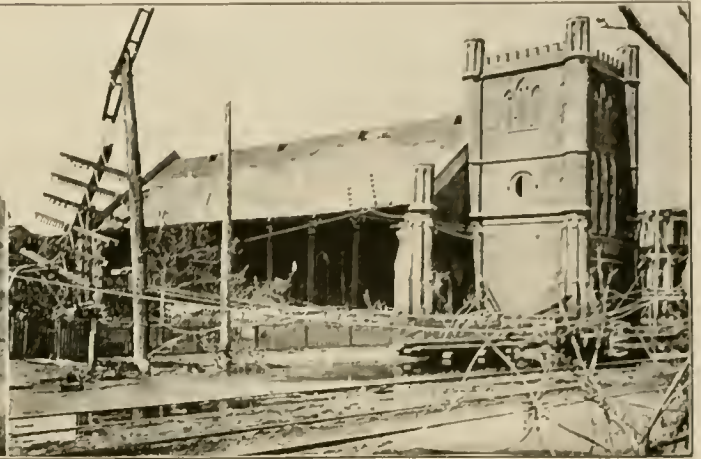
the building at the time. Their escape may be accredited to the fact that the cars could not run after three o'clock in the evening and by five, the water was high enough in the boiler rooms to extinguish the fires. This building was constructed nine years ago. The machinery in the power house was all of the most modern type and it is an entire loss. Major Baer, receiver of the road, said today that the plant was a total wreck, the loss amounting to over \$200,000. All records of the property and bonds of the company

and all books were ruined in the flood. In the offices of the company not a desk remained. Bookcases were demolished and their contents strewn about the rooms. The offices of the company are located on one of the highest streets in the city and it is of interest

made the horrors could not then be realized. Three or four barge loads of the dead were carried out to sea and there buried, while thousands upon thousands of others were either buried or burned where found and among these were fathers and mothers, who in a



TRACK MOVED 200 YDS.



CORNER OF 22d AND WINNIE ST.

to know that the water rose to a depth of 4 ft. 1 in. in these offices, which are 2 ft. above the street level.

It is the desire of Major Baer to give the patrons of the company electric service in the lesser damaged districts by the end of the week and men are now at work repairing breaks in the trolley wires and car tracks of the Market St., Center St. and West Broadway lines, arrangements having been made with the Brush Electric Co. for power. One of the engines owned by the Galveston City Railroad Co. is being repaired and will probably be used to furnish part of the power. The work of repairing the broken trolley wires is really a minor task. The chief consideration is the question of power and it is hoped that the temporary arrangements will suffice until the repairs to the power plant can be completed.

A few of the piles that once supported the street railway trestle, extending from Center St. to Tremont, on the beach is all that remains to mark the curved line of the right of way at that point. At Denver Resurvey, the extreme western portion of the city, the wires and poles are down and the tracks badly disarranged.

twinkling had been taken from their all, leaving them in a wide world to battle with the coming storms of life, homeless, penniless and barely with friends.

Sept. 26, 1900.

WOVEN WIRE FENCING.

With the development of electric traction, the problem of fencing rights of way through rural districts has become as prominent as it has been for years with steam railroads; but fortunately for the traction companies, they are able to profit by the experience of the railroad companies, and are in position to avoid the expensive experiments which have caused the railroad companies so much annoyance and unprofitable outlay.

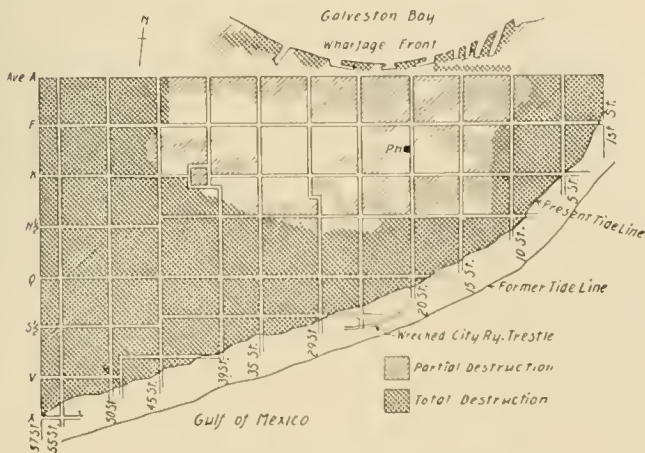
The traction companies are able to apply at once to their rights of way the most improved and most economical of fences, which are now taking the place of all the more primitive forms hitherto used by railroads. During the past year, thousands of miles of railroad property have been fenced with the American steel woven wire fences, and a number of traction companies have also availed themselves of the advantages afforded by this form of fencing and have placed it along their rights of way. It goes without saying that the expense of construction and the still greater expense of maintenance of wooden fences of any character, whether made of finished lumber, pickets, or split rails, cannot be considered for a moment as the proper solution of this problem.

A fence that is proof against wind, fire, snow drifts, against heat and cold with their expansion and contraction, is what the traction companies must have. These requisites are found in the woven wire fence, of which the American style, manufactured by the American Steel & Wire Co., is recommended as at once the cheapest and strongest.

The immense production of wire by the American Steel & Wire Co., and its facilities by reason of producing from the ore every grade of steel by the bessemer, open hearth and crucible processes, enable it to make for this fence just that grade of steel wire best calculated to meet the peculiar requirements of fencing. And, further than this, the galvanizing being done with zinc or spelter of its own production, assures a finished wire strong and durable.

Another feature in which the American Steel & Wire Co. is unique is in its contracts for furnishing the fence erected. It has a corps of trained fence builders, and will take contracts to build any amount of fencing, including furnishing the posts, all necessary appurtenances and all labor. Fence erected by these expert workmen is sure to be properly put up.

The American Steel & Wire Co. solicits correspondence from all interested in fencing, will promptly furnish estimates for any quantity of American fence of any height, either delivered in rolls of 40 rods, or fully erected and in place.



PORTION OF THE CITY DESTROYED.

The Galveston City Railroad Co. was chartered in 1867, and is a consolidation of two smaller companies; a receiver was appointed in 1897 and on Feb. 6, 1900, the property of the company was purchased by the Guaranty Trust Co., of New York. The system had 40 miles of track and 76 cars were operated.

There is a well organized citizens' committee at work in a business-like manner, but the work before them is a vast undertaking, and it will be some time before thousands will know the real nature of the disaster which has overtaken them and the world will never know it all.

The accompanying illustrations will show a small part only of what has been, and even could a picture the size of the town be

COMPRESSED AIR TRACTION IN NEW YORK.

About three years ago the street railway companies of New York, wishing to secure a practical and economical motor that could be used on their cross-town lines, where the installation of electrical conduits was not justified, because of the light traffic, undertook extensive experiments with compressed air for traction. The Third Avenue R. R. had motor cars built by the General Compressed Air Co., on the Hardie system, which comprised long stroke single expansion engines driving one of the car axles, the two axles being connected by side rods, as in the common type of steam locomotives. The Metropolitan Street Ry. had Hoadley motors, built by the Compressed Air Power Co.; these motors were compound, of short stroke and ran in oil, driving a shaft geared to the car axle.

The success of the Hardie motors on the Third Ave. lines convinced the managers of the Metropolitan Street Railway Co. that the patents of the General Compressed Air Co. were necessary for the best results, and the Metropolitan syndicate formed the American Air Power Co., which was a consolidation of the two air companies mentioned. Some modifications of the motors used on the Metropolitan lines were made, but the general characteristics remained the same.

About this time Mr. Robert Hardie became engineer for the Compressed Air Motor Co., which was the licensee of the General Compressed Air Co. for Wisconsin and Illinois, and introduced the Hardie motors for the night service of the North Clark St. cable line of the Chicago Union Traction; the cars used in Chicago were described and illustrated in our issue for October, 1899, page 729.

The excellent results achieved with the Hardie motors in Chicago led the Metropolitan syndicate to open negotiations for a further consolidation, and as a result the Compressed Air Co. was formed, thus merging all interests. Hardie motors have been substituted for those formerly used by the Metropolitan company, and the future of compressed air traction is now brighter than ever before.

The cars as now used in New York carry 14 reservoirs on the truck, and one under each seat, having an aggregate capacity of 55 cu. ft. and weighing 4,340 lb. The air passes from the reservoirs into a common header, and from the header into a pipe running to each end of the car. A stop valve under the control of the motorman regulates the flow of air. The air passes through a reducing valve and comes out at a working pressure of 150 lb. It then passes into the reheating tank, which is placed in the middle of the truck, and contains 500 lb. of hot water, varying in temperature from 320 to 170 degrees. The air passes into the bottom of this heater and escapes into the water through a perforated pipe. The air is heated to the temperature of the water, and is then drawn off at the top whence it passes from the exit pipe to the throttle valve of the motor, and thence to the valve chest of the engine, in the same way as steam in a steam engine. The cars are fitted with air brakes.

The compressing station at W. 24th St. and the Hudson River, which was built for use with the old cars, will be used for the new. It has a capacity of 56,735 cu. ft. of free air per revolution, and compresses to 2,500 lb. per sq. in.

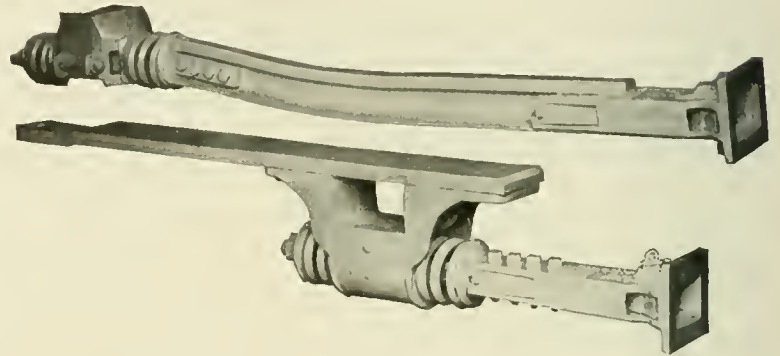
FOR A BIG INTERURBAN IN CANADA.

An act is being prepared to incorporate the Toronto & Central Ontario Electric Railway Co., with \$5,000,000 capital, to construct and operate a system of railways in conjunction with different municipalities. Assurance has been received that such a system could be financed in New York, as interurban systems in the states have been wholly successful, and this stock is very popular with investors. It is intended that there shall be main routes with branch lines; and the standard railway gage will be adopted. This system is to be equipped with vestibuled palace cars at least 75 ft. long, having separate compartments for mail and packages. There is also to be a smoking compartment. It is the intention to furnish the cars in the most luxurious manner in order that passengers may be carried long distances without fatigue. There will also, it is intended, be small and suitable freight cars provided for shippers of farm produce. It is hoped that at least 500 miles will be constructed within five years.

VAN DORN COUPLERS.

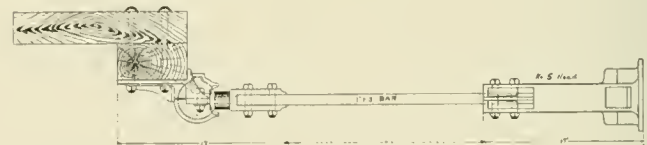
The business of the W. T. Van Dorn Co. for 1900 to date is almost double that of any previous years, and Mr. Van Dorn states that now all the elevated roads of this country have adopted the Van Dorn couplers as standard, the Manhattan and the Boston elevateds being the last ones to do so. Large shipments have lately been made to Yokohama and to Glasgow, and orders have recently been received from Europe and from many interurban roads in the United States.

The company has now 13 distinct patterns in 13 sizes, which it has been necessary to build to meet the requirements of customers. The No. 3 and No. 4 draw bar heads with draft rigging, shown



NO. 3 AND NO. 4 VAN DORN DRAW BAR HEADS.

in the illustration, have been built for the Manhattan Elevated, of New York. They have been made on strong lines to withstand the heavy service; the rail is comparatively straight and the spring power in the heads has been materially increased, each head having five lifts of springs, 2 x 3-16 in. each. The draw bars for the



NO. 5 VAN DORN DRAW BAR.

Boston Elevated are similar to these, except that the drop is less and the stop casting slightly different.

The No. 5 draw bar is shown here connected to a ball joint. This is the company's standard for street cars. The No. 7 and No. 11 are similar to the No. 5, but are heavier, being for interurban cars.

BAD WIRE THIEVES IN CHICAGO.

The police of Chicago have spent considerable time of late trying to catch a gang of wire thieves that have been despoiling the electric lighting, trolley and telephone systems. The gang seems to be composed of expert electricians and in one or two instances they have gone so far as to drive up to the wires in a wagon resembling a street railway repair outfit and remove several hundred feet of feeders without attracting suspicion.

This was bad enough, but to cap the climax the thieves one day recently, after securing 500 ft. of cable, went and stole the telephone instruments and batteries from two of the patrol boxes used by the policemen for reporting to headquarters. The policeman on the beat had to walk to the station to turn in notice of the theft and the boys in the police department are feeling sore.

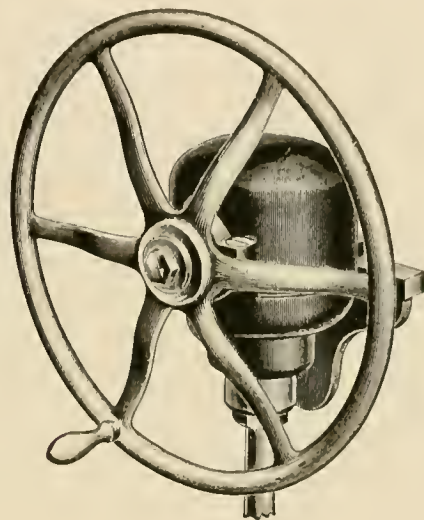
The Toledo Traction Co. has decided to permit firemen and policemen in uniform to ride free at any hour of the day or night.

The report of the Auburn (N. Y.) City Railway Co. for the year ending June 30, 1900, shows net earnings of \$76,237; operating expenses, \$50,002; other income, \$342; fixed charges, \$22,416; net income, \$4,160; deficit from previous year, \$26,080; total deficit, \$21,920.

VERTICAL WHEEL GEARED BRAKE.

The accompanying illustration shows a ratchet geared brake handle, designed for use on vestibuled cars, where there is not sufficient room for the ordinary horizontal wheel or ratchet handle. This vertical wheel brake handle is known as the Beverly, and is made by the Beverly Engine & Machine Co., of Beverly, Mass.

The wheel is any desired size from 12 to 15 in. The bevel gears are in the ratio of 2 to 1, and are made of brass with the teeth milled to secure a good fit and noiseless operation; the gear case is of



BEVERLY RATCHET CLUTCH.

malleable iron and is attached to the dashboard of the car. The ratchet clutch is in the spindle in the lower part of the case and the device is so arranged that it can be welded to the ordinary brake spindle. The wheel takes little room on the platform and the gear and the ratchet clutch gives a great leverage, as the motorman can work the wheel back and forth from any position the same as he can the ordinary ratchet handle. The device has been in use for the past two or three seasons on a large number of vestibuled cars in New England and in some of the Middle States, and is rapidly gaining favor with street railway managers.

MULTIPLEX ELECTRIC HEADLIGHTS.

It is a well-known fact that the use of electric headlights is much more convenient and economical for street railway purposes than is the use of the now out-of-date oil headlight, and it is equally a recognized fact that the light from an electric headlight consisting of a 16-c. p. lamp and a parabolic reflector is not much more than the light obtained from the lamp itself. The reason for this is, that a true parabolic reflector requires the source of the light to be practically a point, such as an arc light produces, or as is produced in less degree by a brilliant oil light.

Therefore, a regular locomotive headlight with an oil lamp will always be more efficient than the same headlight would be, fitted with an incandescent electric lamp of equal candle power, because the reflected image of the latter is very much distorted and out of focus. The light of the oil lamp is more condensed and consequently most of it is in proper focus with the parabola, while but a very small portion of the light of the incandescent lamp is in focus.

It is for these apparent reasons that the inventor of the "Multiplex" reflector conceived the idea of making a reflector which is adapted to the requirements of the incandescent lamps. The general form of the "Multiplex" reflector is on the lines of a true parabola and the "Multiplex" improvement consists of so altering the form of the parabolic reflector as to form a number of annular and concentric separate reflectors which illuminate the distortion of the reflected image of the incandescent lamp, with the result of a reflector which is several times as efficient as an ordinary parabolic reflector.

"Multiplex" reflectors have now been on the market little more than one year and have attracted the attention of street railway

managers everywhere, their introduction and adoption having been extremely rapid. The cost of headlights fitted with these improved reflectors being on a par with that of ordinary headlights, they are very naturally preferred and adopted in competition with the latter.

For railway headlights they are constructed in accordance with scientific principles. They are spun out of brass of heavy gage, and consist of a series of convex or concave corrugations of shape, size and radius varying with the style and kind of light to be used in combination therewith. They are polished, heavily silver plated, and then burnished, or nickel buffed, and are finished in such a manner as to maintain a lasting brilliancy. Each one of the concave corrugations performs the functions of a separate and distinct reflector, reproducing the light in a greatly magnified and intensified beam, the beams from each corrugation merging into those of the other corrugations, and this multiplication of separate beams of light is the secret of the intense light produced by the "Multiplex" reflector headlights. Two kinds of rays are projected from this reflector. One set forms a bright beam of great intensity, projected in a comparatively small field and penetrating to a great distance, while the other set has a much larger field of less intensity. This feature makes the headlights especially desirable for street railway purposes.

The Multiplex Reflector Co. makes a specialty of furnishing reflector shells to parties who may desire to substitute "Multiplex" reflectors in the cases which they now have. The factory of the company is at Cleveland, O., a convenient and centrally located shipping point for all parts of the United States. The selling agents for these headlights and reflectors are the W. R. Garton Co., Chicago; Western Electrical Supply Co., St. Louis; Morris Electric Co., New York; and Percy Hodges, Boston.

MR. YERKES WILL BUILD LONDON ROAD.

Mr. Charles T. Yerkes has purchased the charter for an underground road in London, and will proceed at once to build the line. The price paid for the charter was about \$500,000. The road is from Charing Cross to Hamstead, and will cost about \$12,000,000. It will be built of American material, by American men with American capital, everything, in fact, about the road will be American except the employes and passengers. It will be of a type representing the highest development of the electric railway art and cannot fail to be a revelation to the British riding public. The third-rail system will be used and special attention will be devoted to ventilation and lighting. The equipment will be something fine, and fast time will be made.

Mr. Yerkes sailed on October 6th for this country, where orders for necessary material will be placed, and everything connected with the construction of the road will be pushed with the utmost possible speed.

ROCK ISLAND ROUTE TO CONVENTION.

A large number of delegates will take the Chicago, Rock Island & Pacific from Chicago and intermediate points to the Kansas City convention. The usual concession is made in rates, which are one and one-third fares (\$16.70) for the round trip. The well known excellence of the Rock Island and its great popularity need no recommendation to travelers who want everything the very best. The train leaving Chicago at 5:45 p. m. carries buffet, library, smoker and dining cars. Reservations and further information can be had of any of the following agencies: Chicago, 91 Adams St.; New York, 305 Broadway; Boston, 200 Washington St.; Philadelphia, 111 South Ninth St.; Pittsburg, 415 Park Building; Detroit, 11 Fort St., West.

RELIEF ASSOCIATION AT WASHINGTON.

The officers and employes of the Washington (D. C.) Traction & Electric Co. are planning to form a relief association for the benefit of the 950 men employed on the system. President Stevens has promised to give \$1,000 as a nucleus for the insurance fund.

The Rockford (Ill.), Beloit & Janesville Electric Railway Co. has filed a bond to insure the construction of the road.

NEW CARS FOR ALBANY & HUDSON RAILWAY & POWER CO.

The accompanying illustrations show two styles of cars recently built by the Wason Manufacturing Co., of Springfield, Mass., for the Albany & Hudson Railway & Power Co., which has a 40-mile third-rail line connecting Albany and Hudson, N. Y. The cars have overhead trolleys, as well as shoes for taking current from the third rail, as they operate over the local street railway

the ceiling at intervals of about 4 ft. The buffers are curved angle bars, and are braced by the wooden floor beams and by two steel channels extending in a flaring direction and bolted to the platform timbers.

The summer cars are 53 ft. 6 in. long over the buffers and 52 ft. over the vestibules; the body proper is 43 ft. long, 8 ft. 6 in. wide, and 9 ft. 2 in. from the bottom of the sill to the top of the roof. The weight of the car body is 27,763 lb.; trucks, 15,900 lb.; electrical equipment, 12,600 lb.; air brake equipment, 1,465 lb.;

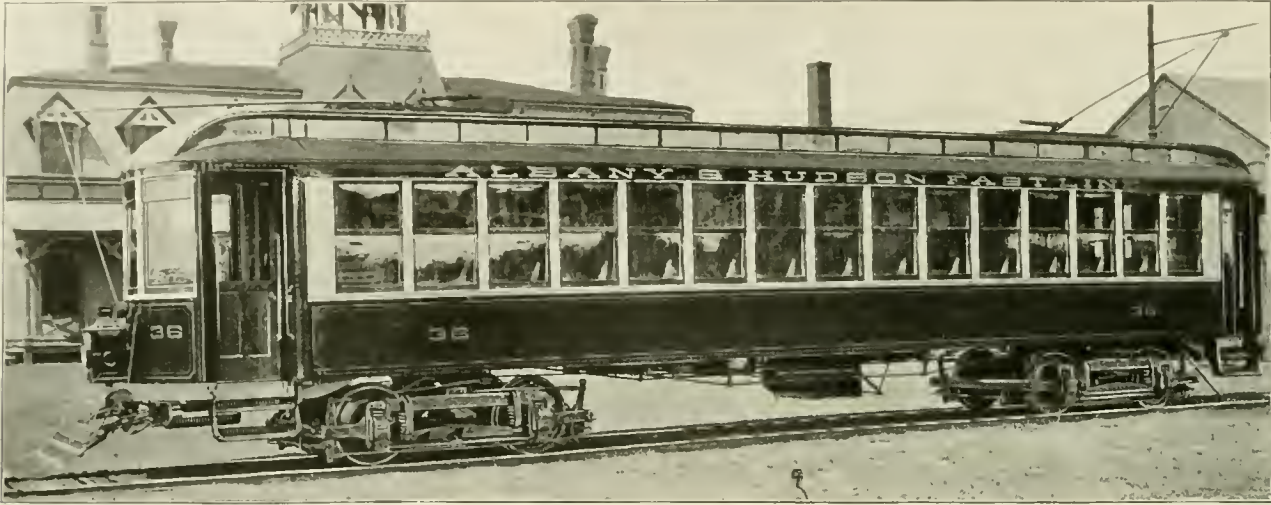


FIG. 1—SUMMER CAR FOR ALBANY & HUDSON—WASON MANUFACTURING CO.

tracks in Albany and Hudson. There are 10 summer cars, Fig. 1, and 8 winter cars, Fig. 2; of the winter cars 5 are full passenger and 3 combined passenger and baggage cars. The trucks are the Brill No. 27 extra heavy, the type developed by the J. G. Brill Co. for operation over T rails at high speed, while also suitable for the grooved rails in cities. The summer cars each have four G. E. 57 motors, 50 h. p. each, and K-14 controllers; the winter cars have four G. E. 51 motors, 75 h. p. each, and L-4 controllers. All cars have Christensen air brakes, with motor compressors, the compressors being housed in under the floor near the middle of the

total, 57,728 lb. This is heavier than the standard passenger coach of the Boston & Albany R. R., which weighs 52,000 lb. The window sashes are in two parts, and drop into the walls of the car flush with the coping. The vestibules have low side doors and curtains; the windows are shaded with ordinary duck curtains, which roll up. The interior finish is in white ash, white grained, while the ceilings are of light colored bird's eye maple simply decorated. Double sliding doors are provided at each end, giving a clear opening of 36 in. The cross seats are of the Wheeler patent type, made by the Haywood Brothers & Wakefield Co., of Wake-

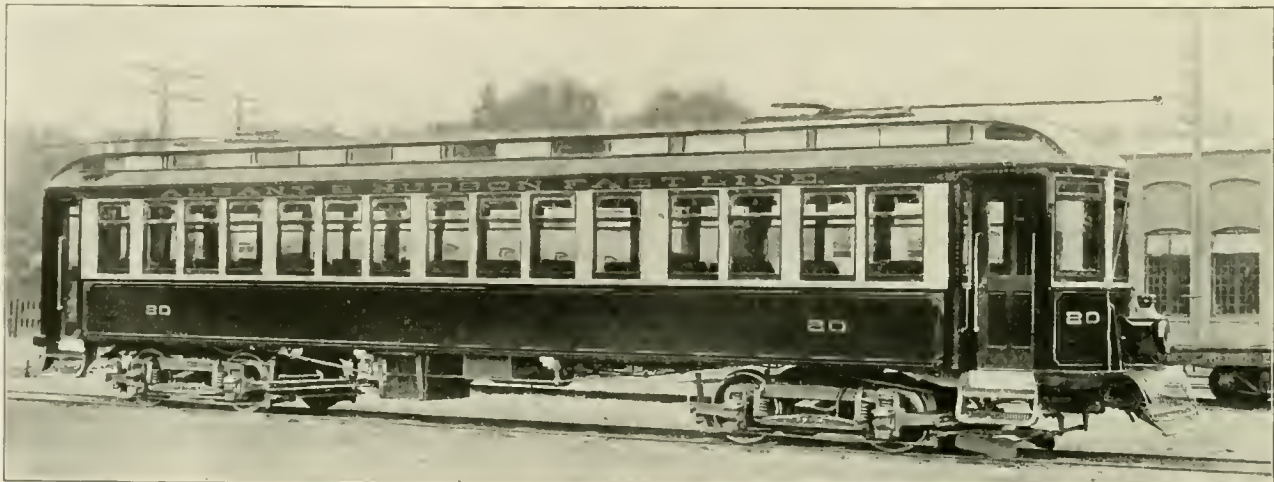


FIG. 2—WINTER CAR FOR ALBANY & HUDSON—WASON MANUFACTURING CO.

car; also, ordinary ratchet hand brakes. They also have Providence fenders, and track sanding devices made by the American Locomotive Sanding Co., of Philadelphia, using compressed air. For lights there are 15 single keyless electric lamps on each side along the ventilator stringers, and two candle lamps at each end for use in case of failure of the lighting current. The registers are the Meaker duplex type; the two register cords and the bell cord are carried above the center of the aisle, being strung through rings at the lower ends of thin flat bronze strips, which depend from

field, Mass. The seats and backs of the summer cars are of wooden slats, and have corner grab handles.

The winter cars are divided by glass partitions into two compartments, one for smokers, and are to be run one way all the time, smoker end forward. They have 15 windows on each side, and the lower sash is designed to drop into the wall of the car. The interior finish is in mahogany, with paneled ceilings to the windows, finished in special marquetry design at the posts; the upper sashes are provided with embossed plate glass windows.

The ceiling is painted and decorated with tasteful designs. The cross seats are of the same type provided for the summer cars, and are upholstered in carpet, and provide seating capacity for 60 passengers. The ventilator shifting device is a rod and lever arrangement recently designed by the car builder, by which the ventilators can be operated from the rear end of the car. These cars have Perry ventilators, designed by E. S. Perry, of New Bedford, Mass. There are call buttons on the posts, and corrugated rubber floor mats. The additional equipment includes Consolidated electric heaters and Dorner & Dutton track scrapers. The total weight of the car is 59,700 lb.

The sills are reinforced by steel trussing; there are no steel plates used with the sills. The steps are of the double Stanwood type. Besides the ordinary grab handle at the ends an outriggered wooden vertical handle is provided against the end of the car. The gates are of the Wood type, made by the R. Bliss Manufacturing Co., of Pawtucket, R. I.

The three combined baggage and passenger cars are similar to the other five winter cars, except that a baggage compartment 14 ft. 6 in. long has been partitioned off. This compartment has seats that can be used if needed.

There are also two 43-ft. cars for express or freight; these are really electric locomotives, and have M. C. B. couplers. The express cars have side doors near the center 5 ft. in width.

DAMAGES FOR JOINT USE OF TRACK.

There has been much litigation at Atlanta, Ga., concerning the exclusive right of the Atlanta Railway & Power Co. to operate street railways. As we understand the situation the predecessors of the Atlanta Railway & Power Co. had the exclusive right to operate street railways over streets already so occupied by it, for a term of 30 years from Jan. 1, 1806; and that in consideration of an ordinance granting permission to change the motive power the companies agreed to submit to the condemnation of their tracks under certain conditions.

The Atlanta Rapid Transit Co. sought to condemn portions of the tracks of the Atlanta Railway & Power Co. for joint use, and three separate suits were begun. The matter was referred to three assessors. The portion of the assessors' report considering the elements of damage is as follows:

1. That the Atlanta Rapid Transit Co. shall pay the cost of the special work and the readjustment of tracks to suit the present situation.
2. That it shall be the duty and obligation of both companies to bear in equal proportion—that is to say, one-half each—of the cost of maintenance during joint occupancy, and what we mean by maintenance includes renewals necessary to keep the track and appurtenances connected therewith in good condition.
3. That upon abandonment of the joint use of these tracks by the Rapid Transit company the street railway structure shall belong to the Power company.
4. That the Atlanta Rapid Transit Co. shall pay to the Atlanta Railway & Power Co. for a one-half interest in the use of the property condemned, the sum of \$1,078.85, and for interference and damage to its property, and interference with its exclusive right, the sum of \$3,500.

In the other two suits the awards were \$1,221.48 and \$740.40 for the use and \$1,000 and \$3,000 respectively for damages. One of the assessors dissented as to the award, but concurred in the reasoning of the report, while another dissented as to the reasoning but concurred in the amounts. Appeals were taken in all three cases by the Rapid Transit company.

C., B. & Q.'S FINE SERVICE TO KANSAS CITY.

Three fast trains daily leave Chicago for Kansas City on the Chicago, Burlington & Quincy R. R., one at 6:10 p. m., arriving in Kansas City at 8:40 a. m. This train, which offers unsurpassed accommodations, comprises buffet, library and observation cars, high grade sleepers, and dining cars in which meals are served a la carte. Special arrangements will be made to accommodate all delegates to the street railway convention at Kansas City, October 16th to 19th, and their guests. Application for accommodations or for special cars should be made to F. E. Bell, city passenger agent of the Burlington Route, 211 Clark St., Chicago.

ADVERTISING IN STREET CARS.

BY GEORGE KISSAM.

(Mr. Kissam is the senior partner of George Kissam & Co., a firm which does a more extensive business in street car advertising than any other in the world.—Ed.)

Nowadays when street railways are projected the possible income from advertising in the cars is always considered, and in many cases it is put too high. Fifteen years ago there was very little advertising seen in the cars, and it was of a character vastly different from the present display; the cars and advertising have both advanced materially in that period.

The late Mr. Wm. F. Carleton, of Boston, was really the pioneer of legitimate street car advertising, and his methods were of a character to induce a rapid increase of this business by reason of the fact that they were agreeable and profitable to both the street railway companies and the public. In the early years of his career Mr. Carleton made money rapidly as he had exceptional ability to secure advertising contracts, but he was compelled to expend thousands of dollars in the purchase of advertising racks to equip the various cars controlled by him, all of which capital and much more invested by Carleton & Kissam was practically sunk forever.

In the early days of street car advertising contracts were plentiful at good rates, but as the cars increased rapidly the demand for space did not keep pace with it, there was no particular trick in selling space in a thousand cars, but ten or twenty thousand car contracts are like century plants and bloom about as often.

Few railroad officials are aware of the amount of time, work and expenditure involved in securing advertising for street cars; it takes years sometimes to close a deal, many costly designs by the best lithographic artists, reading matter evolved by writers of national fame, who must condense their copy and keep it absolutely free from even a word that might be offensive to the passengers, solicitors who must be paid liberal commissions and who are depended upon to induce the prospective advertiser to use street car space. The competition of other advertising mediums is very keen, and inducements are offered and prices made that, in many cases, place the buyer of space in a position to dictate the price of street car advertising and pay considerably less for it than the railway companies actually receive from the lessees. This state of affairs has been largely brought about by the competition for privileges of the various street car advertising concerns and by the erroneous idea of what the advertising should bring on the part of railway officials.

It is a fact that since 1803 hardly any of the advertising companies have made any money, several have "gone up" leaving unpaid rentals and some have been on the "ragged edge." The concerns with large capital have hung on hoping for better rates and reasonable terms from the railway companies. Eighteen hundred and ninety-nine was a good year for all, but it would take several good years to make up the losses sustained previously. The large lessees of advertising privileges—and they could be named on the fingers of one hand—must have plenty of capital to carry on the business, the outlays for labor, office expenses, commissions and rentals are all cash down and in advance, while the receipts are necessarily of a credit nature with the accompanying losses.

Open cars are the bane of street car advertising concerns; during the months of their operation there is a certain loss to be faced, the transverse seats make it difficult to see the advertising cards, and many regular buyers of space eliminate the summer months in consequence; the cars are usually longer than box cars and cardboard to keep the spaces full is quite an item of expense.

Many roads are building long box cars with transverse seats and center aisles; these are open to the same objection, though in a milder form; but they are not desirable because railway officials imagine that because they are longer more should be paid for them. If the railway men knew how hard it was to sell 20 spaces in a car they would faint at the prospect of selling 30 or 32. As a matter of strict fact these long cars (unless every car is long) are a two-edged sword in respect to selling space; the spaces must be kept full of something unproductive, and the companies' idea of their value is based on their length.

Small plants of from 10 to 30 cars are almost invariably unprofit-

able to the lessee, the experience of all is singularly similar in this respect. The first year is a good one, then the local merchants drop out like a drove of sheep and the large general advertiser, the backbone of street car advertising, does not want the small towns, yet the railway companies controlling these plants expect to receive the same price per car yearly as is paid in large cities.

The lessees of large plants are compelled for self-protection to carry many of these small places at a loss or with the prospect of their being consolidated in the future with plants of a larger number of cars; when this does not occur the small town shows an invariable loss, and is not only an expensive luxury, but an annoyance, as well, for the lessees of reputation must keep these cars looking well. To do this properly requires frequent visits by men of experience, an experience that takes years to acquire, even though it "looks easy enough to put the cards in" to an outsider.

Some companies have experimented with running the advertising themselves, and some have been quite successful (apparently) the first year, but experience has shown that there is a vast difference between running an advertising business and a street railway, and the invariable sequel has been to make a lease with some one who understands street car advertising and how to run it properly. In this connection it is proper to say that far seeing and experienced street railway officials prefer to contract with concerns who understand the requirements of street railways and adapt the advertising to existing conditions, than they do with amateurs or people who imagine the business an easy one and offer more for the privileges than those who know its real worth can afford to.

To run street car advertising properly requires years of experience. The appearance of the cars, reading matter and illustration of the advertising must be of a character pleasing to the public; the railway companies must not be hampered or annoyed, and the work is necessarily done at hours and places not to interfere in the slightest degree with the road's management. This means running the business agreeably to all, those who do it usually find the street railway officials in harmonious mood.

There is one grand underlying principle which the railway officials should consider, that it is for their interest the lessee should make something on his contract, otherwise the old proverb of "killing the goose that laid the golden egg" is bound to be exemplified; the men who devote their time, capital and energies to procure advertising in the street cars should enjoy a fair profit on their investment and efforts, otherwise it is only a matter of time when they either fail or retire from the field.

In a sense the street railway companies are special partners of the lessee; any special partner in other business would be glad to realize 20 or 25 per cent on his capital and assume all business risks. The street railways, when dealing with responsible parties, assume no risks and receive from 50 to 90, and sometimes over 100 per cent. They are put to no trouble except to receipt bills and draw sight drafts for rentals; the advertising space used in the cars is of no practical utility so far as running the roads is concerned, so the revenue thus derived is, in a certain sense, "velvet."

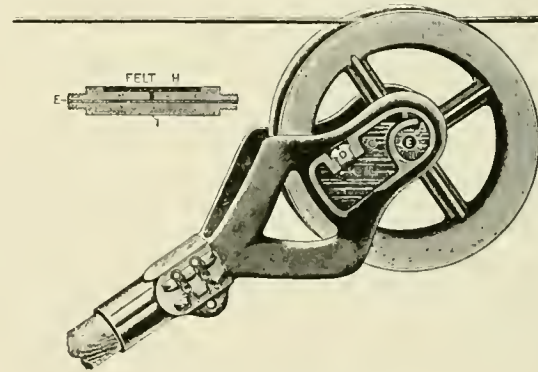
A phase of the business that street railway presidents should carefully consider and analyze is "malicious bidding" for the advertising privileges by so-called advertising companies and piratical individuals, who have no idea of taking the cars, and only bid to compel the lessee to pay a higher price than it is legitimately worth, so they can gratify their malicious spirits or get revenge for fancied injuries. The respectable and responsible concerns engaged in street car advertising have been considerably annoyed by these pirates, and in many cases put to great trouble and financial loss by reason of their illegitimate bidding. Let railway officials carefully study the apparently attractive letters they receive in reference to their advertising privileges, analyze them thus: Do they come from a distant city, do they treat somewhat bombastically of the writer's great responsibility, and practically contradict it by offering to put up surety bonds? Let the manager hesitate and ask himself why they should want cars out of their territory; why offer bonds if they're good. Maliciousness and want of good faith are apparent in the one case, bluff in the other; they may succeed in compelling the old reliable tenant to pay more and lose money, but when a new lease is made, is it logical to suppose the said old lessee will continue unless he gets a fair deal? If these "malicious bidders" should succeed in driving out the old lessee they will find

a way to squirm out of closing a losing lease, or if they should take the cars they immediately proceed to sell to the advertising public a number far in excess of what are run; this swindle goes on until detected, often involving the railway company in considerable trouble. Is it worth while for the sake of a few more dollars (offered) to take the chances here alluded to or possibly worse? Any concern capable of malicious bidding and over selling cars will be capable of any other crooked action. Is it not better to "let well enough alone" and stick to the "old reliables," whose contract means sure money and no annoyance?

"EXCELSIOR" TROLLEY HARP.

The "Excelsior" self-oiling trolley harp has come to be well-known in the trade, and is now being used by over 25 of the large electric railway systems of the country. An excellent testimonial as to the merits of this harp is the fact that the largest users of it are roads operating heavy cars at high speed; among these are the Cleveland City Ry. and four of the Cleveland interurban roads, the Detroit Citizens and three of the Detroit interurbans, the interurbans at Toledo, the Mill Creek Valley Street Ry., the Cincinnati Street Ry.

The harps are made in three sizes, for 4, 5 and 6-in. wheels. The 4-in. size is made of brass, but the larger sizes, where the



"EXCELSIOR" TROLLEY HARP.

weight is too great in brass are made of aluminum; the 4-in. harps will be made of aluminum if desired. The self-oiling feature is readily understood by examining the illustration. The main reservoir C is filled through oil filler holes D. The auxiliary reservoir A is filled every time the trolley pole is lowered, and the partition B holds this supply around the end of the axle through which the oil is fed to the wheel by way of passage E centrally bored through the axle. In a slot on the axle is placed a piece of "piano" felt to distribute the oil and prevent too free a flow.

These harps are made by the International Specialty Co., of Detroit, which makes the following claims for the harps: They effect a saving in oil and at the same time efficiently lubricate the wheel. They are noiseless and cleanly. Having no bushing to wear, the wheel runs true. The oil is fed by gravity and reaches the bearing where it is needed.

LACKAWANNA LIMITED TO CONVENTION.

The Lackawanna Railroad announces its facilities and calls attention to the mountain scenery afforded by its route from eastern points. The limited leaves New York daily at 10 a. m., crossing the Delaware and the Blue Ridge Mountains at noon. Binghamton is reached at 3:20 p. m. and Buffalo at 8 p. m.; from Buffalo the run is made over the Wabash lines, reaching Detroit at 2:40 a. m., and St. Louis at 2 o'clock in the afternoon. At 9:30 p. m. the train arrives at Kansas City having made a run of over 1,400 miles in less than 36 hours. Sleepers, dining cars and all equipment are strictly first class. Tickets are sold on the certificate plan, one and one-third fare for the round trip.

Reservations can be made of H. J. Ball, 429 Broadway or Guy Adams, 26 Exchange Place, New York City; M. L. Smith, Scranton, Pa.; W. C. Brayton, Syracuse, or F. P. Fox, Buffalo.

NEW INTERURBAN LINES IN CHICAGO TERRITORY.

Electric interurban interests are quite active at the present time promoting new lines in the vicinity of Chicago, there being one such line approaching completion, one well under way and three others which seem certain to be built.

The Joliet Railroad Co., of Joliet, Ill., has for two years been operating a line to the town of Lockport, about five miles distant, where the controlling works of the Chicago drainage canal are located, and about a year ago a further extension to the town of Lemont was planned. The idea originally was not to extend the system beyond Lemont, but the numerous excursions from Chicago to the drainage canal, and the lack of proper facilities for easily reaching the various points of interest led the American Railways Co., which controls the Joliet company, to decide upon a line to Chicago. The first car was run over the Lemont extension on September 17th, and the hope is that the track can be laid to connect with the Chicago lines before winter stops the work. The line, when completed, will be 30 miles long, and open up what is believed will prove a desirable suburban residence district in the Desplaines Valley. The route keeps close to the drainage channel, and this fact insures a heavy excursion business in summer. In Chicago the line will connect with the Chicago City Ry. at Archer Road and 59th St. From this point a branch will extend north and connect with the Suburban R. R. in Lyons, thus making the Joliet road accessible from the west, as well as from the south side of the city.

Grading for the Aurora, Wheaton & Chicago Electric Ry. was begun on September 18th, and the work is to be pushed as rapidly as possible. The route of this road is from Aurora to Wheaton, the county seat of Du Page County, via Eola and Warrenville, and thence to Chicago, where it will connect with the Metropolitan Elevated at W. 48th St. From Aurora to Wheaton is about 14 miles, and from Wheaton to the connection with the Metropolitan is about 18 miles. There are a number of cuts and fills on the line, some being 25 ft. deep; though there are 11 railroads on the route, only two or three of the crossings will be at grade. Messrs. L. P. Wolf and U. P. Hord are the principal local promoters of this line, and they expect to have it in operation before the winter of 1901. This is the road in which Mr. Henry A. Everett and his Cleveland associates are largely interested.

The Illinois & Rock River Railway Co. has been organized with a capital of \$1,000,000 to build a 64-mile line along the Rock River from Sterling north to Rockford. Most of the necessary franchises have been secured and grading will be commenced after the election, so that a portion of the road is expected to be in partial operation by spring. Mr. Glenn E. Plumb, formerly president of the Chicago General Railway Co., is the principal promoter.

The two other interurbans projected in the territory directly contributory to Chicago are the Waukegan, Fox Lake & Western Electric R. R., of which R. D. Wynor is president, and the Rockford (Ill.), Beloit & Janesville (Wis.) Electric Ry. It is expected that the former road will be graded so that track laying can commence by May 1, 1901, and a forfeiture bond has been filed to insure the construction of the Rockford-Janesville line.

NEW HAVEN REGISTERS.

One of the interesting exhibits at the street railway convention in Kansas City will undoubtedly be that of a register which in actual use on quick running wood working machinery has registered nearly eleven million times. This machine will be exhibited by the New Haven Car Register Co. at its space, No. 65. The company advises us that this number of registrations is many more than would be made on any street railway in over 100 years, and that the test is a much more severe one than the same number of registrations made in actual service on any street railway. The machine is still unimpaired for regular service, which speaks volumes for the great wearing qualities of the New Haven fare registers. The company will make a full exhibit of its widely-known single, double and triple registers, both round and square, such as are in daily operation on the leading railways in all sections of this and foreign countries.

REPORT OF UNION TRACTION, PHILADELPHIA.

The Union Traction Co., of Philadelphia, makes the following report for the year ending June 30, 1900, which shows an increase in receipts and expenditures over the previous year:

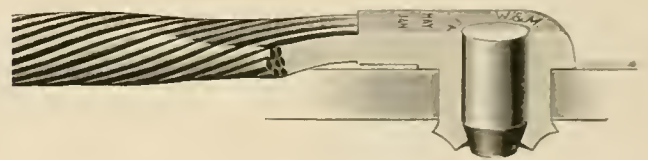
	1900.	Increase.
Receipts from operation.....	\$12,971,291	\$1,202,133
Operating expenses.....	5,624,898	831,532
Net receipts.....	7,371,392	370,991
Other receipts.....	253,528	11,111
Net income.....	7,624,921	382,029
Fixed charges.....	6,680,990	61,073
Surplus.....	938,021	320,947

At the annual meeting on September 19th, Charles O. Kruger was elected a director to fill the vacancy caused by the death of James McManes, and the following directors were elected: Thomas Dolan, William L. Elkins, Alex. M. Fox, John B. Parsons, William H. Shelmerdine, Alfred Smith, J. J. Sullivan, P. A. B. Widener, George D. Widener, George W. Elkins and Alex. Balfour. Resolutions were adopted commending President Parsons and other officers for the way they have managed the affairs of the company during the past year.

CROWN RAIL BONDS.

The simplicity of the "Crown" bonds furnished by the Washburn & Moen department of the American Steel & Wire Co. is doubtless the key to their widespread adoption in the construction of electric railways and tramways. Taking it for granted that the copper of which these bonds are made is of standard conductivity, and that the company is able to furnish every style of bond, solid or flexible, for bonding over or under the fish plates, under the rails, or for cross-bonding, the simplicity of application is a reason for the popularity these bonds have attained.

When it is noted that the work of applying "Crown" bonds is all done on one side of the rail, and that only one man is required



CROWN RAIL BOND.

to handle and properly attach the bond, the economy effected on the score of labor alone is a very considerable item in every mile of bonding and accounts for the claims made by this company that unquestionably more "Crown" bonds are in use on electric railroads than bonds of all other patterns combined. Perhaps one of the greatest labor saving points in connection with this type is in re-bonding work. The ability of one man to handle the re-bonding without assistants is a point in economy which cannot be overlooked by street railway superintendents and contractors.

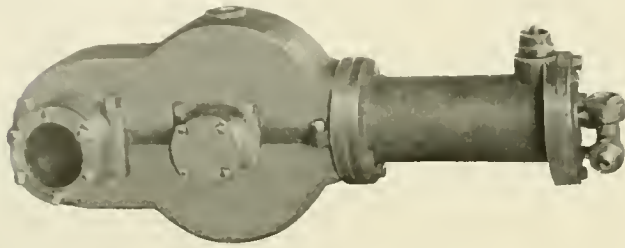
A catalog or little booklet on "Crown" bonds will be sent free to anyone writing for it to the American Steel & Wire Co., at either the Worcester, New York or Chicago offices, and the company will be glad to extend the services of its expert electrical engineers to facilitate by suggestions the settlement of all questions regarding bonding, line wires, feeders, whether aerial, underground or submarine, and other electrical work for lighting or power plants.

The Cleveland, Berea, Elyria & Oberlin Railway Co. is now using at its outing resort, Puritas Springs, a starting bell that 25 years ago served to announce the leaving of the single horse car that comprised the rolling stock of the street railway of Berea in those days.

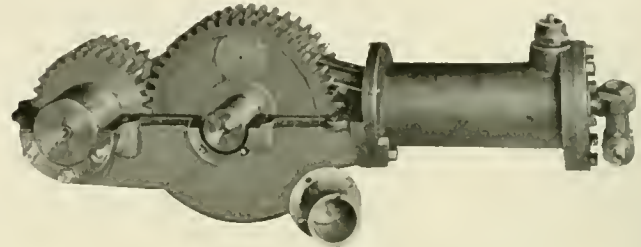
KNELL AIR BRAKE FOR STREET CARS.

The accompanying illustrations show the air compressor and the general arrangements of an air brake system for street cars recently patented by Mr. W. F. Knell, of Battle Creek, Mich.

From the two views of the compressor, one with the upper part of the gear case removed, the general arrangement of the parts



AIR COMPRESSOR.



COMPRESSOR WITH TOP OF CASE REMOVED.

is readily apparent. The gear case is dust proof and partially filled with oil, which the motion of the crank carries to every part of the interior, lubricating the crank pin, crosshead pin, cylinder and gears. All these parts are carefully made and fitted; being amply strong and with bearing surfaces large and well lubricated, the wear will be found slight and the repair bills small.

At the front end of the pump is an automatic pressure regulating valve. The mechanism of this valve is such that a uniform pressure is maintained in the reservoir. When the pressure in the reservoir reaches the desired point, usually from 60 to 80 lb., depending a great deal on the speed and weight of car and the conditions under which a service stop has to be made, the automatic valve goes into operation and maintains the pressure in the reservoir

The Michigan Traction Co., of Kalamazoo, Mich., has been making a trial of the Knell air brakes and advises us that they have been most satisfactory in service.

SANTA FE ROUTE TO CONVENTION.

Two fast trains daily over the Santa Fe route will afford excellent accommodations for delegates or visitors to the convention at Kansas City October 16th to 19th. Trains leave Chicago at 6 p. m. and 10 p. m. over this route, arriving in Kansas City at 8:30 and 10:30 a. m. respectively. Both trains carry palace sleepers and dining car. Three special sleepers have been engaged, one being for Mr. A. S. Littlefield and party, to leave at 10 p. m. October 15th.

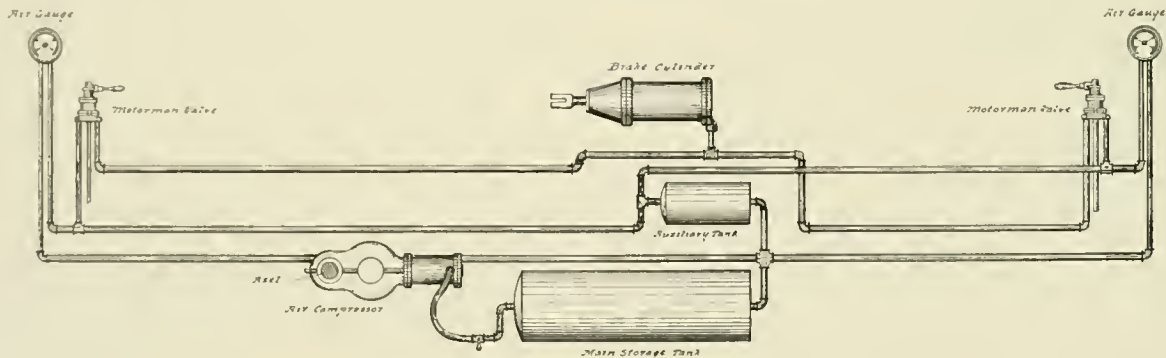


DIAGRAM OF KNELL AIR BRAKE EQUIPMENT.

at that point until air is taken from the reservoir for use in the brake cylinder.

During the time that the air from the reservoir is maintained at the desired pressure by the action of the valve, the pump is released from all duty, simply working back and forth, but exerting no pressure against the air contained in the reservoir, and simply "pumping the atmosphere" through an open port in the automatic valve, the air being forced through the same port to the atmosphere again.

As soon as the pressure in the reservoir has been reduced by an application of air, the automatic valve is instantly released and the pump goes into operation, and in a few revolutions raises the pressure to the maximum point, when the valve again operates and the pressure is maintained in the reservoir until it is reduced by another application of the brakes.

The line drawing shows diagrammatically the arrangement of the apparatus. Pipes lead from the reservoir to each platform, and thence back to the air brake cylinder; in the bends are inserted the motorman's valves.

The advantages claimed for the system are: Simplicity. The wearing parts run in oil, securely protected from dust and dirt, thus ensuring durability. Low weight, from 350 to 400 lb. for a complete equipment. Constant supply of air at full pressure, being always ready for any number of emergency applications in quick succession. Positive and instantaneous release of brakes under

Representatives of the General Electric Co. have chartered a special car, and another has been engaged for a party of prominent officials of different street railway supply companies. Mr. J. M. Roach, president, and Mr. T. C. Pennington, secretary and treasurer, of the American Street Railway Association, have arranged for accommodations over the Santa Fe route, as have Mr. J. G. McMichael, president and treasurer of the Atlas Supply Co., for himself and party, Mr. C. K. Knickerbocker of the Griffin Wheel Co., Mr. Brazier of the Laughlin Brake Shoe Co., Mr. Finney of the Curtain Supply Co., and many others. Application for accommodations should be made to J. M. Connell, general agent passenger department, Santa Fe Route, 109 Adams St., Chicago.

The Indianapolis Street Railway Co. intends to keep its park open all winter, and the merry-go-round and some of the other features will be operated regardless of the temperature.

In exchange for a renewal of its franchises for 25 years the Columbus (O.) Street Railway Co. offers to pay \$40,000 cash and a percentage of the gross receipts beginning at 2 per cent and gradually increasing to 5 per cent. It will also sell 28 tickets for \$1, good at all times, and will give universal transfers. The company further agrees to make the experiment of selling workingmen's tickets good morning and evening at 32 for \$1, but if the receipts show a falling off it will not continue this rate.

TWO INTERESTING CARS.

The illustrations herewith show two interesting cars recently turned out by the J. G. Brill Co., of Philadelphia. The closed car, which is one of the standard American types, is one of a number built for the Brooklyn City & Newtown Railroad Co., of Brooklyn, and is for the run between New York and Coney Island. Being intended to some extent for special service, there

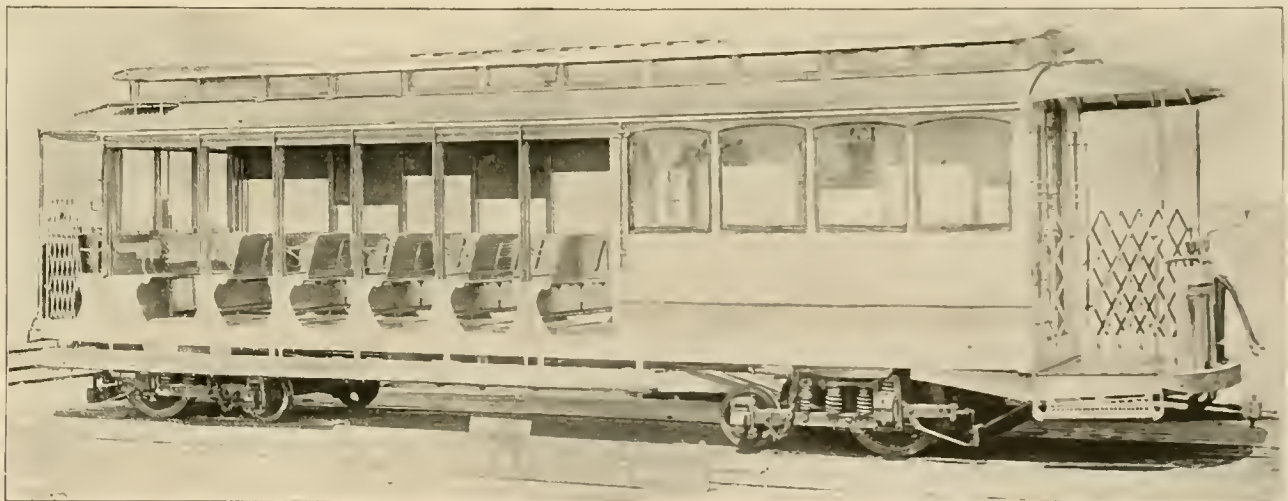
Government Tramways, it is the modified California type, similar to that adopted by the Metropolitan, of New York. The cars are intended to be operated in trains of two each, the closed sections being next to each other; no means of passing from one car to the other are provided, and a train crew consists of a motorman and two conductors. Brakes, controllers, etc., are operated from the open end of the forward car. The general dimensions are: Length over dashers, 36 ft. 4 in.; width at sills, 6 ft. 5 $\frac{1}{4}$ in.; width



A STANDARD AMERICAN CAR J. G. BRILL CO.

are some features in which the design differs from the usual type; perhaps the most noticeable is the absence of vestibules. The car body is 25 ft. long, with 4-ft. platforms, giving a length over the dashers of 33 ft.; the width is 6 ft. 10 in. at the sills and 7 ft. 6 in. over the posts. The seats are longitudinal, of cherry slats covered with Wilton carpet. To permit the car to be used in winter a stove is provided. The body is strengthened with truss rods pass-

over posts, 7 ft.; length of closed compartment, 11 ft. 2 $\frac{1}{2}$ in.; platform at closed end, 3 ft. 11 in.; platform at open end, 3 ft. 8 in. The trucks are the "Eureka" maximum traction, which are arranged to pass a 46-ft. radius curve; a G. E. 1,000 motor is mounted on each truck. The cars have duplex standard air brakes. The arrangement of seats, steps and drainage pipes through the grab handles is quite similar to that of the Metropolitan Street Ry. cars.



CALIFORNIA TYPE CAR FOR AUSTRALIA.

ing over saddles and bearing on needle beams against the bottom of the car. Many of the cars of this general type when for winter use only, have the glass stationary. The trucks are Brill maximum traction, with 33 and 20-in. wheels; each has a No. 49 Westinghouse motor. The details include spring roller curtains at the windows; Brill folding gates, which are hinged to the dasher, instead of to the car body; electric headlights at each end; Brill angle iron bumpers, with 6-in. face; two Brill sand boxes and two gongs. The weight of the car body is 10,500 lb., and of the trucks about 3,250 lb.

The other car is one of a lot built for the New South Wales

In building these cars the Brill company has employed a modification of its ordinary system for the shipment in the white. Electric headlights, angle iron bumpers and Brill folding gates are used.

The hackmen of Detroit, Mich., have asked the city council to pass an ordinance preventing the Detroit Citizens' Street Railway Co. from running its private car Yolande around the city and carrying passengers at 25 cents each for the round trip. They contend the company's franchise does not authorize it to charge more than the regular fare on any of its cars.

PERSONAL.

MR. A. C. MOTT was on September 28th appointed receiver for the Erie (Pa.) Rapid Transit Railway Co.

MR. W. A. HOUSE, manager of the United Railways & Electric Co., of Baltimore, has been making a pleasure trip through the Eastern states.

MR. FRANK E. LOWE, president of the Greenfield (Mass.) & Turner's Falls Street Ry. was married to Mrs. C. F. Towle on September 27th.

MR. CHARLES H. BIGELOW, inspecting engineer of the bureau of surface lines of the Boston Elevated Railway Co., was a "Review" caller last month.

MR. J. G. MILLER has taken the Northwestern agency for the Ajax Metal Co., of Philadelphia, and will make his headquarters in the Marquette Building, Chicago.

MR. E. ADAMS, of Toledo, O., has been appointed general manager of the Sandusky, Bellevue, Monroeville & Norwalk Electric Ry., succeeding Mr. J. D. Parker, resigned.

MR. MAX LOWENTHAL, a well known electrical engineer of New York and a frequent contributor to the electrical press, was married last month to Miss Elizabeth Trier.

MR. GEORGE M. BRILL, of Chicago, has recently returned from Peoria, Ill., and Indianapolis, Ind., where electrical plants for which he is the consulting engineer are being installed.

MR. W. R. MORRISON, in charge of track work on the Wichita (Kan.) Electric Railway & Light Co., called at the "Review" office recently on his way to Joliet, Ill. He is taking a month's vacation.

MR. F. J. J. SLOAT, general manager of the Southern Ohio Traction Co., and his wife will spend three months in California. During Mr. Sloat's absence Mr. Bicknell, auditor of the company, will act in his stead.

MR. C. S. KNIGHT, JR., for the past four years sales agent at Pittsburg for the American Steel & Wire Co., has removed to Chicago and will have charge of the electrical and wire rope department of the same company.

MR. J. W. HARKINS, who enjoys a large acquaintance among power station engineers through his long and successful connection with Wm. Baragwanath & Son, has accepted a position with the Dearborn Drug & Chemical Works, of Chicago.

MR. E. W. GOSS, for several years superintendent of the Middletown (Conn.) Street Ry., has resigned that position and will devote all his time to the Milford (Mass.), Hollister & Framingham Street Ry., of which he has been superintendent since last spring.

MR. T. H. M'LEAN, general manager of the Toledo (O.) Traction Co., was recently the recipient of a silver loving cup presented by the Ohio Electrical Light Association, as a token of the members' appreciation of his interest and hospitality displayed during the recent convention of their association in Toledo.

MR. EDWARD P. SHARP, of Buffalo, has lately become connected with the Bierbaum & Merrick Metal Co., maker of "Lumen" bronze bearings and trolley wheels, as manager of the street railway department. Mr. Sharp has been in the railway supply business for years and is one of the best known supply men in the East.

MR. H. S. COOPER, until last month general manager of the Ithaca (N. Y.) Street Ry., and formerly manager of the Schenectady (N. Y.) Street Ry., has been retained by a prominent syndicate of capitalists as a street railway expert, and will devote his time to examining and reporting upon bankrupt street railway

companies with the view of reorganizing them and placing them on a paying basis.

MR. A. C. VOSBURG, secretary of the New Process Rawhide Co., Syracuse, made a western trip the latter part of September, and reports a fine trade in gears and pinions. Managers are always glad to see him and only wish his visits were more frequent. The noiseless feature of the New Process gears have made them as popular with the manufacturers of automobiles as they long have been with street railway operators.

THE WASHINGTON (D. C.), FREDERICK & GETTYSBURG ELECTRIC RAILWAY CO. has decided to build a new road and has elected officers as follows: President, L. Victor Baughman; first vice-president, D. C. Winebrener; secretary, Chas. C. Waters; treasurer, F. B. Smith; attorney, Wm. H. Hinks. Directors: L. Victor Baughman, John C. Motter, John Baumgardner, Wm. H. Hinks, T. E. R. Miller, C. R. Nutt, F. B. Smith, L. T. Brien, Charles Wertheimer, Isaac S. Annan, D. C. Walker, C. C. Waters, C. E. Cassell, John R. Stoner, D. C. Winebrener, E. R. Zimmerman and Alexander Ramsburg.

OBITUARY.

MR. W. L. HODGE, vice-president of the Butte (Mont.) Electric Railway Co., died at his home in Brooklyn on September 4th.

MR. I. A. KELSEY, a stockholder and officer in a number of New England street railway companies, died at his home in West Haven, Conn., September 24th, at the age of 41 years. Mr. Kelsey was president of the Middletown (Conn.) Street Railway Co., president of the Milford (Mass.), Holliston & Framingham Street Ry., a director of the Winchester Avenue Railroad Co., of New Haven and a stockholder in several other roads.

NEW PUBLICATIONS.

A SYSTEM OF ENGINES. 111 pages. Issued by the Harrisburg Foundry & Machine Works, Harrisburg, Pa.—This concern claims to be the first engineering firm to design and place in successful operation, a complete scientific system of engines, involving a different style of machine for each changed sphere of conditions and service. Its new catalog illustrates and describes in detail each type of the system.

LIGHT ON THE JOINT QUESTION. Issued by The American Improved Rail-Joint Co., Monadnock Block, Chicago.—This pamphlet gives in full the recent decision of the United States Circuit Court of Appeals holding that the general process of cast-welding joints is public property and denying the validity of patents securing to any one person or collection of persons the control of such general process.

YEAR BOOK FOR 1900-1901, of the Armour Institute of Technology, Chicago. Armour Institute was founded in 1892 by Mr. Philip D. Armour, of Chicago, for the avowed purpose of giving to young men and women an opportunity to secure a liberal education. The year book just published gives full information concerning the departments and courses.

BULLETIN OF THE UNIVERSITY OF WISCONSIN. No. 39, "The Chemical Engineer," by Magnus Swenson, special lecturer at the University. No. 40, "Recently Improved Methods of Sewage Disposal," by J. B. Johnson, dean of the College of Mechanics and Engineering. Price 25 cents each.—Mr. Swenson defines the chemical engineer as one who has a very broad and thorough knowledge of the chemistry in his chosen field, a thorough theoretical knowledge of general chemistry, and also such a knowledge of mechanics and engineering as will enable him to be a leader in that particular branch of mechanics where his work lies. The work of the chemical engineer in developing the portland cement and the beet sugar industries are dwelt upon at length and the opportunity which a technical school has for educating men for this comparatively new profession is pointed out.—Prof. Johnson's paper was read before the Science Club of the University and deals with

sewage disposal by chemical precipitation and by bacterial reduction, and gives an account of a number of experiments and practical installations that have been made.

SHOULD WORK BOTH WAYS.

The daily passenger on the street car is usually alive to detect any shortcoming, accidental or otherwise, on the part of the car crew, and frequently makes himself very ridiculous by the loud and pompous manner in which he threatens to report some one. But it is very seldom the thought ever occurs to him of dropping the general manager a line commending some of the many really worthy acts the boys go out of their way to do in helping some stranger or unfortunate person.

On a certain well managed road there was recently posted in all the cars the following sign:

IN CASE OF ANY DISCOURTESY ON THE
PART OF EMPLOYEES PLEASE REPORT
THE SAME TO THE GENERAL MANAGER.

The signs had been up only a few days when a large number of them were found to read thus:

IN CASE OF ANY COURTESY ON THE
PART OF EMPLOYEES PLEASE REPORT
THE SAME TO THE GENERAL MANAGER.

The change occasioned by effacing the first syllable of one word makes a radical change in the character of the request of course, but is suggestive none the less of what the patron can do if he will.

CANADIAN NOTES.

The Halifax Electric Tramway Co., of Halifax, N. S., has declared a quarterly dividend at the rate of 5 per cent per annum on the capital stock. This is the 15th dividend declared by this company.

Another interesting decision regarding Sunday work has been made by the police magistrate of London, Ont. Three employes of the railway company were charged with profaning the Lord's day by sharpening and steeling switch points. The company maintained that, owing to the frequent running of cars, this work could not be done on a week day, nor could it be properly done by night time. The magistrate upheld the contention of the company and released the men.

On September 23d the Niagara, St. Catherines & Toronto Electric Ry. inaugurated a through service between Niagara Falls, N. Y., and St. Catherines, Ont., under most auspicious circumstances. The time schedule calls for 10 round trips per day between the hours of 7 a. m. and 11 p. m. The cars in service on the new system are 50 ft. in length and have smoking and baggage compartments; the coaches are well heated and lighted, and are equipped with high speed motors and automatic air brakes. The work of clearing the land where the new terminal station is to be located, has been started, and will be pushed to completion. This company expects to have a through line between the Falls and Toronto at an early date.

The Chambly Manufacturing Co., of Montreal, Canada, which has recently agreed to supply the Montreal Street Railway Co. with electric power, is now preparing to install the necessary apparatus to enable it to fulfill the contract. The company has secured the services of Mr. Ralph D. Mershon, who for some years past has been the expert for the Westinghouse company in connection with long distance transmission of electricity. Mr. Mershon is now making his headquarters at the company's office at Montreal, but is not in a position to give details of the proposed work until he has given the question some careful consideration. The Chambly company has an extensive water power about 20 miles distant from the city, and will transmit current to the central distributing station in Montreal at 25,000 volts.

At the suggestion of General Manager McLean, of the Toledo Traction Co., a benefit was given at the Casino for one of the veteran conductors who had been ill for several weeks.

TRACK MATERIAL QUOTATIONS.

At a meeting of the steel rail maker in New York on September 20th a substantial reduction in the price of steel rails was made, but the cut was not as great as many of the larger buyers had hoped for or expected. New quotations are as follows: Standard sections over 50 lb. per yard, \$26 at mill, a cut of \$9 per ton, light rails, \$25 delivered; girder rails, \$38 at mill; relaying rails, f. o. b. New York, \$20; track supplies f. o. b. Chicago, splice bars, \$1 35 to \$1.40, spikes, \$1 70 to \$1.80, bolts with hexagon nuts, \$2.10 to \$2.20, with square nuts \$2.00 to \$2.10.

The following quotations on ties have been sent us, all prices being f. o. b. at shipping point. Landsley Brothers & Co., Menominee, Mich., cedar ties, 20 to 23 cents; hemlock, 18 to 20 cents; G. S. Baxter & Co., 18 Wall St., New York City, yellow pine ties, 7 x 9 in. x 8 1/2 ft., 64 cents; 6 x 9 in. x 8 ft., 59 cents; 6 x 8 in. x 8 ft., 53 cents; Perrizo & Sons, Daggett, Mich., white cedar ties, 5 x 6 in. x 7 ft., 23 cents; 6 x 6 in. x 7 ft., 26 cents; 5 x 6 in. x 8 ft., 27 cents.

CHICAGO ELECTRICAL ASSOCIATION.

The fall and winter program of the Chicago Electrical Association includes special papers as follows: "Electric Elevators for Safe and Economical Operation," by Hayward Cochrane; "The Alternating Arc," by C. Wiler; "Roentgen Rays," by W. B. Hale; "Electrical Features of the Paris Exposition," by J. M. Hollister; "Electricity in the Equipment and Construction of a Ship," by C. C. Mattison; "Standardization of Arc Lamps," by H. Almert. The first fall meeting of the association was held on October 5th.

FROM THE EAST TO KANSAS CITY.

For several years past large numbers of delegates from the East in traveling to conventions have used the same route. Special cars and if sufficient numbers warrant, a special train will leave New York at 1 p. m. Sunday, October 14th, on the New York Central. At Albany it will attach the special cars which leave Boston at 10:45 a. m. the same day on the Boston & Albany. Stops will be made at the principal cities on both roads to take on the street railway men from those points. The party will leave Albany at 4:40 p. m., arriving at Cleveland at 3:30 a. m. Monday. From Cleveland to St. Louis the run is over the Big Four, and from St. Louis to Kansas City over the Wabash, arriving at destination at 7:00 a. m. Tuesday, which is the opening day of the convention.

Delegates who desire to visit Chicago can take the Lake Shore from Buffalo, arriving in Chicago about noon and leave at 6 p. m. for Kansas City, arriving there at 8 a. m.

Milton C. Roach, general eastern passenger agent of the New York Central, 1216 Broadway, New York, will make reservations and furnish detailed information. Passengers from Massachusetts should address A. S. Hanson, general passenger agent Boston & Albany Ry.; or local agents of the Boston & Albany.

NEW KIND OF CREATED TRAVEL.

Managers will do well to consider the possibilities of a new source of created business from now until election. It was tried in Chicago last week and pronounced a great success by all concerned.

A political meeting was to be held in a park in one of the suburbs and the local workers conceived the idea of increasing the attendance and interest by inviting numerous political clubs of like faith to join in the good time.

The ward is a large one comprising in all 32 square miles, and to assemble the clans special trolley cars were chartered for the occasion. Forty-five gaily decorated and illuminated cars were required to move the 3,000 guests and the sight was an inspiring one as the long procession of moving colored lights glided along to the music of a dozen bands. At the point where the various sections converged the procession extended over several blocks.

In many places it will only be necessary for the manager to present the plan to the local campaign managers as a decided novelty which is sure to be popular, and afford good revenue to the company.

THE PECKHAM MANUFACTURING CO.

The Peckham Manufacturing Co. has been organized to build new works and take over the business of the Peckham Motor Truck & Wheel Co., which has now grown to such an extent that it is impossible to handle it in the present works. The new works, which will be ready for occupancy about November 1st, are located

of sufficient capacity to care for these as well as other appliances used by electric railways.

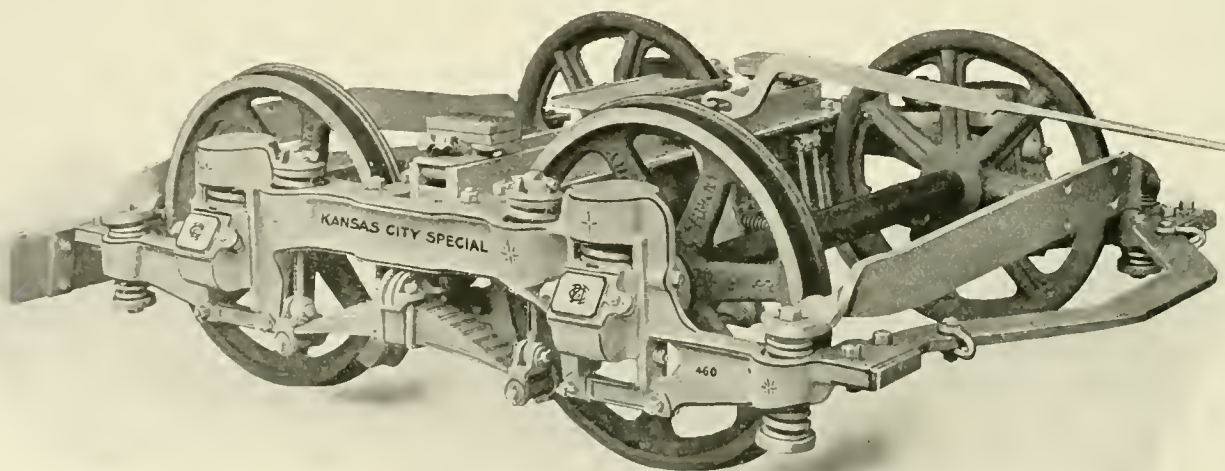
The dimensions of the different buildings are: Main truck building, including stock rooms on each side, 314 x 152 ft.; blacksmith shop, 120 x 70 ft.; power house, 40 x 65 ft.; brake department, 150 x 75 ft.; snow plow department, 200 x 75 ft.; foundry, 140 x 75 ft.; office (two stories), 48 x 48 ft.



WORKS OF THE PECKHAM MANUFACTURING CO.

at Kingston, New York, on the main line of the West Shore R. R., and also have a connection with the Ulster & Delaware R. R. to the river, so that the company can have the benefit of water transportation when desired. These works have been designed with a view of handling the material for the construction of trucks in the most economical manner possible, and are so arranged that the material is so distributed when received, that every move necessary

Peckham's "Kansas City Special" truck is constructed on the same general lines as the Peckham regular 14-B-3 short wheel base truck, the difference being in cast steel side frames which are modified to suit the requirements of the master mechanic of the Metropolitan Street Railway Co., of Kansas City. The changes made are mainly in the construction of the end extensions for supporting the motors, which in this truck are made lower and



PECKHAM'S "KANSAS CITY SPECIAL" TRUCK.

in its manufacture is one leading to the truck erecting department, where by means of a five ton crane, the trucks are loaded on the cars for shipment. The power used is electricity. The capacity of the new works will be 5,000 trucks per year.

In addition to the making of electric trucks, the Peckham company controls the manufacture of the Price friction brake and electric rotary snow plows, and the new works are being constructed

provided with pockets for the motor suspension springs which are located nearer the axle than in the regular 14-B-3 construction, so that the weight of the motors is carried nearer the axles. The end cross bars connecting the two side frames are made flat in this truck, while in the 14-B-3 design they are of angle bar construction.

The bolster of this truck, as in the 14-B-3, is a center bearing

swing bolster carried upon two half elliptic springs, which in turn are carried by coil equalizer springs. Large coil springs are also placed over the journal boxes, thus making three separate sets of springs between the car body and rail, insuring a very easy and steady riding car under all conditions of load. The motors are placed outside of the axles, and the brakes are inside hung, as in the 14-B-3.

HALF FARES.

The Cincinnati Street Railway Co. has declared its regular quarterly dividend of $1\frac{1}{4}$ per cent.

The Lansing (Mich.) City Electric Ry. has decided to install a storage battery in its power station.

"An electric wire on the loose" in Spain means the swinging end of a broken trolley or light wire.

The railroad commissioner of Michigan refuses to permit electric railways to cross steam roads at grade.

The Manhattan Elevated Railway Co., of New York, paid its regular quarterly dividend of 1 per cent on October 1st.

The Peter Cooper Club, of Omaha, Neb., is protesting against a proposition to bond the county to assist an electric railway company.

The Northern Ohio Traction Co., of Akron, O., has reduced the fare between Cuyahoga Falls and Akron from 10 cents to 5 cents.

It is rumored that Brooklyn Rapid Transit Co. will soon pass under the control of the Metropolitan Street Railway Co., of New York.

The Detroit street railways have issued pass badges to their employes in lieu of books of tickets formerly used; the design is copyrighted.

Two attempts were made last month to wreck cars on the Toledo (O.), Fremont & Norwalk Electric Ry. by piling fence rails, ties and large stones on the track.

Mr. C. L. Henry, president of the Union Traction Co., of Anderson, Ind., states that by November 1st cars will be operating between Muncie and Indianapolis.

The Chambly Power Co., of Quebec, Can., has entered into a contract to supply the Montreal Street Railway Co. with 5,000 h. p. continuous current, day and night, every day in the week, for 23 years at \$25 per h. p. per annum.

The Winchester Avenue Railway Co., of New Haven, Conn., has issued an order prohibiting passengers from riding either on the running board or standing between the seats of open cars. This will limit the number of passengers carried to the seating capacity.

Action was brought recently against the Burlington (Ia.) Railway & Light Co. to restrain it from placing cinders between its tracks for the purpose of protecting the paving. It was claimed the cinders washed into the catch basins and formed obstructions in the sewers.

The city council of Tacoma, Wash., undertakes to regulate the speed of cars. A recent ordinance passed by that body provides for a speed not exceeding 6 miles an hour on down grades, 9 miles on Pacific Ave., 12 and 15 miles on residence streets and 20 miles an hour on interurban lines.

The minority stockholders of the Haddonfield Turnpike Co. are seeking an injunction to prevent the Camden (N. J.) & Sub-

urban Railway Co. and the West Jersey Traction Co. from operating cars over the Haddonfield turnpike. It is claimed that the company's rights are infringed by the trolley franchise.

A long interurban car on one of the western electric roads last month ran into a cow that was wandering down the track in search of greener pastures. The car was not badly damaged but, to quote one of George Stephenson's sayings, "it was awkward for the cow."

One of the objections urged against an ordinance at New Orleans providing for separate street cars for white and colored passengers, is the difficulty of deciding where some of the wealthiest white people in the city who are known to have negro blood in their veins would ride.

An attempt by minority stockholders of the Reading (Pa.) Passenger Railway Co. to have the lease of that property to the Reading Traction Co. set aside because of inadequate consideration, has failed. The consideration was \$1, but the court failed to find any evidence of conspiracy or wrong doing.

The Syracuse (N. Y.) Rapid Transit Railway Co. has prepared plans for building a second story over a portion of one of its car barns, and will move its offices. This arrangement will enable the company to concentrate the supervision of the road, and also to save the rental now paid for offices.

The franchises of the Seattle-Tacoma Railway Co., organized to build an interurban road between Seattle and Tacoma, have been sold to a syndicate headed by Jacob Furth, of Seattle, Wash., George B. Blanchard, of Tacoma, Wash., and W. C. Forbes, of Boston. It is said the project will be carried out at once.

The United States Circuit Court has been asked to issue an injunction restraining the Newton (Mass.) & Boston Street Railway Co. from complying with the provisions of an act requiring street railroads to carry public-school children at half fare. The petitioner alleges that the act is class legislation as it affects public-school children and not others.

One of the exhibits at the trial of a suit brought against a street railway company in Tennessee to recover for personal injuries was a photograph taken several months after the accident. For this occasion two cars were placed as near as possible in the same position they occupied at the time of the mishap and a man was placed between them on the spot on which the injured person stood. The photograph was used in explaining the case to the jury.

The Supreme Court of Kentucky has held that a company selling electricity to a street railway is responsible for the maintenance of the wires of the latter in a proper and safe condition. The view taken by the court is that electricity is unlike any other dangerous matter or force and that its control remains with the hand controlling the dynamo; therefore the producer must see to it that the wires to which current is supplied are in a safe condition.

CHANGE IN LEAVING TIME FROM THE EAST.

As the last form of this issue is going to press we are advised that arrangements for the accommodation of Eastern delegates to the Kansas City convention, as given on page 621, have been changed. The New York Central & Hudson River R. R. will run a special train leaving New York at 10:00 a. m. Sunday, October 14th, arriving in Kansas City at 9:30 p. m. Monday, October 15th, making but one night on the road. Other leaving times are as follows: Albany, 1:30 p. m. Sunday; Buffalo, 7:40 p. m. (Central time) Sunday; Cleveland, 12:10 a. m. Monday; St. Louis, 2:15 p. m. Monday. Regular train leaving Boston at 10:45 a. m. does not connect with New York Central special.

The city fathers of Johannesburg, South Africa, refuse to grant concessions for an electric railway to take the place of the present horse lines for the reason that the farmers would lose a good customer of oats and straw.

ECHOES FROM THE TRADE

GARSON MYERS has been appointed Western sales agent for the Crucible Steel Co. of America.

BABCOCK & WILCOX boilers have been awarded a Grand Prix at the Paris International Exposition.

THE UNITED STATES FENDER CO., Camden, N. J., has been incorporated by W. J. Browning, W. F. Weiss and J. W. Morgan, all of Camden.

THE BETHLEHEM STEEL CO., of South Bethlehem, Pa., furnished the shaft for the 1,500-h. p. unit at the Kaw River station of the Metropolitan Street Railway Co., of Kansas City, Mo.

THE J. G. BRILL CO., of Philadelphia, is building 75 convertible cars for the Union Traction Co., of Philadelphia. These are 38 ft. over all with cross seats and center aisle and are mounted on Brill double trucks.

THE WESTERN ELECTRIC CO., of Chicago, has purchased 225,000 sq. ft. of dock property on the Chicago River, and will build a new \$1,000,000 factory for heavy foundry work and the construction of cables.

THE CROUSE-HINDS ELECTRIC CO., of Syracuse, N. Y., supplied many of the panels for the large switchboards in the United States Pavilion and the United States section of the Palace of Diversified Industries at the Paris Exposition.

THE SHAW-WALKER CO., of Muskegon, Mich., is one of the largest exclusive makers of card indexing systems in the world, and its cards and cases are well adapted to keeping storeroom accounts, records of employes, tools, patterns and drawings, histories of accidents and to other conditions arising in street railway operation.

THE SIMPLEX ELECTRICAL CO., of Cambridgeport, Mass., has issued a very interesting pamphlet on electric heating which also includes electric cooking utensils, irons, etc., as well as a complete assortment of heaters. The catalog is extremely interesting and will surprise one who has not kept in touch with the development of this art.

THE DEAN BROTHERS' STEAM PUMP WORKS, of Indianapolis, Ind., is sending out its catalog No. 42, devoted to single style steam pumps for handling any kind of liquid, hot, cold, clear, gritty, fresh, salt, acidulous, or alkaline. All parts of Dean pumps are interchangeable and all machinery is given a severe running test before it leaves the factory.

THE CRANE CO., of Chicago, furnished all the valves, fittings and piping for the new plant of Armour & Co., Chicago. The installation gives a very practical example of the accurate and durable construction of Crane valves, as some of them have been under 150 lb. steam pressure for five months with one end connected and the other open to the atmosphere.

THE EVENING SCHOOL OF ELECTRICITY, under the direction of the Harlem Branch of the Young Men's Christian Association at No. 5 West 125th St., New York City, opened for its third season on October 2d. The school is in charge of Mr. S. A. Small assistant instructor in electricity at Columbia College, who has seen active service in all branches of electrical work.

THE GENERAL ELECTRIC CO. is distributing a 92-page pamphlet on the subject of "Aging of Transformer Iron." The book contains five important articles that have been issued regarding this subject, as follows: "The Aging of Transformer Iron," by Prof. W. Elwell Goldsborough; "On Slow Changes in the Mag-

netic Permeability of Iron," by Mr. W. Hordey; "Effects of Prolonged Heating on the Magnetic Properties of Iron," by Mr. S. R. Roget; "Hysteresis in Sheet Iron and Steel," by Mr. Arthur Hill-eyer Ford; and "The Aging of Transformer Iron and Steel," by Mr. J. A. Capp. This pamphlet is one that should be in the hands of every central station manager, and will be furnished free of charge upon application to the General Electric Co., Schenectady, N. Y.

THE B. F. STURTEVANT CO., of Boston, Mass., has issued an illustrated catalog of its steel plate planing mill exhausters for removing chips, shavings, dust and all kinds of light refuse from mills, factories and other establishments. The catalog contains the following tables: One giving the weight per running foot of round galvanized iron pipe, the weight of elbows and the proper gages for diameters of pipes ranging from 3 to 72 in.; a factor table for reducing the weight of galvanized iron pipe of one gage to that of another gage; velocity, volume and horse power required when air under given pressure in ounces per sq. in. is allowed to escape into the atmosphere; pressure and horse power lost by friction of air in pipes 100 ft. long and of varying diameters; areas of circles of given diameters and lengths of the sides of squares of the same areas.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, will be represented at the convention by Mr. Charles Scudder, jr., manager of its electric railway department, who will make his headquarters at the exhibit of the Ohio Brass Co. in Convention Hall. He will also have a display and be glad to see electric railway men at the Baltimore Hotel. This company has gradually enlarged its electric railway department so that today it carries one of the largest stocks of electric railway supplies in the West. It is prepared to equip electric railways complete with anything pertaining to construction, maintenance or operation. It has recently printed a catalog devoted exclusively to electric railway supplies, which is about the only catalog covering everything pertaining to electric railways from a bonding cap to a complete electric railroad; this will be mailed on application.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, sends us the following list of railway companies that have recently contracted with it for "Chloride" accumulators: Pawtuxet Valley Electric Street Ry., Providence; Brooklyn Rapid Transit Co.; Boston & Maine R. R., Boston; Potomac Electric Power Co., Washington; Metropolitan Street Ry., New York (increase); Brightwood R. R., Washington (increase); Rhode Island Suburban Ry., Providence; Bellows Falls (Vt.) & Saxton River Street Ry.; Detroit Citizens Street Ry.; Union Traction Co., Philadelphia (sixth plant); Sea View R. R., Wickford, R. I.; Stillwater & Mechanicville (N. Y.) R. R.; Glens Falls (N. Y.), Sandy Hill & Fort Edward Street Ry.; Biddeford (Me.) & Saco Ry.; Portsmouth (N. H.), Kittery & York Street Ry.; Newton & Boston Street Ry., Newtonville, Mass.; Waterville & Fairfield (Mass.) Railway & Light Co.; Keene (N. H.) Electric Ry.; Buffalo Ry. (four orders); American Railways Co., plants for Joliet, Lemont, and Spring Forest, Ill.; Boston Elevated Ry.; Dayton (O.) & Northern Traction Co.; Indianapolis (Ind.) Street Ry.; Union Railroad Co., Providence (increase).

The North Jersey Street Railway Co. will hereafter carry U. S. mails between Jersey City, Hoboken, Union Hill, Bayonne and the other towns and cities on its route, making in some cases a saving of from 12 to 18 hours in the delivery of mail.

It is said that owing to the ordinance passed two months ago by the Montgomery (Ala.) city council requiring the local street railway company to provide separate seats for white and negro passengers, the company's receipts have fallen off 25 per cent. The negroes have declared a boycott and refuse to ride on the cars.

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Editor. Business Manager.

Application made for entry as mail matter of the second class.

VOL. X. WEDNESDAY, OCTOBER 17, 1900. No. 1.

PROGRAM.**American Street Railway Association.**

WEDNESDAY, OCTOBER 17TH.

"Comparisons of the Various Systems of Electrical Distribution for Street Railways." By C. F. Bancroft, electrical engineer Massachusetts Electric Companies, Boston, Mass.

"Painting, Repainting and Maintenance of Car Bodies." By F. T. C. Brydges, superintendent of car shops, Chicago Union Traction Co., Chicago, Ill.

Appointment of Committee on Nomination of Officers and selection of next place of meeting.

Wednesday afternoon, trip to Armour Packing Houses.

Wednesday night, theater party.

THURSDAY, OCTOBER 18TH.

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions." By N. H. Helt, president Meriden Electric Railroad Co., Meriden, Conn.

Election of Officers for ensuing year.

Thursday afternoon, trip to Ft. Leavenworth.

FRIDAY, OCTOBER 19TH.

The entire day has been set apart for the examination of exhibits. Friday night, banquet at Coates House.

Accountants' Association.

WEDNESDAY, OCTOBER 17TH.

Convene at 10 a. m.

"The Routine of a Street Railway, Electric and Gas Lighting Company." By C. O. Simpson, auditor Augusta Railway & Electric Co., Augusta, Ga.

Report of Committee: "Is a Standard Unit of Comparison Practicable?" By the chairman, H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

"Department Accounts." By H. L. Wilson, auditor Boston Elevated Railway Co., Boston, Mass.

THURSDAY, OCTOBER 18TH.

"Material and Supply Accounts." By W. M. Barnaby, accountant Brooklyn Rapid Transit Co., Brooklyn, N. Y.

Informal Discussion upon any subject in street railway accounting. (This is to be in every sense informal.)

Report of Convention Committees.

Election and installation of officers.

LOCAL COMMITTEES.**ENTERTAINMENT AND BANQUET.**

W. H. Holmes, Chairman, Pres. Metropolitan Street Ry.

L. E. James, V. P. Metropolitan Street Ry.

D. B. Holmes, Counsel, Metropolitan Street Ry.

Frank Hagerman, Counsel Metropolitan Street Ry.

J. K. Cubbison, Attorney.

Frank Walsh, Attorney, Metropolitan Street Ry.

W. E. Kirkpatrick, Sec'y. and Treas., Metropolitan Street Ry.

H. W. Wolcott, Gen. Mgr. K. C. & Leavenworth Elec. Ry.

A. A. Lesueur, Managing Editor K. C. Times.

A. M. Hopkins, Managing Editor K. C. World.

H. Fleming, Managing Editor K. C. Journal.
C. A. Snider, Evans-Snider-Buel Co.
U. S. Epperson, Mgr. Geo. Fowler Packing Co.
Hugh C. Ward.
Jas. McGowan, Mgr. Barber Asphalt Paving Co.
R. L. Gregory, Pres. Gregory Grocery Co.

EXHIBITS.

W. A. Satterlee, Chairman, Gen. Supt. Metropolitan St. Ry.

C. W. Waddell, Manager Fairmount Park.

J. P. Loomas, Manager Convention Hall.

H. C. Schwitzgebel, Pur. Agt. Metropolitan St. Ry.

R. E. Richardson, C. E., K. C. Electric Lt. Co.

F. M. Bernardin, B. R. Electric Co.

INFORMATION BUREAU.

Jno. O'Keefe, Chairman, Metropolitan Street Ry.

J. A. Harder, Asst. Sec'y. and Treas. Metropolitan Street Ry.

E. R. Royer, B. R. Electric Co.

J. W. Mason, Mgr. Electric Supply Co.

RECEPTION AND LADIES COMMITTEE.

C. F. Holmes, Chairman, Gen. Mgr. Metropolitan Street Ry.

Jno. A. Brown, Mgr. Equitable Life Assurance Society.

G. T. Stockham, Mgr. Midland Hotel.

C. F. Morse, Gen. Mgr. K. C. Stock Yards Co.

Hy. H. Meday, Mgr. K. C. Car & Foundry Co.

W. T. Osborne, Mgr. Electric Supply Co.

Jno. W. Speas, Secy. and Treas. Monarch Vinegar Works.

F. C. Peck, Pres. Stewart-Peck Sand Co.

Henry Evans, Pres. Evans-Smith Drug Co.

Robt. M. Goodlett.

S. H. Velie, Treas., John Deere Plow Co.

Jas. A. Reed, Mayor.

Lathrop Karnes, K. C. Electric Light Co.

Harry Friedberg, Div. Supt. K. C. Electric Light Co.

Hugh McGowan, Pres. K. C. Gas Co.

W. H. Lucas.

Mrs. C. F. Holmes.

Mrs. G. T. Stockham.

Mrs. W. H. Holmes.

Mrs. W. A. Satterlee.

Mrs. W. E. Kirkpatrick.

Mrs. A. M. Crow.

Mrs. J. H. Durkee.

KANSAS CITY DIRECTORY.

Convention Hall, 13th and Central Sts. Tel. Main 1525.

Convention Headquarters, Hotel Midland, 7th and Walnut. Tel. Main 537.

METROPOLITAN STREET RAILWAY CO.

Main Office, 15th and Grand. Tel. Main 50. Private telephone exchange connecting all power stations, car barns and branch offices.

Main electric power station, on Kaw River, Kansas City, Kan. Take Kansas City Elevated line west to Riverside Station.

Sheffield electric power station, near eastern limits of city. Take cars east on 9th, 12th, or 15th St. line, transfer to Independence electric line.

Eighth and Woodland station, combination cable and electric. Take 8th St. cable line, east.

Eighteenth and Olive station, combination cable and electric. Transfer to 18th St. line, east to Olive St.

Thirty-first and Holmes St. station, combination cable and electric. Transfer to Holmes St. line south to terminal.

Twelfth and Charlotte cable station, main repair shops and barn. Take 12th St. cable line, east to Charlotte St.

Fifteenth and Grand cable station, and general offices. Transfer to Grand Ave. line, south to 15th St.

Ninth and Washington station, cable driven by electric motors. Take 9th St. cars west to Washington St.

Postal Telegraph, Main Office, 8th and Delaware. Tel. Main 241.

Western Union Telegraph, Main Office, 7th and Main. Tel. Main 559.

Telephone Co., Main Office, 6th and Wyandotte.

Post Office, 9th and Walnut.

City Hall, 4th and Main.

Public Library, 9th and Locust.

DEPOTS.

Union Depot, Union Ave., between 9th and 12th Sts. Roads entering: Atchison, Topeka & Santa Fe Ry.; Burlington Route; Chicago & Alton R. R.; Chicago Rock Island & Pacific Ry.; Kansas City, Ft. Scott & Memphis R. R.; Missouri, Kansas & Texas Ry.; Missouri Pacific Ry.; Union Pacific R. R.; Wabash R. R.

Grand Central Station, 2d and Wyandotte Sts. Roads entering: Kansas City Southern Ry., (Port Arthur Route); St. Louis & San Francisco R. R., (Frisco Line); St. Joseph & Grand Island Ry., (Grand Island Route); Chicago Great Western Ry., (Maple Leaf Route); Kansas City & Northern Connecting R. R.

Grand Ave. Passenger Station, 22d St., between McGee St. and Grand Ave. Roads entering: Atchison, Topeka & Santa Fe; Chicago, Milwaukee & St. Paul Ry.; Kansas City Belt Ry.

RAILROAD CITY FREIGHT AND TICKET OFFICES.

Big Four, 8th and Wyandotte. Tel. Main 625.
 Burlington Route, 823 Main St. Tel. Main 278.
 Chicago & Alton, Main and Delaware. Tel. Main 542.
 Chicago & Great Western, 7 West 9th. Tel. Main 1044.
 Chicago, Rock Island & Pacific, S. W. Cor. 9th and Main. Tel. Main 541.
 Chicago, Milwaukee & St. Paul, 915 Main. Tel. Main 1447.
 St. Louis & San Francisco, 915 Main. Tel. Main 1447.
 Kansas City, Pittsburg & Gulf, 102 West 9th. Tel. Main 3219.
 Memphis Route, J. E. Lockwood, Gen. P. A., Junc. Bldg, 9th and Main.
 Missouri Pacific, 901 Main. Tel. Main 548.
 St. Joseph & Grand Island, 102 West 9th. Tel. Main 1476.
 Santa Fe, N. W. Cor. 10th and Main. Tel. Main 459.
 Union Pacific, S. W. Cor. 10th and Main. Tel. Main 1109.
 Wahash, N. W. Cor. 9th and Delaware. Tel. Main 543.

LEADING HOTELS.

Midland, 7th and Walnut. European, \$1 per day and upward. American, \$3 per day and upward.
 New Coates, 10th and Broadway. European, \$1 per day and upward. American, \$3 per day and upward.
 Baltimore, 11th and Baltimore. European, \$1 per day and upward. American, \$2.50 per day and upward.
 Savoy, 9th and Central, European, \$1.50 to \$3.50 per day. American, \$2.50 to \$6.00 per day.
 Brunswick, 11th and Broadway. American, \$2 to \$3 per day.
 Washington, 12th and Washington. American, \$2.50 and up.
 Blossom, opposite Union Depot. American, \$2 and \$2.50.
 Cunningham, 12th and Broadway. American, \$1 to \$2.
 New Albany, opposite Union Depot. American, \$2.
 Wellington, 9th and Broadway. American, \$2 and upward.
 Glenmore, 10th and Wyandotte. American, \$2 and upward.

AMUSEMENTS.

Coates Opera House, 10th and Broadway. Tel. Main 1172.
 Grand Opera House, 7th and Walnut. Tel. Main 3084.
 New Auditorium, 9th and Holmes. Tel. Main 570.
 Orpheum, 9th and May. Tel. Main 692.
 Gillis Opera House, 5th and Walnut.
 Stock Yards, Kansas City, Kan. Take 12th St. cable, west.

EXPRESS COMPANIES.

Adams, 919 Main. Tel. Main 333.
 American, 714 Main. Tel. Main 1311.
 Pacific, 814 Delaware. Tel. Main 534.
 United States, 814 Delaware. Tel. Main 534.
 Wells-Fargo, 910 Main. Tel. Main 244.

PARKS.

Budd Park, St. John and Brighton.
 Fairmount Park, seven miles east.
 Washington Park, seven miles east.
 Troost Park, 29th and Troost.
 Cbelsea Park, two miles west of Kansas City, Kan.
 Holmes Square, 18th and Holmes.
 Exposition Ball Park, 15th and Montgall.
 The Paseo, bet. Flora and Grove from 9th to 17th.
 City Park, 20th and Woodland.
 Ivanhoe Park, 30th and Woodland.

CARRIAGE RATES.

Inside Woodland Ave. and 23d St.
 Passenger without baggage\$0 50
 Passenger and trunk 1 00
 Each additional trunk 25
 Inside 31st and Prospect and beyond 23d and Woodland.
 Passenger 1 00
 Each additional passenger 50
 Inside 42d and Cleveland and beyond 31st and Prospect.
 First piece baggage 50 cents, each additional 25
 Each Passenger 1 00
 First piece baggage 75 cents; each additional 25
 Day or night, \$2.00 first hour, \$1.00 each additional hour or part thereof.
 The opera rates are: To and from any point within the following boundaries:
 23d and Woodland, two persons.....\$3 00
 23d and Woodland, four persons..... 4 00
 31st and Prospect, two or four persons 4 00
 42d and Cleveland, two or four persons..... 5 00

TELEPHONE SERVICE.

Kansas City is well provided with public and private telephones and has connection with all suburban and long distance points. The toll rate for five minutes' conversation within city limits is five cents. Public telephones are operated by nickel-in-the-slot machines.

To call central give hell crank one sharp turn. Place receiver to ear and give number wanted to central, who will repeat it back. Hold receiver until party responds. A numeral after the telephone number as given in telephone directory signifies a party line and designates the number of rings. It should be repeated to central thus when calling: Main 891-2, say "Main eight ninety-one, two rings."

DISTANCES FROM KANSAS CITY.

When you are in Kansas City, you are 1,267 miles from Albany; 1,459 from Boston; 981 from Buffalo; 458 from Chicago; 614 from Cincinnati; 997 from Cleveland; 633 from Denver; 708 from Detroit; 962 from Galveston; 166 from Independence, Kan.; 26 from Leavenworth, Kan.; 1,805 from Los Angeles; 942 from New Orleans; 1,303 from New York; 894 from Pittsburg; 1,213 from Philadelphia; 2,093 from San Francisco; 273 from St. Louis; 63 from St. Joseph, Mo.; 1,267 from Washington, D. C.



THE LIGHT THAT FAILED.

When President-elect Roach led the grand march into the banquet room of the Auditorium at Chicago last year his face wore its usual pleasant smile, and his demeanor did not give the slightest clue to anything calculated to ruffle one's spirits or impair digestion. And he was as cool and collected as anyone present, though few would have been after his experience. This episode is now made public for the first time, and its publication will be as much a surprise to its subject as it will prove interesting to our readers.

In accordance with the usual custom Mr. Roach as the new president was to extend the welcome and introduce the toast-master at the annual banquet with which each convention closes. Mr. Roach is noted for never failing to keep an appointment, and exactly on the minute; and it was no fault of his that attendance on committees and looking after the comfort of guests kept him at the headquarters hotel until nearly six o'clock. In Chicago during October it is quite dark at five o'clock.

He jumped into his own carriage and directed the driver to make all speed to his residence on the north side, where he meant to exchange his business suit for one appropriate to the occasion. Now, it appears that only the day previous the police department, seized with a sudden zeal, had issued the strictest kind of orders as to vehicles without lamps after sundown. The conveyance in question had lamps, but little oil in them, and the carriage had not proceeded more than two blocks when out they went. At the next corner a stalwart policeman held up the vehicle and promised to run them in. An apology followed the explanation and discovery of who the occupant was, but the cop at the next crossing was a new man who didn't know anybody, and entreaties would not go. Neither did the carriage.

The driver was sent on the double quick to secure another conveyance. The first one he encountered was an electric automobile. This was chartered and Mr. Roach changed cars and congratulated himself on having lost only fifteen minutes in going four blocks.

Autos were comparatively new in Chicago a year ago, and were untamed creatures more uncertain than the weather, but the two sixteen candle incandescents beamed brightly and the machine labored along at nearly eight miles an hour. Everything went pretty well until the Chicago river was reached, and here two tugs were trying to pull a belated and overloaded ore barge through the narrow channel. After waiting five minutes, which seemed as many hours, the electrician who perched up aloft was ordered to go through the tunnel. This involved retracing the course and going out of the route several blocks, but seemed the only solution. When the tunnel was reached the auto traveled pretty well down the incline, in fact, nearly ran away, but evened matters when it reached the up grade. Here it bucked and spit fire and finally stuck, refusing to go forward, and to turn and retrace the course in that narrow passage was simply impossible. All the north side cable trains must go through this tunnel, which in two minutes was choked with a long blockade. The driver was told to ask the gripman to "give a push," but that official was not to be ensnared into any responsibility for damages to a broken-down auto. Finally Mr. Roach succeeded in getting the rear window open, and immediately there was all the pushing anyone could ask for. The auto never made such speed up a steep place before or since. Meanwhile time had been going on if autos had not.

Out of the tunnel fortune favored the trip, which was directed through Lincoln Park to avoid travel and get up speed. When fairly in the park the auto rolled along quite respectably until suddenly—hump! bang! it ran over a stray stone and the lights went out. The driver stopped. Mr. Roach held a short but very unmistakable conversation, which included threats, entreaties, and promises of reward and of going bail, after which the trip was resumed. It was noticeable, however, that the auto went lame,

seemed to interfere or something, but when a park policeman shouted to stop and get arrested for running without lights the chief engineer put her up to the last notch and prospects were even on getting out of the avenging hand of the law. But this was not to be. What happened might have been either the policeman's revolver, an explosion of dynamite, an earthquake, or all three combined. The noise was something fearful and accompanied by a hissing sound, as if all the serpents in the park collection were let loose. The auto reared and bucked and shook, and then came to a dead stop. The trouble was inconsequential; "Only a tire busted," explained the disciple of Edison.

The policeman, fortunately, knew Mr. Roach, and the promised patrol wagon was not called out; so, leaving the wreck, our friend betook himself to pedestrianism, which, supplemented by a two block's lift on his cable car and further sprinting, got him home.

* * *

At the moment when a large man with both arms full dashed out of a house and into a closed carriage there lacked exactly twenty-four minutes of the time when several hundred hungry people were scheduled to enter the banquet hall. No kodaks would have been obtainable of the exertions of the lightning change artist within the carriage, as it rushed at break-neck speed over the three and one-half miles which lay between the residence and the hotel. People on the sidewalks stopped to look, but saw only a flash of wheels, a carriage with the curtains tightly drawn, and a streak of black fading away down the street.

* * *

With two minutes to spare a vehicle drew up in front of the Auditorium, and from it emerged in faultless attire President J. M. Roach, who leisurely strolled into the reception room, remarking in a careless, indifferent manner, "I hope the steward will be prompt. We are all ready for dinner, and delays are annoying." Just then the orchestra started up and the procession started with Mr. R. at the head.

* * *

Down stairs, outside, a pair of foaming horses were panting for breath, and in the box the driver, his face beaming with excitement, was telling another driver how he had just earned twenty dollars.

STORY OF A STRANDED CABLE.

In the balmy days of cable traction the greatest bugbear was a stranded cable, which sometimes unwound and balled up in hopeless confusion, and sometimes parted entirely. When this occurred far from the power house the work of repair was frequently done at the pit at the end of the line. At this point the cable is carried around a big horizontal wheel called a sheave. The work was always done under high pressure in order to get the cars moving again as quickly as possible.

Mr. F. A. Tucker, now general superintendent of the Omaha Street Railway Co., relates an amusing incident which occurred here on one of the Kansas City lines in the early days. He had been connected with the San Francisco road, and when Kansas City started a new road it sent for him. He relates an experience as follows:

"I had been here some time, and began to congratulate myself in having gotten both our men and system into pretty good shape, when our cable rope stranded most unexpectedly and inopportunistly. The city was crowded with people for a special holiday, and our traffic was exceedingly heavy. I had our rope crew at the trouble pretty quickly, and then being called away on an important matter, I kept posted as to progress of the work by a special messenger. About time for the work to be completed I went down and found a beautiful job of splicing, with a loop around one of the spokes in the tail sheave. Of course the rope had to be cut and the splicing done all over again. Each minute seemed an hour, and each of the three hours as many days. I had always theretofore found words to relieve my mind, but on this occasion I was fairly speechless, and to this day I always think of that occurrence and the attendant circumstances as the most serious affair I ever experienced."

THEATERS.

COATES.—Wednesday night and matinee, "The Runaway Girl." Thursday, Friday and Saturday nights and Saturday matinee, "At the White House Tavern."

AUDITORIUM.—Every night, Wednesday and Saturday matinees, "The Great Ruby."

ORPHEUM.—Every night, Thursday and Saturday matinees, Vaudeville.

GRAND.—Every night, Thursday and Saturday matinees, "In Old Kentucky."

GILLIS.—Every night, Wednesday and Saturday matinees, "The Night Before Christmas."

STANDARD.—Every night, Saturday matinee, "The Broadway Burlesquers."

The American has made a new ruling on badges. Now the delegate who is a railway official but whose road has not joined the association receives the same badge as the supply member. It was desirable to have some means of distinguishing actual members when voting. There are a lot of companies who send delegates each year and receive all the benefits without contributing a dollar to the organization.

In addition to the American and Accountants' conventions, there are also here this week a big gathering of fancy stock-men, the Knights of Pythias and a religious conference, and they claim it isn't a very good week for conventions either.

Which would you rather own, the street railway or the hotels of Kansas City? Judging from what we can see either are good enough for the average man.

The trip to the stock yards this afternoon will be a killing affair.

Convention Hall only seats 22,000 and yet there were a number of vacant seats yesterday.

Nothing the matter with Kansas City, and Kansas City weather.

The mayor in his welcome omitted several blocks of statistics we have been accustomed to. Thanks, even if we don't know the exact number of fire plugs and lamp posts.

C. Densmore Wyman will not be present, much to the regret of his many friends. He is in the far South on an inspection trip which cannot be postponed.

Nicolas S. Hill, Jr., general manager of the lines at Charleston, S. C., and a member of the executive committee, cannot be present. He has been in poor health for some time and his physicians have decided on an operation which will be performed this week. We extend sympathy and an earnest wish for his speedy recovery.

Convention Hall will be occupied with a big horse show two days after the railway convention closes. This explains the "ground floor" on which the exhibits got in.

There is going to be a hot time at the theater party to-night. Don't miss it.

Among the prominent and regular attendants at conventions who has rarely missed a meeting, is Mr. John A. Brill. He is at present at the Homestead Hotel, Hot Springs, Va., where he is being much benefited in health.

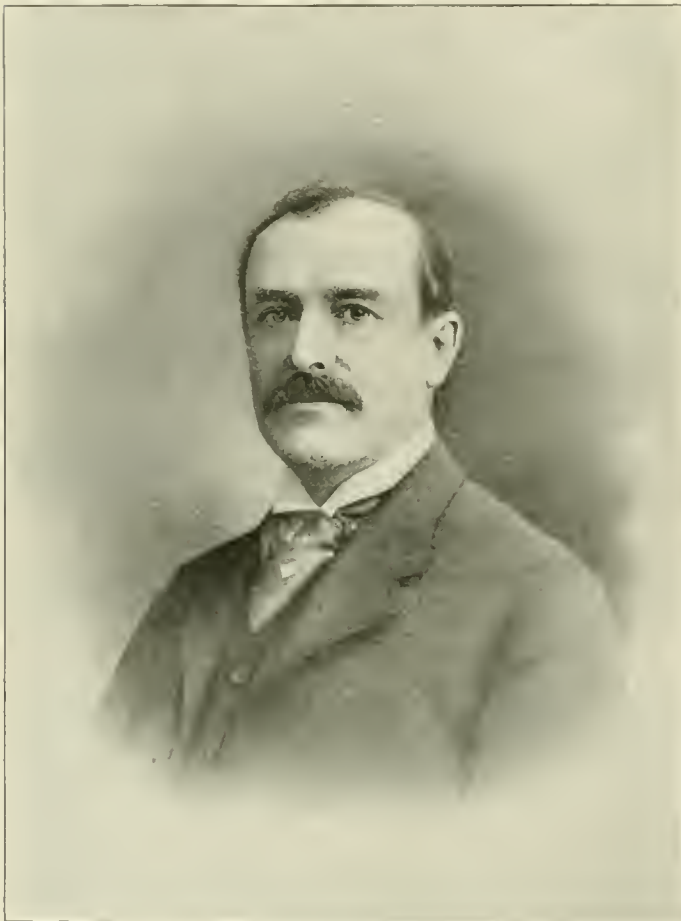
EVIDENTLY A GOOD ROAD.

A man from St. Louis recently rode in an electric car in Cape Town with eight other Americans from different parts of the United States. The car was made in Philadelphia, the rails in Pittsburg, the motor in Lynn; the motorman was from San Francisco, and the conductor from Boston.

AMERICAN STREET RAILWAY ASSOCIATION.

Opening Session.—Welcome by Mayor Reed.—Annual Address by President Roach.—Reports of Executive Committee and Secretary.—Paper by Mr. D. B. Holmes.

The 19th annual convention of the American Street Railway Association was called to order at half past eleven by President J. M. Roach. Notwithstanding the late arrival of a large number of the delegates, the large room in the roof garden of Convention Hall was well filled, and the attendance steadily increased until adjournment. The meeting room is on the west side of the building, and while the association as a body was never before so near the sky, the ascent was reached by a series of easy inclines not at all tiresome.



JOHN M. ROACH,
President.

The speaker's platform was tastefully ornamented with potted plants and cut flowers, and the delegates almost reluctantly gave up the social greetings of old friends to take up business at the sound of the gavel. The representation this year is excellent and comes from almost every state. If anyone has doubted the wisdom of selecting so distant a point as Kansas City that doubt was wholly dissipated yesterday morning. There was the same earnest interest in the meeting which has been the history of former years, and the somewhat chilly temperature of the room was not reflected in the attention paid the speakers, some of whom were interrupted frequently by the "hum of industry" from the exhibit section.

After calling the meeting to order the president introduced Mayor Reed, of Kansas City.

ADDRESS OF MAYOR REED.

Mr. President and Gentlemen: I do not know whether I can make you hear me this morning or not. My voice, which usually is as soft and as musical as the notes of a nute wafted over moon-lit waters, has been laid out on the altar of my country to such an extent in the last few days that I imagine it bears a distinct resemblance to the malignant blending of the sounds of a cracked fiddle and the roar of a buzz-saw. If I could make you hear, and say something to make you feel at home in this city, I shall be delighted.

I esteem it, Mr. President and gentlemen, a great honor to address this body of distinguished gentlemen, and I trust that your meeting here in this roof garden is not being held under that part of the scriptures which states that "The wicked dwell in high places." (Laughter.)

Of course, I do not know much about street car men, except our friends, Con and Waiton Holmes; but I have heard it rumored on the street that that is not Mr. Con Holmes' proper name at all—that his first name has been acquired by virtue of his various and intricate business transactions in this city, and his ability to talk franchises out of the council, and when he gets them to immediately put them into execution. (Laughter.)

In the little I have to say to you, I shall not bore you with a speech, because I do not know what purpose a speech serves on an occasion of this kind. When the old Egyptians had a feast and everybody was feeling hilarious and good-natured, there was a pleasant custom of passing around a skull and saying to each of the guests, "Remember you are mortal; remember you are mortal." I apprehend I was brought here to represent the skull and cross-bones on this occasion. You are here to transact important business, having important objects in view, and it is not a time for speech-making. It is a time when you desire to deliberate and get to business.

I wish to say on behalf of this city that Kansas City, as much as any other city in the world, welcomes to her midst the representative business men of all other cities. We in the West believe that it requires capital and brains and courage to build cities. We in the West know that if capital comes to us it must come because it expects a fair remuneration; and I wish to call your attention, gentlemen, to the fact that you are in Missouri; and, notwithstanding the fact that all of the states that surround us, in times past, in those troublous times when there were hard financial conditions existing, nearly all of the Western states placed upon their statute books laws aimed at the destruction of the wealth of financial institutions, there never has been a syllable, line, or sentence of what we commonly denominate crank legislation placed upon the statute books of Missouri. (Applause.)

We in this state believe that capital should receive its fair remuneration; but we believe, at the same time, of course, that these great institutions which you represent owe some duties to the citizens of the cities, and that it is their business and duty to serve the citizens and serve them well. We at the same time realize that great financial institutions must be secure in their profits, and that all the people have the right to ask of them is a policy of "Live and let live," a policy of serving the people and in turn of being benefitted by the people. That is Missouri doctrine, and it is Kansas City doctrine. We in Kansas City know what Eastern capital has done for us. We know that fifteen or sixteen years ago we scarcely had in Kansas City a mile of paved streets. We know that it took a great deal of money to pave our streets; of course that was paid for by our citizens, but it took money to create the great plants for the purpose of paving our streets. While we insist, and shall insist, that these institutions should treat our people fairly, at the same time the people of Kansas City are willing that they shall receive a fair remuneration upon their capital invested. Our people have done this and the result has

been that for the size of the city, we have paved more streets than any other city in the world. (Applause.)

We believe in luring the capital of the East here for the purpose of investing in great public buildings. I do not think a single man lives who came to Kansas City and used ordinarily good business judgment in the matter of his investment in great public buildings, but to-day is receiving splendid dividends upon that investment. Of course, there were men who came here during the "boom" days when the whole town and the whole country had gone mad, who bought property without regard to business judgment, and paid fabulous prices and lost money; but the men who came with business judgment and with business care, and invested their money as men ought to invest it, have all received fair dividends.

We had a few years ago in this town two streaks of rust and five teams of mules, drawing horse cars, that meandered slowly and laboriously up and down the almost inaccessible cliffs of this town. This was called a railroad system, and it was said that the cars were run for many years for the purpose of holding the franchise. I do not know what the object or purpose of the railroad was, but I do know that everybody who was in a hurry was obliged to walk. (Laughter.)

About the period referred to, fifteen or sixteen years ago, there was begun the building of the present street car system of Kansas City—built first with a cable equipment, and Mr. Holmes will tell you here in your secret meetings, if you can have any with your walls of canvas, of the struggles, I presume, that his road underwent in overcoming the natural difficulties of this town; but to-day, in riding over this street car system, you, better than I, will judge whether any progress has been made in that respect. And as far as dividends are concerned, I apprehend that Mr. Holmes can tell you all about that, if he only will.

The point I wish to impress upon you, gentlemen, and I do it with a selfish purpose of convincing, as far as I can each man in this audience, that Kansas City is a good a place to invest money; that every legitimate enterprise where the men have come and used good business judgment, has been a success in this city. We have no warfare to make upon capital. Of course, as I said before, we do insist that capital shall treat us fairly, and as a general proposition, capital has treated us fairly. I would call your attention to the fact that Kansas City lies in the very center of the richest agricultural country that God ever spread out beneath the canopy of the skies. In whatever direction you go, for hundreds of miles, you pass through the finest arable land there is in the United States of America. I want to call your attention to the fact that there is scarcely a town or village for hundreds of miles in either direction from Kansas City but is, by force of our railroad system, compelled to pay its tribute to the center.

From this city down to the Southern coast and down to the Gulf we have various railroad lines. This city is the outlet for all of the grain, all of the cattle, and all of the farm products of every description of the entire West and Northwest and as soon as the Nicaragua Canal is built, if it is ever built, and I hope when it is built it will be built by the American Government (applause), and that crowning over all, at each end, and wherever is necessary between those ends, will be American forts and American cannons (applause)—and that great waterway is added to the lines of vessels that already ply from these Southern ports, this city must receive the greatest benefit that any city in the United States receives from the building of that canal. The reason for this is that the railroads are already built here, and they will not be torn up, and having already been built here, all of the grain and all of the farm products of the great West and Northwest, and much of the Southwest, will flow through the gateway of Kansas City to these direct lines leading down to the Gulf.

Another reason why we are going to succeed here is because of the qualities of our people. Each of you lives in a city and each one thinks his city is "it." Each of you gentlemen thinks your city is the best city, and I have nothing to say against your city; but I hold, with all due modesty, that it can be said that this is the most typically American city on the continent. Here in our state and city is the parent stock of the very best blood of the South, and grafted on to that we have the genius of the Yankee, the men from the Middle States and the men from the Eastern States, and from all parts of this country; and whenever you come to Kansas City, you will touch elbows as you pass upon the street,

with men from every state in this nation. I might say we have a few Greeks and Turks whom we keep for exhibition purposes. What does this mean in the upbuilding of a city? We have always heard it said that the "horizon of civilization was covered with the white caps of progress;" that it is the boy who has brains and genius and courage, who leaves his home in the East and comes to the West and develops into the great man representing the type which has made this country what it is. In the progress of the nation, every time that the milk of humanity has been skimmed, the West has been favored with the creamy side of the dish. The result is that there is such energy, such determination to succeed, such an indomitable will back of everything that our people undertake, that Kansas City has made a splendid success in the few years she has been a city. Let me give you one illustration, and with that I close. At a tremendous expense for a town of this size, with not very many extremely wealthy men in it, we built this Convention Hall. We built it as a public enterprise, and into it went the money of the capitalist, and the money of all our citizens, even down to the men who carry the dinner-pail, not always so full, either; into this Convention Hall went the dollars of the laboring men. (Applause.) It was destroyed by fire, we had invited the National Democratic Convention to meet here on the 4th of July. This hall was burned, if I recollect aright, exactly 90 days before that convention met. Before the building had been on fire an hour, thousands and thousands of dollars had been subscribed to rebuild it, and in the 90 days which intervened between the burning of the building and the 4th day of July the new hall was erected. We had to make our contracts as rush orders, and you street railway men will understand what a "rush" order means, and how much it costs, but when the 4th of July rolled around, this building had risen from the ashes of the former building and was completed as you see it here at this minute. (Applause.) A lot of "lobsters," gentlemen, do not do that kind of work, if you will pardon the use of a slang phrase. It is because we have that kind of people that we are succeeding here; we are glad to have you come here, and ask you to look this city over, and see whether it is not about the best place in the United States in which to make money. If you come here, you will be treated fairly by our citizens.

I need not extend to you the liberty of this city. That old phrase died years ago, and then I never saw a lot of street car magnates in my life that needed the liberties of a city—they generally know how to get them (laughter); but you are welcome among us, and I know you will be made to feel at home because I know the Messrs. Holmes and their associates in business will make you feel at home. You may have read something in the papers here of the police outrages, but if, perchance you lose your way, for that is all would ever happen to so distinguished a body of gentlemen as you are—if perchance you do lose your way, I guarantee you that some good police officer, like a good Samaritan, will conduct you to your hotel in peace and with due dignity and if necessary will take you up the back way.

President Roach: Mr. Mayor, on behalf of the association, I desire to thank you for your eloquent words of welcome spoken to us, and also to give you my personal thanks.

The first business at this meeting is the calling of the roll. If it is the pleasure of the meeting, instead of taking time to call the roll, the official registration of the secretary will be deemed the calling of the roll. That has been the custom in the past, and will be considered as applying at this time, if there is no objection. We now extend an invitation to those companies represented at this meeting which do not belong to our association, if there be any here of that class, to join us; or if the representatives of such companies have not time to do this at present, they can do so later by applying to Secretary Penington.

President Roach then delivered his annual address:

PRESIDENT'S ADDRESS.

Gentlemen: It gives me great pleasure to meet with you in this magnificent western city. I have every assurance that nothing will be left undone to make our visit most pleasant and profitable. There is a breadth of character and freedom of personality in this young metropolis of the plains, which is peculiarly appealing to the business man who has large interests entrusted to his care, and I believe the members of this association will show their appreciation of the many pleasant things provided

for their entertainment while in this community. When this 17th annual convention of the American Street Railway Association shall have finished its labors, I am sure I may safely say to Mayor Reed that none of you will have regretted the acceptance of the hospitality of the people of Kansas City, so graciously extended by him.

I see before me representative men from all the leading cities of this country. To your hands are entrusted street railway investments aggregating hundreds of millions of dollars and the welfare of over a million persons. From the single-track one-horse car of forty years ago the business in which you are engaged has grown to a magnitude where nearly all fields of human endeavor are called upon to perfect its equipment or aid in its management. It has outgrown ridicule and financial instability and in the rapid whirl of events has built cities, enriched its promoters and made possible a freer, healthier and happier life for its patrons. Each day the street car is entering more and more into the business life and pleasures of the community, and each day its benefits are becoming more apparent to the general public.

The street railways of America now represent the enormous investment in bonds and stocks of \$1,800,000,000, upon which investors are receiving annually over \$70,000,000 in interest and dividends. Salaries and wages amounting to \$250,000,000 a year are distributed among the 300,000 employes necessary to equip, operate and manage this great industry, repair its 20,000 miles of track, handle its 60,000 cars and meet the ever-pressing demands for improvement. Directly and indirectly over 1,200,000 persons depend upon the traction interests of America for their livelihood.

An industry of such proportions penetrates and more or less affects all other enterprises in the country which sustains it. Nine-tenths of the business men and women of the United States look to the management of street railway companies to furnish them with swift, comfortable and safe transportation to and from business. Still a greater per cent of pleasure-seekers demand and receive from the same management service to and from the theater, casino, park and suburb and the transportation is of such elegance of equipment and so efficient as to satisfy the most exacting. It has required heroism and patience on the part of the street railway men to meet, with so little friction, the demands of a critical patronage in so excellent a manner as is being accomplished by them at the present time.

On all sides we hear the cry of improvement and in every direction we hear the sound of the busy car shop as it responds to the demand for more modern equipment. The public is becoming more exacting and there is need for the most perfect knowledge and the widest experience to successfully cope with the ever-changing situations which confront the street railway manager. Street railway companies have frequently, at great cost, increased their miles of tracks and added to an expensive equipment, primarily for the sole purpose of accommodating the public, by extensions into outlying districts, unwarranted by additional business to be acquired in such territory. This policy has proved wise in nearly every instance. It requires considerable pluck on the part of a company to back a temporary loss in order to please its patrons. Those companies which have pursued such a course have generally been rewarded by more liberality on the part of municipalities, more good nature and praise from patrons and an early increase in the new districts acquired, which soon brought those lines to a paying basis.

In thus catering to the wishes of the public the street railway industry of the United States has been brought to a high standard of excellence and has kept safely in advance of traffic. The aggregate of miles of track has grown from a few hundred miles of single track, confined mainly to business centers, to many thousands of miles of thoroughly equipped double tracks, which have brought the country districts within quick and active touch with the larger cities. Such energy and management must and will be appreciated and fairly treated by the communities benefitted.

It may be declared that corporations are without soul, but it cannot truthfully be said that managers of street railway corporations are lacking in good sense or business principles. False economic doctrines yield to and flee before rapid development and prosperity. A well equipped street railway with modern service, which seeks to oblige the people, operated in any community, will develop the best resources thereof and bring pros-

perity to its people with such rapidity as to utterly confuse and put to flight all false economic doctrines.

Newspapers, reviews, magazines, periodicals and journals of this country, indeed of many parts of the world, are entitled to the thanks of this association for the fair and generous treatment accorded in their columns to the street railway men and their interests during the year. It is the province of these publications to exploit the great industries of the land. If upon one day we are able to congratulate ourselves upon their unstinted praise, we should patiently hear the publicity given to our faults, if any there be, in the next issue.

The last year has been a period of notable activity and healthy progress, with but few disturbances of a serious nature. The managers of large street railway properties should shape their policy toward their employes and the public so that disturbances between employer and employe will be entirely eliminated from their history. The management of the great corporations of the country can best retain the adherence and loyalty of employes by adopting toward them a policy at all times just, and at the same time courteous, kind and conciliatory. The good will of your employes and of your patrons will be found an asset of great value in the days of trouble and most desirable at all times.

A business so widespread in its usefulness, holding and judiciously employing as it does so great a portion of the capital of the country and so essential to the best interests and prosperity of the trade centers, should, and I believe in good time will, possess the very necessary good will and hearty support of the municipalities it so faithfully serves. Our interests and those of the public are inseparably interwoven and naturally harmonious. If the relations become strained and in conflict, such conditions are unnatural and illogical, therefore it should become one of the leading features of our association to suggest a uniform policy for street railway companies, and of so broad a gauge that the mutuality of the best interests of the public and of the company shall be as apparent to the people as to the street railway managers themselves.

I take pride in announcing that the condition of your association, both as to membership and finances, is improving each year. I wish to urge you to make this gathering of use to our association and of importance to the street railway industry. This may be accomplished by a full attendance upon and participation in the business meetings. The executive committee has selected members who have prepared papers on important subjects, and I urge upon you the advisability of entering into full discussion and analysis of these subjects, so that a clear understanding of all questions presented may be carried home with you. I also urge the association to show appreciation for our friends, the supply men, who have produced for this annual meeting their splendid exhibit. Allow me to request your hearty support in the work of the Accountants' Association, which meets in annual convention here at this time. Its work is of great importance and is worthy of your most serious consideration.

To the secretary and members of the executive committee our thanks are due for the satisfactory manner in which they have assisted in conducting the affairs of this association. Personally their efforts have been highly appreciated.

The honor of having acted as your president for the last year has been most gratifying to me and shall ever remain one of the pleasant recollections of my life as a street railway man. For my successor I bespeak the same courtesy and cordial coöperation which it has been my good fortune to enjoy.

The secretary then read the report of the Executive Committee. The committee recommended the following rules of procedure:

1. No member will be recognized by the president unless he shall announce distinctly his name and address.
2. Speeches will be limited to 10 minutes, unless the time shall be extended by the convention.
3. Members who desire to offer resolutions or other matters to be considered by the convention, are requested to submit them in writing over their signatures, to the secretary.

Regarding banquet tickets the committee endorsed the action of former years, to-wit: "There shall be two tickets issued to each member company of the association when there are two or more official representatives; when there is only one representative, only one ticket, and when a company is not officially represented, no ticket shall be issued on account of said company."

It was recommended that, because of the satisfactory condition of the finances of the association, the admission fee be waived in the case of any company joining the association at this meeting.

The president had appointed Messrs. John A. Rigg and C. W. Wason as a committee on Memorials of Deceased Members.

Mr. C. K. Durbin, having left the street railway business, resigned from the executive committee of the association, and was succeeded by Mr. W. H. Holmea.

On motion of Mr. Dyer, of Augusta, the report of the executive committee was adopted.

Mr. Penington then made the following report:

REPORT OF THE SECRETARY AND TREASURER.

The report of the secretary and treasurer, T. C. Penington, showed a balance Oct. 10, 1899, of \$5,658.87, receipts of \$6,564.55, expenses of \$5,222.67, and a balance Oct. 10, 1900, of \$7,000.75.

Oct. 11, 1899, the number of member companies was 165; since then 32 new companies have joined the association, 2 have been suspended and 31 have withdrawn.

The new members are:

Atchison, Kan.—Atchison Railway, Light & Power Co.
Aurora, Ill.—Aurora Street Railway Co.
Asbury Park, N. Y.—Atlantic Coast Railroad Co.
Bridgeton, N. J.—Bridgeton & Millville Traction Co.
Chicago, Ill.—Chicago Electric Traction Co.
Columbia, Pa.—Conestoga Traction Co.
Detroit, Mich.—Detroit & Pontiac Railway Co.
Dayton, O.—Dayton & Western Traction Co.
Elgin, Ill.—Elgin City, Carpenterville & Aurora Railway Co.
Fond du Lac, Wis.—Fond du Lac Street Railway & Light Co.
Ft. Wayne, Ind.—Ft. Wayne Traction Co.
Galesburg, Ill.—Galesburg Electric Motor & Power Co.
Hamilton, O.—Cincinnati & Hamilton Electric Street Railway Co.
Highwood, Ill.—Chicago & Milwaukee Electric Railway Co.
Joliet, Ill.—Joliet Railway Co.
Kansas City, Mo.—East Side Electric Railway Co.
Knoxville, Tenn.—Knoxville Traction Co.
Montreal, Canada.—Montreal Street Railway Co.
Oakland, Cal.—Oakland Transit Company.
Pasadena, Cal.—Los Angeles & Pasadena Electric Railway Co.
Pittsburg, Pa.—Consolidated Traction Co.
Peoria, Ill.—Peoria & Pekin Terminal Railway Co.
Pueblo, Col.—Pueblo Traction & Electric Co.
Schenectady, N. Y.—Schenectady Railway Co.
Sioux City, Ia.—Sioux City Traction Co.
St. Louis, Mo.—St. Louis Transit Co.
Seattle, Wash.—Seattle Electric Co.
South Bend, Ind.—Indiana Railway Co.
Vicksburg, Miss.—Vicksburg Railroad, Power & Light Co.
Venice, Ill.—Venice, Madison & Granite City Railway Co.
Willoughby, O.—Cleveland, Painesville & Eastern Railroad Co.
Westwood, Mass.—Norfolk Western Street Railway Co.

After the report of the secretary and treasurer had been accepted and ordered filed the secretary announced that the Kansas City Club and the Elks Club had extended cordial invitations for all the delegates to visit their club rooms, the badges admitting members of the association.

The president then announced the first paper:

THE CONSOLIDATION OF STREET RAILWAYS AND ITS EFFECT UPON THE PUBLIC.

By Daniel B. Holmes, Counsel Metropolitan Street Railway Co., Kansas City, Mo.

It is no part of the purpose of this paper to enter into an extended discussion of street railway consolidations from a legal point of view. It is assumed that no considerable number of those present would be particularly interested in that branch of the subject. Suffice it to say that the laws of nearly if not quite all of the states of the Union are in such condition that practical street railway consolidation may be brought about and made effective by union of companies as a technical consolidation, or by purchase and sale of the corporate property or capital stock or by common ownership of the corporate shares of several companies, or in other ways which might be mentioned.

Whenever consolidation is desired by the parties interested it may be safely assumed that counsel learned in the law will find little or no difficulty in pointing out the way in which that end may be legally accomplished.

Street railway companies may be properly classified as public service corporations, and whenever a union takes place of several such companies, it at once becomes obvious that the interests of the capital invested and of the travelling public may and probably will be positively affected thereby. Therefore these two interests will form the chief basis of what I have thought proper to lay before this convention of practical street railway men, whose calling is such that they never feel at liberty to disregard either the best interests of their stockholders or the welfare of the public, whose constant servants they are. And I may be permitted to add, in the light of an experience and intimate association with street railway managers extending over a period of upwards of twenty years, that no class of men with whom I have come in contact in the active practice of a profession which brings about the most intimate relations with all sorts of men, are so constantly mindful of the best interests of the public they serve by night and by day, as are the street railway men. I am the more pleased to make this acknowledgment because the street railway man has so many impatient masters among the trav-



D. B. HOLMES.

elling public that he is much more often the subject of unjust criticism than of the well-deserved encomiums he would surely receive if the difficulties of his situation and his conscientious efforts to faithfully discharge his company's duty to the public were even half-way understood. Above all men it is his lot to bear the "whips and scorns of time," and if he will but pin his faith to the teachings of the Good Book, he may expect to receive hereafter that reward which in but few cases, I am sorry to say, comes in this life in the shape of an adequate salary for so hard and thankless a job.

That the consolidation of street railway interests affords opportunities for the introduction of many various economies is a truth which is almost axiomatic, and this may be fairly said to have been the controlling consideration which has inspired and accomplished the many consolidations which have taken place in various parts of the country. By this process the managerial force is greatly reduced and the salary list largely diminished. Where three or four presidents, managers or superintendents were required for the successful management of the separate properties, but one officer of each kind is needed in their united state, and while he receives more salary than any one of his predecessors, as of right he ought, because of enlarged duties and more weighty responsibilities, still there is substantial saving over what was previously paid.

But there is in this connection a still more important consideration. As is the case with any other calling in life, the supply of really first-class street railway managers is more or less limited, and the larger salary offered by the consolidated interests naturally commands, and in all probability secures, a higher order of talent than the separate properties could retain even where it had been fortunately possessed. In this way the consolidated properties in nearly every instance are managed with greater ability than was shown by the management of the disconnected parts, and this is a positive gain, the value and importance of which can scarcely be estimated. This successful manager, you may be sure, is truly a remarkable man. The relations existing be-

twen street car companies on the one hand and the municipality or its citizens on the other, are the fruitful source of jealousies and complications constantly arising which can be successfully disposed of by nothing short of the possession of genius for diplomacy, and for affairs and finance all at the same time, in order to be able to satisfy the demands of the public without involving the company in irretrievable financial ruin.

In most instances, the consolidation of street railway properties creates opportunities for marked reduction in the cost of generating motive power. Location is a most important consideration as regards the power station. Unless the power station is so situated that both fuel and water can be delivered to it at minimum cost, the highest degree of economy in developing motive power is altogether impossible. This is greatly facilitated by the union of properties since the car lines are so situated in most cities that but few of them, if independent, could operate from power stations located near steam railroad switches and water courses. A greater or less number of high-priced employes are always necessary around every power station whether large or small, and this is an expense which is greatly curtailed by generating as much power as it is practicable to handle from one station. A company possessed of an extensive system with large mileage has thus presented to it the opportunity of producing power at the minimum cost, a thing altogether impossible on a short line railroad.

But perhaps the most important result from consolidating street railway lines is the great stimulus it affords to street railway traffic. Outside of a few of the very large cities where the problem is not how to get business, but how to successfully handle that business which of necessity must come to the car lines, the street railway companies are quite generally engaged in efforts of all kinds to create travel on the lines artificially by offering to the public attractions of various and sundry kinds. This is all well enough, but one of the most effective means to this end is the consolidation of the street car lines. I believe it is the uniform experience that the aggregate travel on the united lines exceeds by a large percentage the business formerly done by the separate properties. This is partially accounted for by the fact that short distances are now ridden that were formerly walked, because two fares were then necessary in order to ride, and this was considered too great an outlay for the accommodation afforded.

But how stands the case with the public? I am altogether sure it is no different. Indeed the immediate benefit to those who ride upon the cars far exceeds the increased returns to the consolidated company. Where before the union, two and even three fares in some instances had to be paid in order to convey the passenger to his destination, he may now make the same journey for a single fare by means of transfers and through cars, which were previously impossible. Taking Kansas City for an example, 50 per cent of all the passengers who ride on the cars make at least one transfer in every journey, so that it may be truly said 60,000 passengers save 5 cents each and every day in the year in Kansas City alone, and this saving is due solely and directly to the consolidation which took place only a few years ago. And who are the people thus benefitted? It is chiefly the laboring classes who can least afford to spend their hard earned gains unnecessarily. The sons of toil who were formerly compelled to shelter their wives and rear their children in the polluted air and noise and smoke because unable to pay more than a single fare in going to and from their vocations, can, and do now, dwell in the neat little cottage in the suburbs where loved ones breathe the pure air of heaven and bask in the sunshine of life all the day long, and when eventide comes smiles and mirth and joy are the companions who have taken the place of sickness, suffering and grief. Who can estimate the value of blessings like these? If the public welfare is the first and highest duty of the state who can gainsay the immense value to the public of street railway consolidations, and who can say that the state ought to throw any obstacles in their way?

But it is said that competition is the life of trade, and that monopolies are odious. Accepting these as general truths, let us see how it is with the street railroads. Except to a very limited and unimportant degree, there is no such thing as competition in street railroads, and their consolidation is entirely devoid of any objectionable feature of a monopoly. In the very nature of things, street railroads are seldom competitors in business. They were never known to compete in rates, and can only be laid on such

highways as the authorities may determine. The necessity for keeping some streets open for ordinary vehicle traffic keeps the street railroads sufficiently apart as a rule to eliminate any matter of choice on the part of the intending passenger. Each line supplies and accommodates its own peculiar territory, and there is no real choice, and hence no real competition. As to rates, these are universally fixed by the franchise ordinances. They are the same on all roads so that the intending passenger is moved solely by considerations of convenience to himself. In short, he simply takes the line which takes him to his destination with the least inconvenience. Monopolies are only odious when of a character that they do or have the power to fix their own price for what they alone can sell. Not so with the consolidated street railway. So far from having the power to increase the cost of travel, consolidation always results in a practical reduction of cost by giving to the passengers the right to ride for the same single fare the increased distance brought about by consolidation. No thoughtful man would condemn a street railway consolidation, because it neither stifles competition nor increases cost of travel, nor creates a monopoly as that term is generally understood.

There can be no doubt that consolidations of this character are greatly beneficial both to invested capital and the public at large. And happily this is so, because the public is never so likely to have its wants provided for as when it is to the interest of capital to do so. There is no tie so strong as common and mutual interest. This is a principle which would render many conflicts and controversies impossible, if kept always in mind and strictly adhered to in all dealings between public service corporations and the municipality in which they dwell. I commend it to the thoughtful consideration of all who are assembled in this convention, as the firm foundation on which aggregations of capital may safely rest, the Gibraltar of justice and right, garrisoned by an always sound and healthy public sentiment, against which the assaults of prejudice, passion and demagoguery would be hurled in vain.

The meeting then adjourned, the president announcing that the executive committee would then hold a meeting.

RECEPTION AT THE MIDLAND LAST EVENING.

Seldom have the members of the two associations enjoyed a more pleasant occasion than the reception tendered them last evening at the Midland Hotel by the citizens of Kansas City. The evening was spent in informal chat and everyone present will take with them when they leave the most pleasant recollections of Kansas City's warm hospitality. The parlor floor of the hotel was elaborately decorated with palms and American beauty roses, and from behind a perfect bower of hot house plants an orchestra of several pieces dispensed pleasing music. Light refreshments were served and the gathering broke up at a late hour.

Among the prominent ladies serving on the reception committee were: Mrs. Walton Holmes, Mrs. C. F. Holmes, Mrs. Kirkpatrick, Mrs. Derkee, Mrs. Stockham, Mrs. Dr. Crow, Mrs. Gregory and Mrs. Satterlee.

TALLYHO RIDE FOR THE LADIES.

The ladies' reception committee has arranged to give the visiting ladies of the convention a tallyho ride around the city this morning, taking in all the points of interest including the Country Club. The party will leave the Midland Hotel promptly at 9 o'clock and will stop at the Coates and the Baltimore for the guests at those hotels. The gentlemen are cordially invited to attend the meetings of the associations at the Convention Hall and let the ladies enjoy this trip alone.

THEATER PARTY THIS EVENING.

Through the courtesy of the Metropolitan Street Railway Co. the entire seating capacity of the New Coates theater, Broadway and 10th street, has been reserved this evening for delegates and visitors to the convention. Tickets may be secured from the secretary, and it is expected small parties will be made up at the hotels and go in a body to the theater. All parts of the house will be open to the holders of tickets and no seats will be especially reserved. The play is "The Runaway Girl." The curtain rises at 8.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

The 4th annual meeting of the Accountants' Association was called to order at 10:45 by President Duffy, who introduced Mr. Daniel V. Kent, auditor of Kansas City. Mr. Kent warmly welcomed the association in a few well-chosen words and after a brief response the president delivered his annual address.

PRESIDENT'S ADDRESS.

Gentlemen of the Association: In welcoming you to the fourth annual convention of the Street Railway Accountants' Association of America in this progressive, hospitable western city, permit me to refer briefly, and with great pride, to the present standing of the association, what it has accomplished and what it should accomplish.

The association is now on a solid foundation. The membership embraces the representative companies of the United States, Canada and Mexico, in addition to companies representing England and Scotland. Whatever may be the political faith or opinions of the Accountants, there can be no doubt that they are thorough "Expansionists" on the question of membership in this association. Notwithstanding the fact that the annual dues have this year been increased from \$10 to \$20, and that numerous consolidations have been effected in the year 1900, I am glad to say that our membership has not been materially affected. The deficit in the treasury, reported at the last convention, has been more than wiped out by the voluntary subscriptions of the members; we have a substantial cash balance on hand and no unpaid bills or other obligations outstanding.

For the fourth time, we are holding our annual convention in the same city, in the same building, at the same time as the American Street Railway Association. We are under many obligations to that association for the hearty support and earnest co-operation they have extended to us, for the privilege of attending their meetings, and for other courtesies that we have enjoyed at their hands. Unquestionably, the attitude of the older association towards this association has brought the operating and accounting departments of street railways in closer touch with each other, to the mutual advantage and benefit of both departments, as well as the good of the companies represented. To the American Street Railway Association we owe much, and I take advantage of this opportunity to express our appreciation of what it has done for us.

The Standard System of Street Railway Accounting of this association, strongly endorsed and unanimously adopted by the Convention of Railroad Commissioners of the United States, is now the standard of that body. All reports to State Boards of Railroad Commissioners (who are members of the National Association) of the fiscal year beginning July 1, 1900, will be made in accordance with the Standard System, thus placing it in the same position with reference to street railways that the Inter-State Commerce classification of accounts occupies with reference to steam railroads.

The Department of Blanks and Forms is now firmly and permanently established and in successful operation. This valuable collection of thousands of blanks and forms, securely bound in books, perfectly arranged and classified, thanks to the genius of our worthy secretary, Mr. Brockway, forms a library of rare and valued books, of which each member is privileged to make use. This feature is of special value and assistance to all members of the association. The exhibit of the blanks and forms at the annual conventions is one of the most interesting and instructive features of our meetings. A valuable addition to our library is the "Railway Official's Private Report and Reference Book," published by an enterprising supply firm and distributed by it gratuitously. The first copy of this book issued, with the name of the association stamped on the cover, was presented to the association by the publishers. In publishing this book, which is pocket size, admirably arranged and a marvel of the printer's skill, the publishers have recognized the growing importance and value of accounting work

in street railways and paid our association a graceful tribute by dedicating the book to it.

In connection with the use of the Standard System of Accounting of this association, we have a strong committee at work, charged with the responsibility of determining a Standard Unit of Comparison. The members who attended the Chicago convention one year ago, will remember the valuable paper on this subject presented by Mr. H. C. Mackay, the able and energetic chairman of the committee, and will recall the animated and interesting discussion that followed the reading of the paper. The committee will present another report to this convention; it is hoped you will give the subject the earnest, thoughtful consideration its importance demands, that there will be a thorough discussion in which every member present will participate, and that we will agree on a Standard Unit of Comparison which will be acceptable from every standpoint and go hand in hand with the Standard System of Accounting.



C. S. DUFFY,
President.

The advantages of membership in the Accountants' Association, to those engaged in the street railway business, are many and varied. No man could ever hope to accomplish, single-handed what the association can accomplish, as a body. The annual conventions give the members an opportunity of meeting each other, interchanging ideas, learning from each other and acquiring knowledge and experience which could not be obtained in any other way. The Classification of Accounts of the association is a self-instructing text book; the Department of Blanks and Forms is a valuable library of reference. Where, outside of the association, could the street railway worker find such advantages? To those of us who struggled through the disadvantages of an unsystematic accounting system, incident to street railways prior to the advent of modern transportation methods, going through the evolution of horse, cable and electric railways, construction and operation, these advantages appeal strongly. What would we not have given to

have had then what we have now? The work of the association, chiefly educational in its character, has only begun.

Having thus referred briefly to the present standing of the association and what it has accomplished, I will now draw your attention to the more important question of what it should accomplish.

Our first and most important duty is to increase the membership. There are some large companies and many small ones not represented on our membership roll, which should be with us. An earnest, determined effort should be made, in a systematic way, to see that every company is solicited to join the association, and that they are made acquainted with the advantages and benefits to be derived from being members. This effort should not only be made by the association as a body, but each member individually should take up the work, as a personal canvass is often successful where other measures fail. The life and success of this association depend upon its membership.

I earnestly recommend that this association consider the question of formulating a standard system of accounting and a standard unit of comparison applicable to the lighting and power business. The growing importance of this industry, owing to the introduction of modern electrical machinery, making it possible to generate current at one central power plant, economically transmit and distribute it at long distances, the increased consumption of current for commercial and domestic purposes and the tendency of the present day to combine the railway, lighting and power business, demand that we give this subject immediate attention. There are a number of our membership companies now engaged in the railway, power, electric lighting and gas business. I would suggest that a committee be appointed, charged with the responsibility of this work and that they be instructed to make their first report to this association at its annual convention in 1901. I would advise that this committee confer and co-operate with a similar committee of the National Electric Light Association, to whom has been delegated the same work for that association. I am pleased to announce that our William F. Ham has been appointed a member of the National Electric Light Association committee. This is a compliment to Mr. Ham, a recognition of the valuable work he has performed for this organization, and an honor to our association of which we may well feel proud.

It would not be amiss to state that the committee on a Standard System of Accounting, at the suggestion of Mr. Brockway, gave this question of a classification of accounts for lighting and power companies some consideration prior to the annual convention of 1899, but decided not to present it to the 1899 convention, as there were other matters of more direct importance to this association to be considered at that convention. This accounts for our association not taking the initiative.

Accounting is one of the vital elements of business. This is being recognized more and more every day. In reading the proceedings of the conventions of different organizations held during the current year, I was so impressed with this fact, that with your permission, I will present for your consideration some of the more important points which were brought out with reference to accounting, as I feel we should take advantage of every opportunity to study this broad subject in all its phases. At the convention of the New York Street Railway Association, held in Buffalo, Sept. 18-19, 1900, Mr. G. Tracy Rogers, the president of the association, in his annual address, said: "Much has been accomplished in the standardization of our accounts which will work out untold benefit to the roads; besides strengthening our securities, it will give confidence to the public, and afford us material for comparison."

In discussing a paper before the Southwestern Gas, Electric and Street Railway Association, the president of a railway and lighting company said in part: "The point of a comprehensive set of accounts to be kept so that the condition of business can at all times be understood is a great deal more important than we imagine until we go into it, and the more you get into it the more information you will get. We are trying to be able to tell the details of the cost of producing a kilowatt-hour from the time the coal leaves the car until the consumer pays for it. This looks at first as if it was uncalled for, and I have had the question raised that it took too much time. After you have once got into it, it does not take any more time than it did a year ago, to make out your monthly report, with a detailed, statement, and you can see any little difference as to where your expenses are increasing or decreasing."

In appointing a committee to formulate a uniform system of

accounting, the National Electric Light Association recognized the advantages of a uniform system that would be a standard for all to conform to. At the convention of this association, held in Chicago, May, 1900, Mr. J. B. Cahoon presented a paper on "Uniform Accounting." He pointed out the necessity of a system of accounting that would show "true costs," not by single companies, but by a great body, all of whom would follow the same method and use the same system of account in determining the cost of production.

In discussing this paper, Mr. Samuel Insull, president of the Chicago Edison Co., said in substance: The first step in this matter is to have our own members, if we can educate them to a uniform system of accounting, state in their accounts what their cost is, and stop them as far as moral suasion will stop them, from working their construction accounts. If moral suasion will not stop them, if we can get copies of their reports, kept on a uniform system of accounting, we should bring them up here in the convention and ask them to explain their accounts, when some company shows an abnormal profit as the result of immoral accounting, fooling itself.

The question of publicity of accounts of corporations, especially companies engaged in operating public utilities, is receiving close attention. At the twelfth annual convention of Railroad Commissioners, held in Milwaukee in May, 1900, to which this association was invited and officially represented, the president advocated the enactment of legislation that would compel street railways in all states to make reports to the railroad commissioners, as steam railroads now do. At the convention of the National Electric Light Association, the point was brought out in Mr. Cahoon's paper on "Uniform Accounting," that there was no objection to publicity of accounts if "true costs" were shown.

At the last convention of this association, it was suggested that we should have not only a standard unit of comparison, in connection with the standard system of accounting, but a standard form of report, full and complete in every particular, a standard system of blanks and forms, and a standard system of accounting methods. I most heartily endorse and approve this proposition in all that it embodies. Now that we have adopted a uniform system of accounts, we should bear in mind one of the fundamental objects of the association, as set forth in Article II. of the Constitution, namely, "To improve the work of the accounting department." On the principle that he who does not go forward, goes backward, it should be the fixed purpose of this association to broaden and perfect the Standard System of Accounting in every feature of its practical working application, so that the best results possible from every standpoint may be attained. How shall we do this? The question of a Standard Unit of Comparison has already received careful consideration from the committee to whom it was referred, and they will report to this convention.

As to a Standard Form of Report, I will say that the matter has received attention and will be submitted for your consideration later.

With reference to a Standard System of Blanks and Forms and a Standard System of Accounting Methods, I would recommend that a committee be appointed, charged with the work of preparing model blanks and forms, general in their adaptability and use, with such explanations and instructions as may be necessary or desirable. These blanks and forms should cover the accounting work of every department. I would suggest that the best form for each specific purpose could be selected from the library of the association, and in that way a book of model forms could be prepared. The necessary explanations and instructions concerning the use of forms should include in a general way, suggestions as to the methods to be pursued in gathering the figures and data that are to be compiled in each specific form. These suggestions must of necessity be general in their application. Special local conditions will require special study and treatment.

In connection with what this association should do as a body, "to improve the work of the accounting department," each member individually, for himself, for the association, and especially for the company he represents, should take up this work and devote to it all the energy, ability and application that he may have. We should be thoroughly posted on the affairs of the company we are connected with and have a general knowledge of the operation of the road in all departments, or our sphere of usefulness and the value of our work will necessarily be limited.

We should closely study the special local conditions which are a part of the operation of every road, so that the accounting problem involved may be correctly solved and the conditions of operation clearly and comprehensively set forth.

We should aim to make our system of accounting practical, complete, thorough and economical. The advantages of modern methods in commercial business, and the introduction of labor-saving devices should be thoroughly investigated and made use of if they can be used to advantage. We cannot be producers of "gross earnings," but we should be increasers of "net earnings." We should be careful not to duplicate work or expend labor that is unnecessary or yields no return. We should not be carried away with a mass of figures and statistics that have no practical value or serve no good purpose, neither should we go to the other extreme of dismissing as useless and valueless, much that may be of vital importance, simply because it increases the work of the accounting department or necessitates the expense of additional clerk hire, when results may be produced which would more than repay the work and expense involved. I believe in an accounting system of such scope and extent that the grasp of the affairs of the company, as well as the operation of the property, is at all times within the hands of the accounting officer in charge; a system that will furnish any information that may be required or desired, promptly; a system that will make it possible to answer any question which may be asked.

There are two propositions that enter into the work of the accounting department; though different, they are intimately connected with each other. One is "accounting," the other is "railroading." Mr. H. H. Vreeland, president of the Metropolitan Street Railway Co., of New York, at our last annual convention, said this about the calling here represented: "I, from my experience, have always looked upon the auditor, or accounting officer, of a railroad as the most important lieutenant and aid of the president or managing officer of the road. I look upon the man at the head of the accounting department as the confidential accounting adviser of the head of the property."

The papers to be presented to this convention deal with practical accounting questions and are along the lines of the work that this association should now take up. The subjects of the papers were selected and the program of the convention was arranged with this special purpose in view. To the gentlemen who have responded to the demands of this convention, we are under many obligations. I desire to express our most sincere thanks and appreciation for their hearty co-operation.

Special mention is due our able and energetic secretary, Mr. W. B. Brockway, for the valuable work he has performed for this organization. To Mr. Brockway's efforts the association owes much of its success.

To the "Street Railway Review" and the Street Railway Journal, and our good friends and honorary members, Messrs. Windsor and Higgins, we are under many obligations for courtesies extended. The columns of the "Review" and Journal have always been open for the publication of anything that would further the interests of this association.

Formal notice has been given, as required by the By-Laws, that a change is proposed in Article VII of the By-Laws. This means that the question of changing the time and place of holding our annual conventions is to be voted on at this convention. I earnestly hope that the question will be fully and thoroughly discussed from every standpoint, and that every member present will express his opinion as to what he thinks is best for this association to do, before the matter is put to a vote.

With reference to the next convention, I am reminded of a question of the utmost importance to the association, and one that has given your present officers much concern. I refer to the assignment of papers. The success of our meetings depends in a large measure on the selection of proper subjects for papers and having the papers prepared and presented to the convention. Any member of this association, when asked to prepare a paper, or perform any other duty assigned to him, should appreciate the honor sufficiently and have the interest of the association at heart in such a degree that he would gladly respond when called on and give the association the benefit of his best efforts. This is a duty that every member owes to his fellow members and the calling he represents, a duty that should not under any circumstances be disregarded or shirked.

In conclusion, permit me to express my appreciation of the honor you have conferred on me, that makes it at once my duty and privilege to preside over the deliberations of the fourth annual convention of this body. To be president of the Accountants' Association is an honor I esteem more than words can express. I thank you for the honor bestowed and for the many acts of kindness and courtesy that I have received from your hands, as well as your valued assistance in many ways. Let me bespeak from you faithful attendance and close attention to the proceedings of the meeting, and especially, full discussion on all subjects. I earnestly hope that this convention will be a fruitful source of information and education, as well as a pleasant reunion for us all. Gentlemen, I commit the business of the convention into your hands.

The secretary and treasurer then submitted his annual report as follows:

REPORT OF THE SECRETARY AND TREASURER.

The report of the work done in this office for a year has become a rather large undertaking, caused by the three divisions into which the office has resolved itself—viz., secretary, treasurer, and the Department of Blanks. In each there has been so much accomplished that it seems better to divide the report so as to cover each section of the work separately. This is without any desire on my part to imitate the well known Poo-Bah, but if any such charge should be made, I would promptly lay it upon the happy faculty the association has of being successful and busy, and keeping the secretary busy, too.

In reporting the membership as it is today, the prophecy made in last year's report as to the effect of consolidation has been, to a large extent, verified; but the applications for membership that have been presented have neutralized the loss, so that, from a numerical standpoint, we are but very little worse off than a year ago.

Applications have been received from the following twenty-one companies:

- Indianapolis Street Railway Co., Indianapolis, Ind.
 - Charleston Consolidated Railway, Gas & Electric Co., Charleston, South Carolina.
 - Louisville Railway Co., Louisville, Ky.
 - St. Joseph & Benton Harbor Electric Railway & Light Co., St. Joseph, Michigan.
 - Union Traction Co. of Indiana, Anderson, Ind.
 - Chicago Consolidated Traction Co., Chicago, Ill.
 - Manchester Corporation Tramways, Manchester, England.
 - St. Louis Transit Co., St. Louis, Mo.
 - Portsmouth, Kittery & York Street Railway Co., Portsmouth, New Hampshire.
 - San Antonio Street Railway Co., San Antonio, Tex.
 - Conestoga Traction Co., Columbia, Pa.
 - Chicago Union Traction Co., Chicago, Ill.
 - Washington Traction & Electric Co., Washington, D. C.
 - Winchester Avenue Railroad Co., West Haven, Conn.
 - Cleveland & Eastern Railroad Co., Cleveland, O.
 - Connecticut Lighting & Power Co., New York, N. Y.
 - Consolidated Traction Co., Pittsburg, Pa.
 - Bridgeport Traction Co., Bridgeport, Conn.
 - Seattle Electric Co., Seattle, Wash.
 - Buffalo Railway Co., Buffalo, N. Y.
 - Erie Transit Co., Erie, Pa.
- Resignations have been received from the following twenty-five companies:
- Southern Electric Co., St. Louis, Mo.
 - Nassau Electric Railway Co., Brooklyn, N. Y.
 - City & Suburban Railway Co., Washington, D. C.
 - Brooklyn, Queens County & Suburban Railway Co., Brooklyn, New York.
 - Citizens' Railway Co., St. Louis, Mo.
 - People's Railway Co., St. Louis, Mo.
 - Lindell Railway Co., St. Louis, Mo.
 - Missouri Railroad Co., St. Louis, Mo.
 - Kokomo City Street Railway Co., Kokomo, Ind.
 - Columbia Railway Co., Washington, D. C.
 - Hamilton Street Railway Co., Hamilton, Ont.
 - Columbus Central Railway, Columbus, O.
 - Metropolitan Railroad, Washington, D. C.
 - Union Depot Co., St. Louis, Mo.

West Chicago Street Railway Co., Chicago, Ill.
 Cleere & Proviso Street Railway Co., Chicago, Ill.
 Hawaiian Tramways Co., Honolulu, H. I.
 Oakland Transit Co., Oakland, Cal.
 Fair Haven & Westville Railway Co., New Haven, Conn.
 Milwaukee, Racine & Kenosha Railway Co., Racine, Wis.
 Syracuse Rapid Transit Co., Syracuse, N. Y.
 North Chicago Street Railroad Co., Chicago, Ill.
 Brightwood Railroad Co., Washington, D. C.
 Central London Railroad Co., London, England.
 Lowell, Lawrence & Haverhill Street Railway Co., Lowell, Mass.

The statement of growth in membership is:

Charter members, Cleveland, March, 1897.....	25
Additions reported at Niagara Falls, October, 1897..	12
Additions reported at Boston, September, 1898.....	32
Additions reported at Chicago, October, 1899.....	34
Additions reported at Kansas City, October, 1900.....	21

Total applied.....	124
Withdrawn.....	28

Membership October 16, 1900.....96

This shows a net loss of but 4 members. But the average number of applications received per year has been 34, while 1900 shows but 21, a drop of 13 in the average. These figures show plainly the need of a definite action on the part of the present members toward the gathering in of every company within reach. It is not so much that a larger showing may be made that this effort seems necessary, as it is to make the association so representative that its deliberations may carry the positiveness which comes from such a larger point of view.

During the year furniture has been added to the equipment of this office, including a second-hand typewriter, a book-case, a copy-press, etc., costing less than \$60.00. All of this was very much needed.

The financial statement is interesting, showing as it does that the increase in dues has been well received by the membership, and that the necessity of a larger income is appreciated.

The receipts have been as follows:

In Bank, Oct. 14, 1899.....	\$ 19.28
Donated account 1899 deficit.....	160.00
Dues for 1900.....	1,570.00
Dues for 1899.....	10.00
Applications..	310.00
Interest on deposits.....	7.65
Total.....	\$2,076.93

The expenses have been as follows:

Salary, secretary....	\$200.00
Secretary, office expenses.....	75.90
Postage.....	62.00
Office furniture..	59.25
Printing 1899 Report.....	260.65
Stenographer, Chicago Report.....	110.00
Printing..	58.05
Department of Blanks.....	12.75
Printing 1899 Standard Report.....	129.50
Note paid..	125.00
Miscellaneous..	88.59
Total.....	\$1,181.69

Balance in bank, October, 1900..... 895.24

Had the dues remained at \$10, and expenses for this year as they are—and it is difficult to see how they can be reduced—the result would have been an income of \$1,120, and a deficit of \$61.69. This income includes \$160 contributed at the last convention; without it, the deficit would have been \$221.69. To take into account that the expenses are \$210.05 less than last year, will make the wisdom of the increase in dues more clear.

At this point I wish to explain, that with his customary liberality, President Duffy has refused to receive his expenses to New Orleans to confer with the secretary in March of this year, or to Milwaukee, to attend the meeting of the National Convention of Railroad Commissioners. In the latter trip, Mr. F. E. Smith, auditor of the Chicago Union Traction Co., took the same action; and it is through the kindness of these gentlemen that the treasurer

is enabled to report a decrease in operating expenses and so large a balance in bank.

For the Department of Blanks and Forms, there is to report a considerable increase in the blanks filed by the addition of the issue of 12 companies and the re-filing of a number of re-issued forms. All of these add to the interest and value of the collection, which has reached such large proportions through your co-operation.

Among the new blanks received is a large set from the Glasgow Corporation tramways, which, on account of the differences in practice, were rather difficult to fit to our classification of blanks, and have been filed in a separate book numbered 15. An examination of this set will be found very interesting.

Owing to economy of space, instances will be noticed where blanks have been filed on top of others, in all cases showing the full size and composition of each; but at times by a similarity of papers, the dividing line could not always be easily distinguished. To remedy this, a light black line has been ruled around every blank, giving a result very noticeable to those who examined the collection at Chicago; and, at a glance, rather than by close scrutiny, the blanks are separated and compared.

The new collection of rubber stamp impressions, while not representative, is an interesting addition and assists to the result aimed at by the department.

Some changes are contemplated in the arrangement of the permanent set and the sets used for requests, all helping in what experience has shown is needed to make the collection a positive benefit, and not let it become merely a curiosity.

It is a pleasure to state that the friendship and help heretofore shown by the officers of the American Street Railway Association and the street railway papers has been continued unwaveringly, and the most cordial thanks are again expressed to them and the many others who have assisted in bringing the association to the position it now occupies.

W. B. BROCKWAY.

In addition to the new members given in the report the secretary stated that there should be added to the list of new members as read, the Washington Power Co., of Seattle, Wash., and the Syracuse Rapid Transit Co., of Syracuse, N. Y., which had resigned and rejoined.

In relation to the list of resignations read, the secretary stated that most of them had been caused by consolidations which were prophesied last year. He thought there were only about 7 of these 25 that resigned on account of the increase in dues.

President Duffy: Gentlemen, you have heard the report of the secretary and treasurer, which is very gratifying when it is considered that we have 98 members, as against 100 last year, and \$895 in the bank, instead of \$75 in red ink. What is your pleasure?

On motion of H. L. Wilson, Boston, the report was accepted and ordered filed.

President Duffy: The next order of business, gentlemen, according to the printed programme, is the appointment of committees. On the Committee on Nominations, I will appoint Mr. H. L. Wilson, of Boston, Chairman; Mr. S. E. Moore, of Pittsburg, and Mr. Simpson, of Augusta. On the Committee on Resolutions, I will appoint Mr. Wm. F. Ham, of Washington; Mr. Chas. M. Hemingway, of New York, and Mr. Suda, of St. Louis.

The next order of business is the paper, or, rather, the address, of Mr. John I. Beggs, general manager of the Milwaukee Electric Railway & Light Co., on "What Does the General Manager Want to Know from the Accounting Department?" and in this connection I desire to say that Mr. Beggs has very kindly filled the place of another gentleman on the programme, at very short notice. Mr. Wyman had this paper assigned to him, but has recently gone out of the street railway business, at least out of the direct charge of a road, and he has been called to Boston, and it was impossible for him either to attend the convention or to prepare a paper, and Mr. Beggs, very kindly consented to address this body on the same subject.

ADDRESS OF MR. BEGGS.

Mr. President and Gentlemen: I must apologize for not having given more time and thought to the subject which you expected to hear discussed by Mr. Wyman. It was only a few days, or possibly a week ago, when I was requested by your executive officers to prepare a paper upon this subject. I have never prepared a paper

in my life, and am almost too old to learn new tricks. Therefore, what I shall say upon this subject will be simply the thoughts that are suggested to me as the manager of one of these public utilities.

What the general manager wishes to know from the Accounting Department, I should narrow and say, "What Does the General Manager Wish to know from the Head of the Accounting Department?" I would not be presumptuous enough to think that I, in the few minutes that I shall occupy, could stand here and tell to you what the general manager wants to know from the accounting department, when so much time has been so well expended by your association for several years past developing and demonstrating just what he should know. The system of blank forms and accounts that you have developed is highly creditable to your association. It will do much to save the industry in which we are all so vitally interested. The first thing the general manager wants to know from the accounting department, in my judgment, is that the accounting department believes in the general manager's policy. He wants to know that he has loyal, enthusiastic, energetic supporters in carrying out what may be the general manager's policy, and that they will aid it conscientiously and fearlessly; and when the head of the accounting department cannot subscribe to the general manager's policy he had better tender his resignation. As a rule the general manager stands for the board of directors, and they are supposed to stand for the stockholders, which is the capital. Unfortunately they have not always done it, but they should do it, and I think that the executive managements of these public utilities are year by year giving a stricter account to the great body of stockholders. In order to do this we must have conscientious, earnest work both on the part of the general manager and of the accounting department. Unfortunately, the general manager is not always a trained accountant; he is too often not competent to analyze and determine whether or not the accounts and the various statements that come to him are made up intelligently, or to analyze and determine whether or not they have been properly kept. And that, in days gone by, has been responsible for the failure of some of these public utilities, and caused them to be re-financed. They have run aground without knowing it; like the mariner whose compass has become disarranged or does not know how to read it, they are cast ashore; they run against the breakers, and it is the easiest thing in the world, because too often it is to the interest of the general manager and the board of directors to make too glowing a statement of what they were doing, and this is particularly the case during the years of construction or development when they have a capital account to be drawn upon.

Capital account has covered multitudes of managerial blunders and extravagances. Therefore, I always take the position that it is best to close up the construction account as quickly as possible. If there is going to be any error made in your accounting departments, gentlemen, let it be on the other side. Have a little more property than you think you have. When a man puts his hand in his pocket and expects to find seventy-five cents, but finds, instead, a dollar, he feels very good. It is not a very large amount, but nevertheless it is on the right side. He has just a little more than he expected. But if he puts his hand in his pocket and finds he has only fifty cents, he is disappointed; he says, "I certainly thought I had that," and such is the case with many of these properties that they go on deluding themselves; because there is a construction account, they charge into that many things that should have gone to operation. It is one of the reasons why many new enterprises seem to show such phenomenal results. I have seen a statement very recently of a certain line running into the city of Chicago, or nearly so, showing the expenses to be down to somewhere about 30 per cent. (Laughter.) Now, we all know how that is produced. Of course, that is not done in order to show what the actual results are. It is produced in order to unload a promoter's property upon an unsuspecting investing public. I only refer to that because that statement has been brought to my attention within a few weeks, being on the market. But very often our properties get into the same condition, because of a lack of intelligence. Therefore, the general manager wishes to know from the head of his accounting department—and I shall deal with the head—that there is an intelligent understanding, and an honest practice in the making up of either the daily, the monthly, or the annual statements.

As I said at the outset, the general manager wishes to know that the head of the accounting department is in sympathy with and believes in his policy, because a general manager should lay down the policy for his corporation. He is put there for that purpose. Now, he must know that his associate who is in charge of the figures believes in that general policy, will help him carry it out, will in every manner so operate with him, will watch and see that there is consistency throughout every department of the company's business.

Some of our properties are in a little more complex condition than others. Take the property with which I am associated; we conduct a very large electric lighting business in three or four different cities, some part of it under our main company, some under a traction company which we operate. Consequently, it is very difficult at times to feel that the same general practice is observed in each one of the co-ordinate companies, possibly under the name of one, and that the head of each particular department observes the same methods as are observed in every other.

In the street railway business it is highly important that the general manager shall have confidence in the integrity, in the vigilance and discrimination and keen perception of the head of the accounting department and know that he will watch that there is no injustice permitted even to the humblest employe of the company, and that the trainmen are held to strict account. The idea should not get abroad among your force of conductors that there are not too many shortages being reported, or that there is too much carelessness in the accounting department. We make it a rule to have the accounting of the trip sheets and the returns of the various conductors directly under the head of our accounting department. We have but one head of "figure wrestlers" as I call them. We do not have it divided into transportation department, and so on, but all is under one head. I am a great believer in centralizing responsibility, and in having one head responsible and giving him the highest degree of confidence. One of the most important things in dealing with the conductors on street railways, is that they have absolute confidence in those who pass upon their daily returns. They should not, every day or two, be brought face to face with the charge, "You have a shortage to-day of a dollar," or fifty cents, whatever it may be; that creates distrust and it soon permeates the whole mass of men. They begin to distrust the accounting departments, and to believe that their methods are not accurate. That comes back, it works almost incalculable harm among our men, and we who are managing these properties to-day are carefully studying that there shall be no cause of unrest, or dissatisfaction among our trainmen. You have seen a number of serious labor troubles among that class of men during the past year. We went through it, four and one-half years ago, one of the first large railway strikes. We have watched it carefully ever since. It very often comes from the accumulation of a multitude of these trivial matters, that give good cause at times for unrest.

These are some of the things we want from the head of the accounting department. I am ignoring your system of blanks entirely. I did not conceive that was what you wanted to hear about, or that it would be a thing of particular value to you, because you are giving labor and conscientious thought to that subject. The blanks are being perfected from year to year, and developing in greater detail. I thoroughly understand that in different corporations there are varying conditions that do not apply to all. Consequently there must be, with your system of accounts, provisions for some flexibility that may suit the peculiar conditions of various corporations, many of which are interested in a variety of things, and have more than one interest to provide for. They must likewise be sufficiently flexible to permit, sometimes, of what may be the peculiar or unreasonable notions of the general manager. He may have an idea that he wants injected into them certain additional features, or, possibly a very good reason from his standpoint, which is not always recognized, perhaps, by the head of the accounting department. The general manager should have the confidence and command the respect of the head of the accounting department to such an extent that, notwithstanding it may cause some additional labor to provide these auxiliary accounts, as we might call them, for his information the work will be cheerfully done. The manager may have better reason for asking for them than appears on the surface, and it may entail, as the head of our own accounting department has sometimes found, a considerable amount of additional labor; but it is not useless; it is

for some good cause. I am well aware that all managers have ideas that are different possibly from those of the heads of their accounting departments because of some previous experience they themselves had in the science of accounting. I use the word "science" advisedly, because accounting is a science, and if the broad, fundamental, underlying science of accounting is thoroughly understood by the head of the accounting department it will be much easier for those charged with the operating of the properties.

I had something to say when this association was being organized as to what should be included, having given considerable attention to the various forms of accounting of this and its kindred industry, electric lighting, for a great many years. In fact, I was one of a committee some fifteen years ago to standardize a system of accounting for electric lighting plants in that early day. They had done more I think in the line of standardizing their accounts, or at least one branch, electric lighting. I speak more particularly of the old Edison Association of Illumination Companies, which was a close corporation and still is I believe, but I was the president of it for seven or eight years and we had a very carefully devised system of accounting whereby we could, with a great degree of accuracy, compare the results of various companies throughout the United States. Though more limited than this association, we demonstrated, at that early day in the electric lighting industry the great advantage of being able to compare accounts. That is highly advantageous, absolutely essential, even in the street railway business. The general manager wants to be assured that the head of his accounting department is watching his expenditures from day to day, watching that the estimates made of construction, or of some piece of reconstruction, do not seriously exceed the requirements, or if they do, that the fact will be brought to the attention of the general manager in order that a proper remedy may be applied; that the practice throughout the various departments of the corporation is uniform, so he may not have, as is sometimes the case, an employe in one department asking to be transferred to some other department in the business of the same corporation for the reason that the practice is different. Such a condition should not exist, and yet it may exist if the comptroller, or the auditor, or the head of the accounting department, by whatever name he may be known officially, does not bring to the attention of the executive head the facts that exist. Take it in our own corporations, where at times our employes number anywhere from two to three thousand men; it is impossible for the general manager to attempt to know what every specific rate of pay is throughout all departments, and that there is uniformity in the pay rolls and uniformity in the hours put in in the various departments. All of these things come directly under the eye of the head of the accounting department, and where irregularities exist it is highly important that he should report them in order that a remedy may be applied.

It is furthermore important that he keep the general manager advised as to how the receipts are on the various lines. While some general managers try to follow those things, they do not all do so. They would not all be competent, because of a lack of early training in the science of accounting, of determining whether the matter was accurately compiled and put in shape. The manager should see that the various lines are being operated with the smallest number of cars in order to produce given results. If on one line a car is earning two dollars per car-hour—you notice, gentlemen, that I said, "car-hour" (laughter)—and on some other line a car is earning only one dollar per car-hour, and that going along month after month, there is some reason for it. It may be a good one, but nevertheless, it is the duty of the accounting department to bring the matter to the attention of the general manager. The accountant may be conversant with the reasons why certain things are so, but as these matters are coming under his eye day after day, if discrepancies exist he should promptly bring them to the attention of the general manager.

The general manager desires, furthermore, to know that the head of the accounting department is taking occasion to correspond with other roads of similar size operated under practically the same conditions, is obtaining copies of their reports, comparing them and bringing to the attention of the general manager features in them which would seem to show that as regards certain features the other lines were being operated more economically than his own. The points wherein we are operating better than the others, I do not care to know about. I arrange to have the heads of de-

partments go away two or three times a year to some other city where perhaps there is a very good system of operation and management and a good system of accounting; I am very glad indeed to have the head of my accounting department take two or three short trips during the year; to go to different cities, and observe their methods, and I always say: "I don't want you to come back and tell me a single thing that we are doing better than they are. I don't want to know that. That will take care of itself. But go and find something that they are doing better than we are, and we will try to copy that, and if possible, improve just on it a little." The managers want to know, and they do not always have the time to investigate for themselves, that this comparison of accounts is made; otherwise, what is the use of this uniformity if you are going to close it up and lock it up in a safe? I want any company, the head of any accounting department, allied to this association, or to the street railway association, to feel that it can send to the Milwaukee Electric Railway & Light Co., or any other company in which I am in an influential position, and obtain any data that we have. (Applause.) We do not consider it a burden to give information to you, if we have to put on a clerk to copy the reports, we will do it. I want, likewise, to feel that if we wish to have some information from any member of this association, or of the street railway association, that they will not feel that we are burdening them when we ask for it. In our practical operation, I many times take time that I could not command for myself, but I do take it, to go over our system and show its various phases to gentlemen who come from a distance to see what we are doing, and I take pleasure in doing it. The exchange of ideas is valuable, and unless these various statements, these various reports and results that are being realized by the various companies, are going to be interchangeable, of what use is this uniformity of accounts? It is for some purpose. It is for the purpose of being able to make fair, intelligent comparisons, that we may know what we are doing. Above all, have the head of your accounting department keep his accounts in such a way that you do not need to fear if at any time your state railroad commissioner, or if perchance there should be a national railroad commission, should order your books closed. Let your accounts be upon the same basis as is adopted by the national banking department at Washington; when an order is given for a statement of accounts, it is not of some day in the future, but always some time in the past, so that there is no opportunity to fix up the books. So our accounts should be. We want particularly to know, or at least I want to know, that if the head of my accounting department and all of his assistants are called hence, that a new set of accountants can go to their desks in the morning and find nothing to clean up for yesterday—that the work is kept up day by day. That is highly essential, and if that were always done, it would not take so long for many managers to get a statement of what their actual condition is. It is highly important to know that there is promptitude with all these accounts, that the work is always right up to date. It will save many errors and many blunders. It is one of the besetting shortcomings of many accounting departments that they are always going to do something, going to prepare some statement sometime in the future. The future is not theirs. Consequently it is highly important that accounts shall always be up; that if the general manager wants to know something he can send with assurance to the head of the accounting department for such and such a statement and it will be forthcoming as soon as it can be transcribed from the books, or from some other statement, or that he can send the original. Two of the most important things that a general manager wants from the accounting department are accuracy and promptitude.

As I said at the outset, I have to apologize, for not having prepared an address such as would no doubt have been prepared by my friend, Mr. C. D. Wyman. I am substituting for him this morning. I have been substituting for him for four years. (Laughter.) I desire, on behalf of the managers of street railways, to extend to this association, my earnest, heartfelt appreciation of the good work your association has done, still is doing, and which I hope it will continue to do. I think no higher compliment could be paid to your association than the co-operation asked for by the steam roads and by other organizations of this kind in their efforts to perfect a standard system of accounts and of forms. This matter of standardizing forms is as important as the standardization of accounts, the forms on which the accounts pass from the

various heads of departments into the accounting department. Much of the accuracy of the accounting department will depend upon the comprehensiveness of the forms that go out from the storerooms, from the heads of the various departments, from the man in the shop as showing the cost of a certain piece of work, and so on down the line. There is quite as much necessity for making these various blanks uniform throughout, as there is for the accounts themselves, because if these various blanks are not fairly uniform it will be much more difficult to make uniform the accounts based upon them. I do not know just what forms the association has adopted. I think in our own practice we subdivide to a somewhat greater extent than is provided for in the standard forms of your association. However, we keep the various heads so thoroughly in accord with the standard system of accounts of this association that they are practically the same, with the exception that I subdivide to a greater extent some of the expenses of maintaining equipment. I have the cost of all labor and all material subdivided.

I can keep the cost of material in my mind. When I see a statement that material costs so much, I can check whether or not that is about right, without asking any additional figures; but they can cover up a multitude of sins in the item of labor, omissions and mistakes, because that is much more difficult to cover. In all work, my suggestion would be that you subdivide and differentiate between the cost of labor entering into any piece of work and the cost of the material entering into it, because the general manager, if he is familiar with his business, knows about the amount of material. If it is putting a set of wheels under a car, I know what those wheels cost. I do not know if the thing comes to me bulked, called wheels and labor; I cannot tell whether the labor has cost \$1.50, which would be about the cost of putting on a pair of wheels, or whether it is \$2.50 or \$3, if it is all covered up in one item. Therefore, I urge upon the Accountants' Association the advisability of subdividing the cost of materials as against the cost of labor that is necessary to put that material into use. We subdivide in our own practice. For car bodies, for instance, we keep carefully the cost of painting, etc., as an item by itself. Likewise the cost of heating, the cost of lighting cars. Many of these things that are coming to him in that way the general manager wants to know in order that he may be able the better to analyze and determine whether these various items are being kept down to the lowest point consistent with the highest degree of perfection in the maintenance of his construction.

Above all, urge upon your municipality and legislative bodies that they shall call for the publication of your accounts. I for one believe you owe it to them. You are simply trustees for certain rights which they give you in the municipalities. You will quiet much of the criticism we hear regarding public utilities when you make public your accounts. We have had a pretty lively time in the city of Milwaukee for several years, as some of you no doubt know. We have finally got them harmonized to a certain extent by having had passed by our municipal legislature, or common council, so called, last winter, an extension of our franchise and the straightening out of certain questions in connection with it, up to Dec. 31, 1935. We are here to-day with a decision from the Supreme Court of Wisconsin, handed down on Friday last, affirming that franchise and quieting all these various questions. It was claimed that we were suppressing our accounts. That our profits were much greater than they ever were, and the Municipal League and other associations went before the legislature some eighteen months ago, at the biennial session, last winter a year ago, to present a bill requiring us to file our accounts, and annual statement, with the officers of the state. They expected that we would antagonize and oppose them, and possibly by underhand means defeat it; instead of this I urged the passage of that act. Our accounts should be kept, as I said before, in such a manner that you do not need fear the closest possible scrutiny, either as to the underlying policy of the corporation or as to the methods employed in working them out. Once be honest and you will quiet much of the criticism in the various localities in which you are operating. Under the law of Wisconsin to-day, every street railway and electric lighting company must file a statement giving in very great detail the results of its operation every year, and we have no hesitation in doing so. We believe that it will do much to bring about a better state of feeling between the general public and the corporation that is serving it. I believe in the broad,

general, underlying principle that a street railway company is, of all corporations, one in which the general public is most vitally interested, and it has a right to be informed as to your methods of operation and of management. We are public servants, and we are the one class of public servants with whom everyone in the community must come in contact. He may escape everything else, he may escape the tax gatherer, except once a year, the undertaker, except once in a lifetime, but the street railway company he is coming intimately into contact with several times a day. In our own city we are carrying at the present time an average of one-half of the entire population every 24 hours. They are vitally interested, gentlemen. Do not attempt to deny it, but proceed upon the broad, general principle that they have a right to know that the property is being conscientiously operated so as to afford them the greatest possible degree of convenience, of comfort, of safety and of reliability, and to this end, the heads of our accounting departments can do much to assist the general manager and relieve him of many of the details of the complex position in which he is placed.

I thank you, gentlemen, for your patience; I thank you for the courtesy of calling upon me to fill the gap left in your programme. I only regret that time has not permitted me to have given to the subject more analytical thought, that I might have presented these views in possibly briefer form, and possibly in form that would have produced what I wish to produce, make your organization more valuable if that is possible to the great interests that we represent. (Applause.)

President Duffy: I wish to especially thank Mr. Beggs in behalf of this association for the able, interesting and instructive address he has given us this morning. Everyone here should go out of this hall with new lessons to learn. If we had more general managers like Mr. John I. Beggs, we would have more accountants like the accountant of his company (applause); we would have more accountants such as accounting officers should be; not machines, not book-keepers, not, as he termed it, but in a different sense, "figure wrestlers," but accountants. The lessons that Mr. Beggs has pointed out to us, each and every one, should take home to himself, and I earnestly hope that we will have more of the gentlemen across the way in attendance; and I again thank Mr. Beggs for coming here and giving us the benefit of the thought that he has so ably expressed here. (Applause.)

Mr. Beggs: Mr. Chairman, just one other word, because I must ask to be excused and return to the other side. I consider the head of my accounting department my most important associate in the management of the property. I always have done so; I do now. I consider him not so much, as is often the case, in the light of an employe, but really an associate in the management of the property; and so, every head of an accounting department should fit himself to be in reality an adviser upon many of these points that are coming to him daily, hourly, day in and day out throughout the entire year. He is to a certain extent, the right hand of the general manager.

President Duffy: Gentlemen, if I may be permitted to digress a little from the regular order of business—it is with great pleasure that I observe that one of the Old Guard is present this morning. He has honored this association by his presence, and further honored it by the presence of his wife. Gentlemen, we have with us Mr. and Mrs. Henry J. Davies, of Cleveland. Mr. Davies, as you all know, was formerly an active member, an extremely active member. He is now an honorary member, but nevertheless we would be very glad indeed, if upon this occasion he would be an active member. Mr. Davies, will you kindly come forward?

Mr. Davies: Mr. President and Gentlemen: I am glad to be with you again. I hope that in some capacity, either as an accountant or as a supply man, I shall continue to meet you yearly as long as your association meets. I am sorry that I did not hear all of Mr. Beggs' address. That which I did hear was good. It must be, it seems to me, a delight, to work as an accountant for a general manager like Mr. Beggs, a general manager who knows what he wants to know, and who knows how to get at it, and appreciates the work involved in getting at it. But when you are an accounting officer of a company whose management, perhaps, does not know what it wants nor how to get at what it thinks it wants, your responsibility is greater and your services are more valuable to that company. Mr. Beggs, in his address, covered the ground

of the topic assigned him, it seems to me, and I can add nothing to it, unless it be to emphasize two or three things that he said. First, the accountant should study the condition of his company, its receipts, its expenses. He should present to his management comparative figures, figures showing what one line does as compared with another line; what the company did this year as compared with last year, this month as compared with last month; what his company did as compared with another company whose lines are similarly situated. Your general manager will not care for all the details, all the process by which you get at results; he probably will not care for all the results at which you arrive, nor would it be wise perhaps to present them all to him. If your lines are all running along about as they should, if there is no remarkable difference between the operation of one line and another, between the operation of your company and another, he won't care to know the process, the figures by which you arrived at that result. A mere statement of the fact is sufficient. But, if in studying your accounts, you find a remarkable difference between the cost of operating one line and the cost of operating another, between the car-mile expenses of one road and the car-mile, or car-hour, expenses of another, present that fact to him as clearly, as emphatically and as startlingly as possible. Let him ascertain why, help him ascertain why, if you can. Gentlemen, I did not mean to make a speech or discuss any subject. (Applause.)

President Duffy: Our friend, Mr. Davies, said something about being a supply man. He is now the secretary of the National Carbon Co. In speaking of the car-hour I presume that he was thinking of the carbon hour. (Laughter.) I have an announcement to make here. The Kansas City Club, at Twelfth and Wyandotte Sts., extends open house to the persons wearing badges. This extends over two weeks.

Mr. Duffy, as chairman of the committee on "A Standard System of Street Railway Accounting," then submitted the following report:

REPORT OF COMMITTEE ON STANDARD SYSTEM OF ACCOUNTING.

No changes in the present classification of accounts or in the forms of monthly and annual reports suggest themselves to the committee; none have been suggested, therefore we recommend that the classification stand as it was adopted at the Chicago convention in 1899, unless this convention directs otherwise.

Your committee received very few queries from members regarding the classification of accounts. These queries were promptly answered. It is assumed that the classification as it stands, in the absence of any information to the contrary, is satisfactory to all. Your committee would be pleased to hear from the members regarding this question.

With reference to the Classification of Material and Supplies, submitted by this committee to the 1899 convention, in a supplementary report, no official action was taken by the association. Your committee, in referring to this matter now, desires to explain that the classification submitted was not intended for anything more than a suggestion to the convention that would possibly aid in dealing with the important subject of material and supply accounts.

The Standard System of Accounting is now in general use, recognized and accepted as the standard for street railways. One of the most valuable features of the system is, that it admits of comparisons between companies. This feature is especially appreciated.

At the convention of the National Electric Light Association, held in Chicago, May, 1900, a paper on "Uniform Accounting" was presented. This paper criticised the Accountants' Association for treating Taxes as a deduction from income, stating Taxes should be considered a part of operating expenses. This position was endorsed in the discussion of the paper, following its reading. Mr. Stuyvesant Fish, president of the Illinois Central Railroad Co., in an article published in the "Street Railway Review," was quoted as saying that the Inter-State Commerce Classification of Accounts did the railroads an injustice and caused them to make misleading reports, because Taxes were not treated as a part of operating expenses. All of this is very interesting in view of the action taken by this association on the question of the classification of taxes. Your committee does not care to provoke any further discussion

regarding this matter, but begs leave to refer to its position as it explained and sustained it, and was sustained by this association at the conventions in 1897, 1898 and 1899. The paper presented to the National Electric Light Association, not only classified "Taxes" as an operating expense, but "Interest on Investment," "Interest on Current Liabilities," "Investment Insurance," (depreciation), and "Reserve for Sinking Fund." These five accounts are all classified as operating expenses, grouped under the heading of "Capital Accounts." The reason for doing this was, it was held these accounts should all be included as a part of operating expenses and not as deductions from income, in order that the "true cost" of production could be determined. Your committee does not wish to do anything more than present this matter for your information and consideration, without comment, further than to refer to the grouping of these five accounts under a heading entitled "Capital Accounts." The gentleman who presented the paper frankly stated that his stand was open to criticism; for that reason, and because your committee believes that this association should not criticise the position taken by other associations on questions of accounting, it is desired that the matter should not be discussed by this convention.

This association was invited to attend the Convention of Railroad Commissioners of the United States, held in Milwaukee, May, 1900. Messrs. H. C. Mackay, F. E. Smith and the chairman of this committee, attended the convention, responding to the rollcall when our association was called. We were officially recorded in the minutes of the meeting as having been present and representing this association. Nothing transpired at the convention of any direct importance or interest to this organization, except that Mr. Ashley W. Cole, chairman of the Board of Railroad Commissioners of the State of New York, a member of the committee on Classification of Construction and Operating Expenses of Electric Railways, reported for the committee that the 1899 convention adopted the committee's report (this report was the classification of accounts adopted by the Accountants' Association). Mr. Cole stated that some of the states recommended that report to the corporations within their jurisdiction, and the state of New York has had that report printed in pamphlet form and is now sending it to all the electric railroad corporations in the state.

Your committee has made a strong effort to induce the Federal Census Bureau to use the Standard System of Accounting of this association, in the work of compiling statistics concerning street railways, in connection with the Census Report of 1900. We hope to succeed in this undertaking and feel encouraged from the following statement of the director of the census, made in a letter dated July 24, 1900: "The subject of street railways is a special one, which will not be taken up for about a year. I will have the letters placed so that they will have full consideration when the proper time comes. I am glad to receive suggestions at any time."

F. E. Smith, Chicago: Mr. President, I move that the report be accepted and be placed on file.

President Duffy: The committee would be very glad to hear from the gentlemen, because this is our only opportunity except through correspondence, and our information through correspondence has been extremely limited. Is there any discussion or deliberation on this report? Are you ready for the question?

The president put the question on the motion and it was carried.

President Duffy: Gentlemen, that about completes the order of business for the morning, but we have a gentleman here with us, whom we all feel very kindly towards, and who has done a great deal for the street railway accountants. I refer to Mr. J. H. McGraw, of the Street Railway Journal. Mr. Higgins is an honorary member and is unable to be present at the Convention, and Mr. McGraw has honored the association with his presence this morning. Mr. McGraw, I would be very much pleased if you would say a few words to us.

Mr. McGraw: Mr. President and gentlemen; I am not going to take your time with any speech whatever, but I assure you I appreciate the honor of being called upon to address this body of gentlemen, forming the Street Railway Accountants' Association of America. I will not attempt, sir, to take up or go into a discussion of your work, which is well known throughout the country, not only to the accountants themselves and the street railway presidents and managers, but to a large body of outsiders who are interested directly or indirectly and are closely watching your

work. I want to commend most highly the work of this association. I am sure, and I know, that it has been thorough and effective, and the respect in which this association is held by the street railways throughout the country, not only the street railways but the bankers, the capitalists represented in street railways with which I come in contact, take occasion frequently, to speak in the highest terms of the work this association is doing. I thank you again for the honor of being called upon and for this opportunity of saying a good word, which I do most heartily, in favor of the work of this association.

President Duffy: Gentlemen, we have a little time yet, with nothing special for this afternoon, and I would be very glad to hear from any gentleman present who would be good enough to give us the benefit of his thought, or suggestion, or criticism, a sort of a brief and informal discussion on any subject pertaining to accounting. We have one here with us that is comparatively new in our association, at least his company is. I will ask him to say a few words. Mr. Moore, of Pittsburg.

Mr. S. E. Moore: Mr. President and gentlemen: I think the president should state what he would like the few words particularly about before he calls on a delegate so unceremoniously as that. I can only say that I am glad to meet with all of the gentlemen of the convention and that I hope to be able to do something before it is over, that may be of use, not only to the accounting end of it, but to the street railway work generally.

Mr. Duffy: Well, gentlemen, we have another new member in our association, Mr. Hemingway, of New York, representing the Connecticut Light & Power Co. Mr. Hemingway, we would be very much pleased to hear from you.

Chas. M. Hemingway: Mr. President, this is my first appearance in the association and I am very much interested indeed in the papers and reports. One subject in your opening address I am very much interested in. That was the uniformity of accounting where the same company operates railways, electric light and gas plants. That comes particularly under my department and I am very much interested to see something put forward in that department. I have nothing else to say just at this time, but I have learned a great deal from the meetings.

President Duffy: Is there any other gentlemen good enough to favor us with a few remarks, or has a suggestion to make, or shall we adjourn. We have established a record for punctuality which we maintain this morning by a very narrow margin. It is ten o'clock until it is eleven. We would like to open to-morrow promptly at ten, and I would ask all of you to make it a point to be on hand early, so as to take your car out on time. If those gentlemen who are on the executive committee will be good enough to go to the Midland Hotel directly, we will have our executive committee meeting so that the report can be presented to-morrow morning.

On motion, adjourned until 10 a. m.

BRILL No. 27 TRUCK PATENT.

The test case brought by J. G. Brill Co. against North Jersey Street Railway Co. to establish the validity of the patents held by the Brill company on its No. 27 truck is expected to be heard in the very near future in the United States Court at Trenton, N. J. It is being defended by the Peckham Motor Truck & Wheel Co., which built the trucks for the North Jersey Street Railway Co. It is claimed by the Brill company that these trucks infringe its patents. If the Brill company succeeds in establishing the validity of this patent, it will control the right to manufacture this style of "swing bolster spring-link suspended" truck, which is probably the most popular and successful truck of the pivotal type that has been brought before the street railway public.

The Brill company advises us that it has already established its priority of invention covering this patent in the interference proceedings of the United States Patent Office against Chas. F. Tebelacker, whose application was brought out by the Peckham Motor Truck & Wheel Co and this company conducted the interference proceedings.

Don't ask—read the "Review" daily.

Yes, we are having a good time, and we won't argue that pro and con because it is up to Walton and Con.

THE CONVENTION IN 1901.

One of the committees to be appointed this morning is to select the next place of meeting and already a number of cities are bidding for the honor of entertaining the associations. Greater New York was the first one in the field, and the delegates from the Manhattan and Brooklyn roads promise they will give the members the best time they have ever had if their city is elected. Judging from the number of buttons bearing Mr. Vreeland's portrait seen at the hall and the hotels, a good many delegates are willing to let them try.

CINCINNATI AN ACTIVE BIDDER.

Cincinnati wants the next convention and sends the heartiest kind of an invitation. The Street Railway is warmly seconded by the Cincinnati League and other commercial bodies, in urging the associations to visit them in 1901. Those of the longer time members have never forgotten—and never will—the magnificent hospitality displayed when we gathered there in 1886. The banquet was one of the three best in all the 19 years. The exposition building one of the largest and finest in the country, would make an ideal place for exhibits, while its central location makes the city easily accessible by a few hours ride from all the states sending large delegations. The associations certainly would have no cause to regret going to Cincinnati.

TRIP OF THE EXECUTIVE COMMITTEE.

Yesterday the Executive Committee of the American Street Railway Association as the guests of Messrs. Walton and C. F. Holmes were driven in carriages around the city, the party stopping for lunch at the Country Club. Although the day was a little cool, the weather did not mar the pleasure of the trip, which was thoroughly enjoyed by those fortunate enough to participate in it.

TRIP TO ARMOUR'S.

Special cars will be in waiting at 8th and Walnut streets this afternoon at 2 o'clock sharp, to take all in attendance at the convention to Armour's Packing House in Kansas City, Kan. Special arrangements have been made for the reception of the visitors and no one should miss this opportunity of visiting one of the largest meat packing plants in this country. The ladies are especially invited.

Armour's establishment is one of the largest in the world and something of its extent may be judged when it is known the plant includes 30 acres of ground, 90 acres of floor space, 30 acres of cold air rooms, a storage capacity for 200,000,000 lb. of meat and 16 ice machines capable of producing 2,500 tons of ice every 24 hours. There are facilities for killing and dressing 12,000 hogs, 4,000 cattle and 5,000 sheep; and 5,000 people are required to keep its various departments in operation.

A trip through these great buildings is by no means altogether unpleasant, and with a little courage and possibly the aid of a perfumed handkerchief, can be made an interesting and profitable excursion.

Leaving the offices the different branches are visited in order, but the trip must be taken to realize the magnitude and diversified nature of the operations that are carried on in a modern packing house. One passes through the carpenter shop, where boxes of all sizes for packing purposes are turned out at the rate of a dozen a minute; through the tin shop, where a strip of tin is fed in at one end of a series of machines and comes out at the other in the shape of finished cans, in which Armour products are to be sent to all parts of the globe; through the ice-making plant; and on to the rendering buildings. Here are performed the many processes that turn what a few years ago was considered waste into valuable by-products and as in other great industries, these by-products now constitute the principal source of profits. A modern packing house not only turns out meat but also hides and pelts, lard and oils, glue, butterine, sausage, beef extract, mince meat, casings for sausage, soups, soap and fertilizers.

The Royton (Eng.) District Council has decided to apply for a provisional order for constructing tramways and supplying electricity within the district.

FIRST DAY AT CONVENTION HALL.

The arrangements of the local committees were excellent and contributed largely to the rapidity and ease with which the registration—always a somewhat tedious although necessary operation—was effected. The list was made in three departments, members of the American, accountants, and the supplymen. There was less delay and confusion than usual, and once the proper button was secured the visitor was free to pass on into the building. This work was in charge of Mr. O'Keefe, chairman of the Bureau of Information, whose office is directly at the left of main entrance. Here are telephones, telegraph and post-office and facilities for checking parcels. The "bureau" has become one of the fixtures at conventions and is as much appreciated as it is convenient.

is fully as large as at Chicago, and expected to be ample, it was necessary a month ago to make a general reduction in allotments of main floor space, and the entire room beneath the first gallery has also been filled.

There are fewer heavy exhibits than usual, although the electric companies have each some generating machinery, but the car and snow plow exhibit is missed, being confined to one snow sweeper built by the McGuire Company.

There are several new exhibitors this year, and all of those we expect to see as a matter of course have new specialties or improved types of standard goods. The manager who wants to keep up with the progress of the art will find it as necessary and valuable as ever to spend his time freely in an examination of the display.

The hall itself is the most pretentious in our convention his-



GENERAL VIEW OF THE EXHIBIT HALL.

Exhibit Hall presents a fine appearance, and at no previous convention have as large a number of exhibits been in so complete a state as this year. There are the usual number of late comers, chiefly small displays, and a few have been disappointed by the railroads, but taken altogether there has been a very decided improvement. The local service of carpenter work, sign painting, decorating and teaming has been unusually satisfactory and prompt. In this connection it is pleasing to note the general improvement each year in the booths and signs. There is less disposition to gaudy ornamentation and hastily lettered signs, and the result is a much neater and dignified appearance as a whole.

The work of the Exhibit Committee is always the heaviest of all the convention committees and calls for a display of real generalship. That the installation was accomplished in so prompt a manner reflects great credit on Chairman Satterlee. Such exhibitors as followed the directions printed in the "Review" found their boxes in their own space ready to open.

If any thought there would be a shortage in the display, a visit to the hall dispelled such an idea. While the floor space

and presents an inspiring picture. The great arches are draped in flags of all nations in which the stars and stripes predominate, while great banners and colored hangings hang from every cross beam and brace. The aisles are of good width and frequently intersected with cross aisles making it easy to reach every part of the building. The effect at night when all the lights are burning is very pleasing.

HAVE YOU HAD A "CUCUMBER"?

Among the debris which was left in town after the Democratic convention had come and gone last summer was a new kind of drink, introduced by the New Orleans delegation. It consists of an ordinary wine glass filled with crushed ice poured two-thirds full of creme de menthe with a top filling of rich cream, producing a color from which comes its appropriate name—"cucumber."

Predictions for today are for fair weather. Con. Holmes claims this kind of atmosphere all the time.

THOSE IN ATTENDANCE.

A. S. R. A.

Allison, Gilea S., Brooklyn Heights R. R. Co.
 Arrowsmith, A. V., Wilmington.
 Anderson, A. A., Youngstown, Ohio.
 Beggs, John I., Gen. Mgr., Milwaukee Elec. Ry. & Light Co.
 Brockway, W. E., Asst. Sec. and Auditor, New Orleans & Carrollton Ry.
 Bayles, R. N., Rockford, Ill.
 Butts, Chas. S., St. Louis, Mo.
 Bendure, J. A., Gen. Mgr. Atchison Ry.
 Bolen, N. A., Div. Supt., Brooklyn Heights R. R. Co.
 Burrington, P. V., Sec. and Auditor, Columbus R. R. Co.
 Bragg, C. A., Lehigh Traction Co.
 Becker, E. G., Kansas City, Mo.
 Butts, Ed W., Kansas City, Mo.
 Boyle, S. G., Louisville, Ky.
 Clark, Chas. S., Havelhill & Amesbury St. Ry. Co.
 Child, F. W., Director, Nashville St. Ry. Co.
 Connett, E. G., Syracuse, N. Y.
 Curry, W. C., Schenectady, N. Y.
 Coombs, C. A., Sup., Buffalo Railway Co.
 Chamberlin, Eugene, Supt. Eug., Buffalo Ry. Co.
 Chasman, G. F., Jersey City, N. J.
 Carter, J. N., Kansas City, Mo.
 Coombs, E. E., Kansas City, Mo.
 Carr, C. E. A., London, Ontario.
 Carrington, E. R., London, Ontario.
 Draper, N. C., Sup., Peoria & Pekin Traction Ry. Co., Peoria, Ill.
 Dixon, A., Pres., City Elect. Ry. Co., Port Huron, Michigan.
 Dixon, H. A., Mgr., City Elect. Ry. Co., Port Huron, Michigan.
 Dow, C., Sup. Elect. Ry. Co., Port Huron, Michigan.
 Donnell, F. S., Ottawa, Ill.
 Davison, Geo. S., Pittsburg, Pa.
 Duffy, Frank J., St. Louis, Mo.
 Dingley, C. L. S., Dayton, Ohio.
 Dyer, D. B., Pres. Augusta Ry. & Elect. Co., Augusta, Ga.
 Dimmick, D. B., Elec. Engr. Birmingham Ry. & Elect. Co.
 Duffy, C. N., Auditor, Chicago City Ry.
 Doonsey, Sam. G., Joliet, Ill.
 Dozier, D. W., Kansas City, Mo.
 DoNufe, H. S., Kansas City, Mo.
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VOL. X. THURSDAY, OCTOBER 18, 1900. No. 2.

PROGRAM.

American Street Railway Association.

THURSDAY, OCTOBER 18TH.

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions." By N. H. Hest, president Meriden Electric Railroad Co., Meriden, Conn.

Election of Officers for ensuing year.

Thursday afternoon, trip to Ft. Leavenworth.

FRIDAY, OCTOBER 19TH.

The entire day has been set apart for the examination of exhibits. Friday night, banquet at Coates House.

Accountants' Association.

THURSDAY, OCTOBER 18TH.

"Material and Supply Accounts." By W. M. Barnaby, accountant Brooklyn Rapid Transit Co., Brooklyn, N. Y.

Informal Discussion upon any subject in street railway accounting.

(This is to be in every sense informal.)

Report of Convention Committees.

Election and installation of officers.

THEATERS.

COATES.—Wednesday, night and matinee, "The Runaway Girl." Thursday, Friday and Saturday nights and Saturday matinee, "At the White House Tavern."

AUDITORIUM.—Every night, Wednesday and Saturday matinees, "The Great Ruby."

ORPHEUM.—Every night, Thursday and Saturday matinees, Vaudeville.

GRAND.—Every night, Thursday and Saturday matinees, "In Old Kentucky."

GILLIS.—Every night, Wednesday and Saturday matinees, "The Night Before Christmas."

STANDARD.—Every night, Saturday matinee, "The Broadway Burlesquers."

Railroad certificates will be ready at the entrance to Convention Hall this morning. Ask F. J. Duffy.

In addition to the distribution of the Daily Street Railway Review at the various city hotels and Convention Hall, a copy is being mailed to each subscriber to the monthly as well as a copy to each European road.

Secretary A. C. Vosburg, of the New Process Rawhide Co., brought no exhibit and is spending his time visiting his many street railway friends.

Mr. H. R. McCullough sales agent for the Stirling Co. of Chicago, is here.

The Green Fuel Co. is represented by Mr. Geo. H. Klumph, of Chicago, Western manager.

John H. Graham and E. C. Foster, Boston, of the Massachusetts Electric Companies, are taking an active interest in all convention work. They are accompanied by their wives; the party are at the Midland.

Mr. E. F. Wickwire, secretary of the Sterling-Meaker Co., is attending the convention.

Mr. Stedman has a new story.

Hon. E. P. Shaw, treasurer of the Commonwealth of Massachusetts, and one of the best known railway men in New England, is at the Midland, accompanied by his wife.

Mr. F. E. Smith, auditor of the Chicago Union Traction Co., and an influential member of the accountants' association, is at the Coates.

Everyone has been wondering at the absence of W. W. Bean and wife. A telegram announces the dangerous illness of Mrs. Bean's mother and their inability to be present. This will be the first convention he has missed, being one of the two or three who have attended all the meetings.

Mr. W. R. Kerschner, representing the Columbia Machine Works of Brooklyn, has booked during the convention several good orders for Columbia specialties, including patent strain anchors, assembled commutators, gear castings, etc. He is giving away card cases.

If you run trallers, see Mr. Van Dorn at space No. 67 C. He makes couplers.

We are aware that some of the names in our printed registration list are not correctly spelled, but if any such will examine their signatures in the register book, they will understand the cause. A curious signature may be hard to imitate, but it is also difficult to decipher. People who on other occasions will write a perfectly legible hand often finish with a signature that resembles the course of a sky-rocket with a crooked stick.

Mr. Chas. E. Coleman, manager of Eugene Munsell & Co., and Mica Insulator Co., of Chicago, is distributing leather pocket books and small miniatures of the gold medal awarded Micanite goods at the Paris Exposition.

H. H. Littell, of Buffalo, arrived to-day. He is the "daddy" of the American Association, and was its first president. He was continuously in street railway work from Nov. 24, 1864, until March 31, 1899—nearly 35 years. He is accompanied by his son, Clarence.

The Parrott Varnish Co. have an interesting exhibit of car panels at the Midland. This company is now working a line of varnishes especially for street car work, which is being introduced in the West by R. E. Mills, whose headquarters are in St. Louis. Mr. Parrott, the venerable founder of the company which bears his name, will make a Western trip next month.

Mr. C. C. Smith, second vice-president of the Falk Co., is keeping open house at Parlor N, Midland Hotel.

Mr. H. S. Cooper didn't like Ithaca so he took a big Eastern syndicate into partnership with him and he now has money to give away.

If you can't do it, Mr. B. S. Barnard conduit. He is representing the American Vitrified Conduit Co., of New York.

Mr. Chas. Scudder, Jr., manager of the railway department Western Electrical Supply Co., St. Louis, is at the Coates.

The John Stephenson Co. of Elizabethport, N. J., is represented by Mr. P. M. Ding, manager.

PERSONAL EXPERIENCES OF WELL KNOWN MANAGERS

BUT HE WILL NOT SUE THE COMPANY.

C. K. Minary, as all street railway men know, is the general manager of the Consolidated of Springfield, Ill. A few weeks ago he had his superintendent put on a lot of new conductors in anticipation of the big crowd which annually visits the state fair. The employes ride free on their badges, but the boys had been getting a little careless about requiring the badge to be worn, so a special order was posted calling attention to the matter, and the new men had the rule especially laid down to them.

A few days later the manager boarded a car down-town. The conductor was a new man who was trying for a steady job all winter. He didn't know the colonel, who looked to him just as any other 5-cent passenger appeared.

He shuffled up to the colonel and extended a grimy paw for the fare.

The treasurer and general manager smiled benignly. "Oh, that's all right," he said, "I'm one of the boys."

"Where's your badge," the young conductor replied with a look that betokened strong skepticism. "Show me your badge."

"I—I don't know that I have one," the colonel answered with a trifle less assurance than he had when he at first accosted the official.

"Well, you'll either have to show me your badge and wear it in the car or pay me your fare. That's the rules." And he reached toward the bell cord.

The general manager was commencing to feel uncomfortable, but he put on a bold front.

"Look here, young man," he said, "don't you know me? I am the treasurer and general manager of this street car line." Then he beamed forth one of the Minary family smiles which ought to be good for a ride on any line in the land.

"I don't give a d—— who you are. You will pay fare or you cannot ride on my car," was the arbitrary reply.

The colonel was squelched. He subsided, and as pocket after pocket was fruitlessly searched for a ticket the smile gradually faded to that tired look, he has when some alderman wants a job for a constit. Meanwhile the car had stopped and the remarks of the impatient passengers conveyed no special sympathy. Then he hunted for a nickel, but all the money he could find was a twenty-dollar bill. This he tendered with a look which plainly showed the incident was closed.

"No you don't, can't work any such gag on me. We don't make change for more'n two dollars. Now get off, and say, mister, next time you come to town just bring your badge along."

And as the treasurer and general manager got off he muttered, "Guess I'll keep that fellow on all winter."

HOW "FATHER-IN-LAW" TOOK HIS TIME.

Every large street railway has at least one quaint, eccentric character, who has worked for the company since nobody knows when, and who is known to every employe and at least half the town. Such an one there was at Indianapolis, and while the census man might have booked him anywhere from 65 to 80, he always gave his age as "Oh, about 25 or 30." Of course, he had a nickname and an odd one it was. "Father-in-law" the boys all called him on account of his joking the conductors about becoming his son-in-law. The name originated way back in the horse car days, and after a score and more of years "Father-in-law" still remained the title by which every man on the road and thousands of people in the city knew the familiar figure. Armed with his pail of "ile," a track broom and his ever-present pipe, he swept the switches and greased the curves in the Hoosier capital, winter and summer, year in and year out. One day the boys enticed "Father-in-law" into a saloon, and under the pretence of getting his measure,

got him fast in an electric machine where the liveliest kind of a current was on tap. When he cooled down the boys sought to make amends by a treat. But he was not to be caught twice and replied, "Not by a dom sight! Yez have got some of the same stuff in the whisky as is in the machine."

Just about that time the genial Tom McLean, now vice-president and general manager of the Toledo Traction Co., took charge of the Indianapolis system, and began a vigorous pruning in the effort to get earnings and expenses somewhere near a level. The directors had charged him to reduce the force to a certain limit, and in the general shuffle "Father-in-law" got the blue pencil. The news reached him out on a curve, and he proceeded forthwith with his outfit to the general office, and, walking boldly in with the pail in one hand and his broom in the other, exclaimed: "Faith, an yez didn't hire me, and I'll be domed if yez can fire me. That's so. Now I'm goin' back to me switches."

And back he went, for the generous manager couldn't find it in his heart to enforce the order, and so "Father-in-law" greased his curves and swept his switches until last summer, when the faithful old man was promoted, and his name was entered upon the pay roll of eternity.

HOW STUBBS FINISHED THE FOURTH.

The manager of an interurban road in Wisconsin tells of an amusing incident which occurred on his line last Fourth of July. It was a very hot day and the members from the rural districts had frequent access to sundry thirst quenchers. However when the fireworks were over the country residents began to round up at the loading platform. Everybody seemed accounted for and the last car was about to start when somebody discovered Stubbs was missing.



Now Stubbs was a specially patriotic American on such occasions and his neighbors with whom he was very popular refused to allow the car to leave without him. So the sober ones got out to hunt Stubbs. He was located after half an hour's search lying in a gutter under a sidewalk crossing where he certainly would have drowned in the storm which was even then almost breaking. They pulled him out,

carried him to the car and put him down on the steps on the side which was closed by an iron gate.

The car started, the storm burst and Stubbs was emphatically "in it." In the course of 40 minutes he began to sober up and when the car stopped at the power house a big arc light shone full in his face. Stubbs spied a friend on the ground and pushing his nose and one hand through the grating called out to him—

"Say, Jim, how long be I in for? Can't you bail me out?"

GUESSED RIGHT THE FIRST TIME.

A dear old woman with soft blue eyes, white ringlets around her ears and a quaint purple gown got on a Third street car during the late torrid wave.

She looked rosy, but cool and comfortable, while the others on the crowded car were mopping their brows, fanning themselves and cursing inwardly.

As Miss '40 got on the car she said to the conductor: "Hi want to get hoff at Hem street."

"All right," said the conductor, and the car went on. Nothing happened until L street was reached, when suddenly the old woman looked up and asked, "His this Heel?"

"You bet it is," said a big, perspiring man.

Mr. Vreeland of New York and his party will leave Kansas City in his private car after the convention closes for a trip across the continent. From San Francisco he will go to Montreal thence to New York.

AMERICAN STREET RAILWAY ASSOCIATION.

WEDNESDAY, OCTOBER 17TH.

The meeting was called to order at 10:50 o'clock by President Roach.

The President: For reasons unnecessary to explain at this time, we have changed the order of business somewhat. The names of the nominating committee have been selected, and the secretary will now read them. This committee will also recommend to the association a place for our next meeting.

The secretary read the names of the Committee on Nominations, as follows: Chairman, John A. Rigg, Reading, Penn.; E. C. Foster, Lynn, Mass.; E. G. Connette, Syracuse, N. Y.; D. B. Dyer, Augusta, Ga., and Robert McCulloch, Chicago, Ill.

The President: I would say to the gentlemen who have any idea of asking the association to hold its next meeting in their city, that they can see Mr. Rigg, the chairman of the Committee on Nominations, any time at their convenience. Mr. Rigg will appoint a time and place for the meeting of the committee.

Secretary Penington: Mr. President, I will state that I have received invitations from the mayor of Cincinnati, the president of the Cincinnati League, and from president Kilgour, of the Cincinnati Street Railway Co., asking us to hold the next convention in that city. I will turn these invitations over to Mr. Rigg.

The President: In the absence of Mr. Bancroft, the secretary will read the next paper.

COMPARISONS OF THE VARIOUS SYSTEMS OF ELECTRICAL DISTRIBUTION FOR STREET RAILWAYS.

By C. F. Bancroft, Electrical Engineer, Massachusetts Electric Companies, Boston.

In preparing a paper on "Comparisons of the Various Systems of Electrical Distribution for Street Railways," the subject selected by the executive committee, I find that the conditions to be met in the numerous localities where the various systems are in use are so widely different, and each system so generally satisfactory, under certain conditions, and so completely unsatisfactory for meeting other conditions, that comparisons are altogether impossible, except in a very general way.

There are six systems of electrical distribution for street railways at present in more or less general use.

First, what may be called the standard 500-volt continuous current system, where the current is generated at from 500 to 600 volts and delivered direct to the car motors, usually by means of a feed-wire and a trolley, third rail or underground conduit.

Second, what may be called the alternating direct current system, where the power is generated as alternating current, usually at high voltages or from 5,000 to 15,000 volts, and transmitted to sub-stations, where the voltage is usually reduced by means of static transformers, transformed into direct current by rotary converters, and delivered to the lines at about 500 volts continuous current.

Third, the "booster" system, where the current is generated usually at about 550 volts and where, by means of an auxiliary generator, usually series wound, called a "booster," additional voltage is generated and compensates for that lost on the line.

Fourth, the so-called three-wire system, where the current is generated at about 1,000 volts, usually by means of two 500-volt generators connected in series, and is delivered to two motors or two groups of motors in series.

Fifth, the alternating current system, where the power is generated as alternating current, usually at high voltage, and transformed down to about 500 volts at the trolley wires by means of static transformers, which may be located on the poles supporting the feed-wire and trolleys, the cars being equipped with alternating current motors.

Sixth, the storage battery system, where the batteries are carried

on the car and charged at the power house or at special points on the line. Storage batteries can also be used to advantage in connection with any of the other systems under certain conditions, and in fact combinations can be made of any or all of these systems.

For any given conditions as to speed, traffic and length of line, some one of the systems named is likely to be much better fitted and more efficient than any of the others; therefore, it seems to me that a comparison of the various systems can best be made by considering the particular conditions most favorable to each. In the distribution of power for street railways the result to be aimed at is usually the maintenance, at variable loads, of an approximately constant pressure of 500 volts on the trolley wire at a minimum total cost of power.

The cost of generating electric power under the same conditions, as regards fuel, depends to a great extent on the amount of power generated and the capacity of the generating apparatus with reference to the average output required. Under ordinary opera-



C. F. BANCROFT.

tive conditions, with the same power factor, that is, the same ratio of output to capacity, the cost of power per kilowatt-hour from stations of less than 500 kw. capacity increases very rapidly as the station decreases in size. With from 500 to 1,500 kw. capacity, the cost of power per kilowatt-hour decreases slowly as the size of the station increases. From 1,500 to 2,500 kw. capacity the cost per kilowatt-hour decreases very little as the output increases, and above 2,500 kw. station capacity the cost of power per kilowatt-hour becomes nearly uniform. This is due to the fact that in small plants the labor item is disproportionately large, and the general efficiency less than in larger ones, while in plants of 1,500 kw. output and larger the cost of labor remains proportionately nearly the same as the plant increases in size. It follows from this that there is often very little or nothing to be gained from an economical standpoint by substituting one station of 5,000 kw. capacity for two of 2,500 kw. capacity each, provided the local conditions, as regards cost of coal, water, etc., are the same.

The system of distribution most suitable to a particular road depends to a great extent on the location of the power station or stations and the nature of the load. It is always expensive to transmit power, the expense being either in interest on copper investment or in fuel or both; and, therefore, other things being equal, the location of the power station or stations should be as near the load or center of distribution as possible. The location of the station is, however, usually governed to a considerable extent by local conditions as regards cost of fuel, water and real estate.

On a large system, requiring an average output of 12,000 kw., even though the load be distributed within a five-mile radius of a practical station location, it will usually be found economical to generate this power at several smaller stations, rather than at one large station, provided the conditions as regard cost of fuel, water and real estate are about the same, as the cost of power station

buildings and machinery per kilowatt of capacity and the cost of generating power per kilowatt-hour, with a station of 5,000 kw. capacity, is about the same as at a station of 10,000 kw. capacity. The interest on the saving in cost of feed-wire by having several stations, each located near its load, would more than offset the slight saving in cost per kilowatt-hour, due to the generation of power at one large station, and it also has the advantage that in case of fire or accident to one station the other can usually be so interconnected as to temporarily carry the entire load, and thereby avoid much of the stoppage of traffic which would occur if the road was supplied entirely from one station.

For an example of what was called the first or standard 500-volt continuous current system of distribution, a city may be cited in which the street railway lines radiate west from the center of the city like the spokes of a half-wheel, with a radius of about five miles. Instead of having one large station at the hub of the wheel, the road is supplied with power from seven stations, distributed throughout the system, having an aggregate capacity of over 26,000 kw.

The generating and distributing system in use in one of our most densely populated cities may be taken as an example of the way in which the system of distribution adopted is governed by conditions outside of those indicated for the most economical generation and distribution of power to the car motors. Although this system is compact and will probably require an average station output of over 30,000 kw., which it would seem to the outside engineer could be more economically distributed and almost as economically generated at several stations, the street railway company is installing a high-tension alternating direct current system of distribution with a main station of 45,000 kw. ultimate capacity, and five rotary converter sub-stations of from 3,000 to 6,000 kw. capacity each. It is probable in this case that the location of the power station and the system of distribution was governed almost entirely by the great cost of real estate at points suitable for separate power stations.

It frequently happens that several miles distant from a street railway system much cheaper power is obtainable than at or near the center of the system. This may be due to an available water power, or to a difference in the cost of fuel, etc., at the two points. In cases of this kind the second, or what may be called the alternating direct current system, is usually the most applicable. To transmit power at 500 volts in any quantity from a distance of 10 miles, or even less, is very expensive, owing to the large amount of copper required and the great loss. For instance, to deliver 500 amperes at 10 miles distance will require about 150 tons of copper, allowing a loss of about 30 per cent in the line. This same amount of power could be transmitted at 5,000 volts by an alternating direct current system with about 5 tons of copper and with a loss of less than 10 per cent in the line.

The weight of copper required to transmit power a given distance, other things being equal, is inversely as the square of the voltage, that is to say, if it takes 100 lb. of copper to transmit a certain amount of power a given distance at 500 volts, it will only take 25 lb. of copper to transmit the same amount of power the same distance with the same loss at 1,000 volts. It is owing to this fact that the alternating direct current system is so applicable where power has to be transmitted for any considerable distance, as it allows of the use of very high voltages on the line, 10,000 volts or more being in general use, which by means of transformers and rotary converters can be reduced to 500 volts direct current for the trolley wire at points where the power is required. For an example of this system of distribution, a street railway system may be cited which derives its power from a waterfall. Here the power is generated at a pressure of 2,200 volts and is stepped up to 11,000 volts for the line. About 6,000 h. p. is transmitted at this voltage for a distance of about 21 miles. The voltage is then reduced to 500 volts, direct current, by means of static transformers and rotary converters at five sub-stations, located at or near points where the power is required.

The third system mentioned, the "booster" system, is chiefly applicable on lines where there is a light average load, but where for short periods an extra heavy load has to be taken care of. It would seldom be economical to supply an entire road with power by means of booster system, as the greater part of the power generated by the booster represents wasted energy, which is usually generated in an extravagant way, as the power required to drive the booster varies as the square of the current in the

feeder, that is to say, if it requires 50 h. p. to drive the booster with a load of 100 amperes, it will require 200 h. p. to drive it if the load is increased 200 amperes. Line losses which necessitate the continuous waste of more energy than could be compensated for by an ordinary compound wound railway generator are seldom economical, even on a portion of a system, but there are many cases where there is sufficient copper installed to take care of the average load economically, but where for a short time each day, or for a few weeks in the year, owing to local conditions, the traffic is very unusually heavy.

In cases such as these, where the heavy traffic is of short duration, a well designed booster system may save a large investment in copper at a total cost of much less than would be required to pay the interest on the copper investment. For an example of this method of distribution I might cite a street railway company which supplies power to its own lines by means of a standard 500-volt direct current system, and which also supplies power to a smaller road about 13 miles distant by means of a three-phase alternating current system, using 5,500 volts on the line. Here the booster system is used in connection with the high tension system. When it became necessary to repair the high tension line, it was found expensive and inconvenient to do the work between the hours of 12 midnight and 4 a. m., the only time when the power was off, and as it was not considered safe to work on the line when it was in operation, a booster system was arranged to supply power to the distant road for short periods at times of light load. A 200-kw. booster was installed at the generating station and was designed to raise the voltage one volt per ampere of current. Switches were installed at the sub-stations so that the high tension line could be connected directly with the 500 volt feeders, some eight miles from generating station, and the booster was arranged so that it could be readily connected to the high tension feeders.

When it was necessary to replace broken insulators or make other repairs on the line the attendants were notified at the generating station and at the sub-stations, and at a pre-arranged signal, made by varying the voltage on the line, the alternators were thrown out and the booster thrown on in such a way that the power was only off from the trolley wire for the fraction of a minute. It was thus found quite practicable to make repairs on the line while the booster was in operation, and the system proved very satisfactory for supplying power at times of light load, while repairs were being made; the load on the booster frequently running as high as 500 amperes, at which time the voltage generated by the booster was about 500, which in addition to the 575 volts of the direct current system gave 1,075 volts at the generating end of the line; the voltage at the sub-station averaging about 450. While it would have been very expensive to run this booster for any great length of time, for the short time it was used the total cost was much less than the interest on the copper investment required to build a duplicate line.

The fourth system mentioned, or three-wire system, is most applicable to double track lines, where one trolley is made positive and the other negative, there being about 1,000 volts potential difference between the two, the current flowing from the positive trolley wire through the car motors to the rail and from the rail through the car motors and the other track to the negative trolley. The track is usually cross-bonded and also connected to the conductor connecting the two generators which are operated in series in the station. This connection with the track forms the third wire and tends to equalize the voltage should there be more cars on one side of the system than on the other. This method of distribution is usually capable of saving from 20 to 40 per cent in copper, according to the character of the track return. If well balanced, it also greatly reduces the electrolytic action on buried conductors, such as water pipes, etc., and is most applicable where there are excessive track losses with fair opportunities for a balanced load.

There are few roads in this country using the three-wire system of distribution, although it is used almost universally by lighting companies. This is probably due to the complications introduced in railway systems by the high voltage, usually about 1,000 volts, between the trolley wire and feeders on different sides of the system and the difficulty of balancing the load. The saving in copper, while not as great as in the three-wire lighting system, is still enough to warrant the extra complication, and under favorable conditions may prove very valuable.

I am only familiar with one example of this system of distribution. In this case there is very heavy traffic over a double track line to a park, about 16 miles from the power station. It was found impossible to handle the increased traffic on the ordinary 500 volt system with the existing feedwire. By reinsulating the line and operating it on the three-wire system, the efficiency of the distributing system was very much improved and they were enabled to easily handle the increased traffic with the existing feedwire.

The fifth system mentioned, or the alternating current system, is practically untried in this country. It seems peculiarly adapted to lines having long runs at uniform speed with few stops, such as lines connecting cities, rather than for ordinary street railway service. The alternating current motors at present in general use are of the polyphase type, and require at least three working conductors, which is a serious objection in many cases for railway work, as it necessitates the use of two trolley wires in addition to the track as conductors. The disadvantages of this system appear to be the necessity for at least two trolley wires and the probable difficulty in building alternating current motors suitable for railway work which will have a good power factor.

The main advantage of the alternating current system is the possibility of feeding lines with stationary transformers which need no supervision, but which can be considered simply as a part of the feeder, thereby multiplying many times the length of line which can economically be supplied with power from one station. The alternating current motor also has the advantage of running at fairly constant speed independent of the load. It will not race going down hill if the power is left on, but will return power to the line, nor will it slow down much in going up hill. There are four or five railway companies using this system, and judging from the reports that appear from time to time in the railway journals it is giving very satisfactory results.

The sixth system referred to, or storage battery system is decidedly more expensive than the usual methods of electrical distribution, owing to the great first cost and the short life of the batteries. Lead is at present the only metal capable of resisting the attacks of sulphuric acid, and modern batteries consist largely of lead, which is very undesirable from a mechanical point of view and is very heavy, so that unless the present type of storage battery is substantially improved, this system is only likely to be used where other systems are not practicable owing to peculiar local conditions or restrictions. The storage battery, however, has a large field in connection with the other systems of electrical distribution for street railways, and under favorable conditions may considerably increase the station capacity and reduce the fuel consumption; and when used on the line may greatly improve the regulation and increase the copper efficiency.

From this brief outline of the various systems it will be seen that each has its peculiar advantages and that no one is suitable under all conditions. It will generally be found that where the traffic is heavy and the distance short, the standard 500-volt system is most applicable. For suburban work, where the distances are greater and the traffic less congested, or where it is necessary to transmit the power for some distance, the polyphase alternating direct current system will usually be found more economical. In special cases, where for short periods of time an unusually large amount of power is required, the "booster" system will often prove very valuable, while for high-speed, long distance, interurban work the three-phase alternating current system may be attractive. The cars on this system, however, would have the great disadvantage of not being able to run over the ordinary direct current street railway lines.

There can be no general rule given that will determine the most advantageous system of distribution to use under the varying conditions to be met in street railway work. Each case must be considered as a separate problem and that method selected which will best meet the peculiar conditions involved.

The President: Gentlemen, we have gathered here for the purpose of disseminating information. You have heard the paper just read. We would be pleased to hear from some of the gentlemen who are present in reference to the subject matter of this paper. I will call upon Mr. E. C. Foster, of Lynn, to open the discussion.

Mr. Foster: Mr. President and gentlemen: I thank you for calling upon me, but as I am not an expert electrician, it seems to me

that I am hardly competent to discuss the merits of the paper which has been read. I think that Mr. Baneroff has treated the subject in a very broad way. He is a very competent man, and is employed by the same companies which employ me. We consider him one of the ablest electrical engineers in the Eastern country. I do not care to undertake to discuss this subject. There are many others here far more competent to do it than I. I thank you for calling me, Mr. President.

The President: I will call upon Mr. E. G. Connette, of Syracuse, N. Y., to give us his views upon the subject.

Mr. Connette: I thank you Mr. President, but I think, like Mr. Foster, that the paper is of such a technical nature, and the ground has been so fully covered, that there is nothing that can be said that would be interesting in addition to what the author has already stated.

The President: I can fully appreciate what the gentlemen have said. It certainly seems to cover the ground quite fully. We would like to hear from Colonel Dyer, of Augusta, Ga.

Mr. Dyer: Gentlemen of the Convention: I am not at all prepared to discuss a technical paper of this character. I think that the subject has been treated most exhaustively, and it is a valuable paper. This association certainly owes a debt of thanks to the gentleman who wrote it. I am wholly unable, however, to go into the details of the paper, and discuss the advantages of the different systems which have been referred to.

Mr. Wason: Mr. President and gentlemen: It seems to me that from the standpoint from which the author of the paper has taken up the subject, there is very little to discuss as to applying the theories of the paper to any particular road. The fact that the condition of each road as it is presented, determines in a great measure the character of the electrical application, there is hardly anything that we can discuss. If we had a road which we desired to equip, then the question would come up as to which one of the several systems presented would, in the minds of the gentlemen present, bring the best results. Under the circumstances, it does not seem to me that there is really anything to discuss.

The President: Gentlemen, you have heard the reading of the paper. What is your pleasure in the matter?

Mr. Connette, Syracuse: I move that the paper be received and the thanks of the convention tendered to the author. Motion carried.

The secretary then read the following paper:

PAINTING, REPAINTING AND MAINTENANCE OF STREET CAR BODIES.

By F. T. C. Brydges, Superintendent of Car Shop, Chicago Union Traction Co.

In giving my views as to the proper manner in which to paint, repaint and maintain street car bodies, I thoroughly realize that it is a subject of the greatest interest to street railway men; and as it is a part of my daily duty to supervise this class of work, the subject is of the greatest interest to me, and I will endeavor to give my views on the three topics separately.

PAINTING.

Our object in painting a street car is two-fold: maintenance and durability of structure, and appearance. It is needless for me to go into the question of the increased life and durability of a street car, when properly painted, repainted or revarnished, as often as necessity may require to keep it up and maintain it in good condition, as it is an admitted fact that painting, repainting or revarnishing, as necessity may require, adds to the life and durability of street cars.

Our methods of painting new cars are simple and, we think, very efficient. We apply our first, or priming coat, on all wood work to be painted, then putty all nail holes and other imperfections, and then sandpaper the priming coat. In place of applying four or five coats of rough stuff to produce a surface, we apply one coat of glaze, or scrape-in coat, as I am of the opinion that the least number of coats of paint applied to produce a surface for painting the better. There is not so much danger then of the finished surface cracking and checking, as when there are four or five coats of Japan or quick drying material used to produce a surface with rough-stuff, which, as a rule, is dry, brittle and non-elastic, and owing to the thickness of the four or five coats, is almost sure to check more or less within a short time after the work is finished. After the

glaze, or scrape-in coat, is thoroughly dry, it is sandpapered down close. The iron sill plates, in the case of open cars, are scraped in with the same quality of material and then sandpapered in the same manner as the wood work surface, the iron plates and all other iron work being thoroughly painted with best quality of Prince's mineral, mixed with raw oil, turpentine and Japan, as the first coat, to prevent rusting of the iron. After the glaze coat has been thoroughly sandpapered to a smooth surface, apply the first coat of body color, consisting of 10 lb. of bleached white lead, 5 lb. of Japan body color, 1 pint of raw oil and then apply the second coat of pure Japan body color and one coat of color varnish, sandpapering slightly with No. ½ or No. 0 sandpaper each coat of color before applying the next coat of color. Dashes and all iron work are painted with Prince's mineral, as above described, as the first coat, to prevent rust and then brought up in the same manner as the wood work, except the glaze or scrape-in coat, which is omitted on all iron work. This exception, however, does not apply to sill plates or any part that is to be finished in connection with the body or wood work. After a coat of varnish color has been applied, which is the last coat of color, the ornamentation and lettering is put on. Our style of ornamentation and lettering, we believe, is simple and yet very neat in design, consisting of a fine line, a broad line, and a small corner ornament worked into the fine line, thus making the ornamentation not expensive, but very neat in appearance. We are of the opinion that expensive and elaborate ornamentations on street cars are needless, a waste of money, and do not appear as well on the cars as a less expensive design. The great objection to expensive designs for ornamentation is not only their original cost, but it is more difficult to touch up when damaged in service by some careless teamster who has punched a hole in the panel with the pole of his wagon, or scratched the entire length of the body and thereby damaged the side of the car. This class of car damage is a very frequent occurrence in the large crowded cities and much increased by careless teamsters. After the lettering and ornamentation is complete, we finish the entire surface with two or three coats of varnish of standard quality, the first coat being rubbing varnish, if two coat work, also the second coat being rubbing varnish, if three coat work, the last coat being finishing varnish. We do no rubbing with pumice stone on the rubbing varnish, as we consider it unnecessary for street car surface to waste time and money in rubbing down finishing varnish. We object to rubbing with pumice stone as, in our opinion, it reduces the life of the varnish.

INTERIOR FINISH ON OPEN OR CLOSED CARS.

Apply one coat of good wood filler for hardwood work. Stain all softwood work for molding or otherwise to such tint as desired, clean up with fine sandpaper and apply a very thin coat of varnish, allowing it to stand about 24 hours. Then sandpaper and apply a second coat of coach rubbing varnish, then sandpaper lightly with No. 0 sandpaper and apply the third coat of varnish. We use no shellac on our soft or hardwood finish. We object to shellac being used in connection with car finish in any particular. We prefer to have the first coat of varnish applied on the wood next to the hardwood filler or applied on the soft wood. Interior of panels are finished with two or three coats of good standard paint applied on the canvas and other unfinished woodwork.

Roofs.—All roofs are painted with three coats of standard paint, or a good brand of white lead, tinted as desired.

Floors.—All floors are painted with two coats of standard floor paint or Prince's mineral paint.

Trucks.—All trucks are painted with one coat of Prince's mineral paint and one coat of standard truck color, striped to some extent if desired on trail cars.

Time Required for Painting Cars.—Cars, open or closed, can be painted and finished ready for service on this system in eight days.

REPAINTING.

Our system for repainting cars, so far as the painted surface is concerned, is about the same as that already described. When their condition requires the old paint to be removed to the wood, we do so by burning off all the old paint to the wood, then scrape the surface smooth to receive the priming coat and then proceed in the same manner as described with glaze coat, color, ornamentation, lettering and then finish with the same number of coats of varnish as in the case of new work. If, however, the old paint is not cracked too much, and the surface has sufficient life to receive new paint, we clean up the entire car by thoroughly washing it,

then sandpaper the surface smooth and apply two coats of body color and a coat of varnish color, on which we put our lettering and ornamentation. We then finish with one coat of rubbing and one coat of finishing varnish. The interior we revarnish with one coat of finishing varnish, except the seats and other hardwood surfaces of open cars, which we revarnish with one coat of varnish, one-half rubbing and one-half finishing. Two coats may be applied in the same manner if the condition of the car requires it.

MAINTENANCE OF STREET CAR BODIES.

I am of the opinion that the best manner to maintain the life of street car bodies is:

First.—At the car station from which the cars are run have them properly and thoroughly washed every day with cold water and a good quality of pure non-alkali soap prepared ready for use in liquid form at the paint shop of the company, or some other shop, provided it is of equal quality, avoiding the use of warm water, as there is a great possibility of the car washer using the water too warm and thereby damaging the life and appearance of the varnish. After the car has been thoroughly washed, all the varnished surfaces should be thoroughly rubbed dry to prevent water remaining on the varnished surfaces and thereby causing damage thereto and shortening the life of the varnish.

Second.—All street cars, closed or open, should pass through the car shops once each year for general repairs, and be thoroughly cleaned, touched up and revarnished with one coat of varnish, interior and exterior, two coats of varnish if their condition requires it, and the roof painted with two good coats of white lead or standard roof paint. Floors, platforms and all canvas and unfinished interior wood work should be painted with two coats of paint, and the trucks and all iron work repainted with at least one coat of good standard paint.

The President: Gentlemen, you have heard the paper. What is your pleasure? We would be very much pleased to see some of the gentlemen from different parts of the country discuss this subject. It is quite important.

Mr. Harrington, Camden: I would inquire if Mr. Brydges is here, if so, whether he can give us any of the costs of the work he has referred to?

The President: Mr. Brydges is not here. He is not in very good health and was not able to come to the meeting.

Mr. Harrington: I have prepared some statements of the cost of the various kinds of painting we have done. I made some statements last year at the meeting which seem to be rather low in price. I have prepared these figures from work actually done and took five different operations; took them from our detailed sheet. For instance, the first-class operation, which was for an 18-ft. car body, including the entire repainting of the car, the roof and the trucks, under the contract price, piece work system, the cost was \$28.00 for labor and \$19.79 for material, the total cost being \$47.79. I have here, which I will hand to the secretary, a detailed statement showing the various operations and the material entering into them. On a second-class operation, same work; on a 16-ft. car body, the total cost was practically the same. On a third class operation, a \$14.00 contract cutting in of paint work, varnishing, etc., the total cost was \$24.21, the material being \$10.21. The fourth-class operation was outside painting of vestibules and cutting dashers, touching up main body, blacking off iron work, one coat of finishing varnish, one coat of paint on roof, dashers, floors and platforms and one inside coat of finishing varnish. The contract price for this work was \$8.50 and the materials \$7.71, making a total of \$16.21. The simplest operation is probably the fifth-class operation, outside touching up dashers and main body of car, outside blacking off of iron work, one coat of outside finishing varnish, one coat of roof paint, and one coat of paint on inside of dashers, floors and platform. The contract price for this work is \$4.00, and the material \$5.13, making a total of \$9.13 as an average. This work is done on the piece work system. Under the usual system of hiring labor, we usually found our work cost in labor 50 to 100 per cent more than under the piece work system. I have taken these figures from our books, and have had some talk on the subject with other street railway managers, and they think that the figures are very satisfactory.

The President: Are there any other gentlemen who would care to say anything upon this subject?

Mr. Foster: I would ask through you, Mr. President, the price paid by Mr. Harrington for the labor in doing that contract work.

Mr. Harrington: Twenty-five cents an hour for the painter; the assistant painter gets 15 cents an hour.

The President: There seems to be no further discussion on this paper. What is your pleasure, gentlemen, in regard to it?

Mr. Riggs: I move that the paper be received, and the thanks of the association be extended to Mr. Brydges. Carried.

The secretary announced that on Friday at the Convention Hall there would be a vaudeville entertainment provided by the supply men.

The meeting then adjourned until 11:00 o'clock Thursday morning.

PRICE FRICTION BRAKES.

One of the features of this brake is that the energy for applying the shoes to the wheels is supplied by the moving car itself and hence this is one of the cheapest of power brakes. The pressure between the shoes and wheels is directly proportional to the pressure the motorman puts on the operating lever and thus he can accurately judge of the severity of the application.

The brake applies the shoes to the wheels at full pressure by a movement of the car of only 10 in. and releases them instantly.

The Price brake consists of a simple friction device placed on the car axle with a chain attached, which is connected to the sway bar of the ordinary brake rigging, as usually applied on cars. Efficient means are provided for keeping the friction surfaces, which are cast iron, free from oil, grit and water. The clutch levers are so constructed that any imperfection in the construction of the disks, or uneven wear, which may take place, has no effect on the working of the brake, which will continue to operate with perfect smoothness. The link which connects the brake device on the axle, with that part of the brake, which is attached to the car body, is so designed that the movement of the car up and down on its springs, and the swiveling of the trucks has no effect on the operation of the brake. No screws are used in operating it.

The brake can be applied to any single or double truck where there is as much as 6 in. free space on the axle. It requires adjustment only about once in three months, and no other attention except oiling the bearings every second day. The only parts that could be expected to wear rapidly are the friction disks and in service on the Brooklyn Rapid Transit road where the cars are run 16 hours per day show a wear of less than .003 in. per month; at this rate 24 years would be required to wear the metal provided on the disks. Where the Price brake is used there is no trouble from flat wheels because the friction disks permit the shoes to yield in case the wheels are slightly eccentric, while at the same time the pressure is kept constant.

The advantages claimed for this brake are: firstly, that the amount of brake-shoe pressure can be varied, so that it is properly proportioned to the weight on the wheels, using a higher pressure for a loaded than for an empty car. In this way it becomes quite possible to make as short a stop with a loaded as with an empty car, a condition that is quite impossible to meet in the case of a car upon which the brake-shoe pressure is constant under all variations of load.

Secondly, the simplicity of the mechanism used is such that it is not likely to get out of order, and can be easily and quickly understood by the men who are to have charge and operate it. It requires no especial skill to apply it or to operate it, and hence the cost of maintenance is reduced to a minimum. In fact it has been found that one ordinary, unskilled man can easily take care of and properly maintain fifty or more of these brakes, and that, too, when they are running on different divisions, so that a considerable amount of time is lost in going from one car house to another.

Thirdly, the power consumed in the application of the brake is taken from the momentum of the car itself, and thus assists in the stopping, and does not in any way call upon the electric generating machinery to do the work. It, therefore, avoids all the charges for operating expenses that fall upon those systems of brakes that are driven by a current taken from the main current, either directly or indirectly.

And, finally, it is extremely rapid in application. It has been proved, by repeated tests, that the brake can be fully applied within one-quarter of a second from the time that the motorman

starts to move the brake handle. With these advantages in its favor the mechanism is proving itself to be thoroughly efficient and reliable for the work that it is intended to do.

To adapt it to different styles of cars and service, this brake is constructed of three different styles—styles A, B and C. Style A is designed for use on maximum traction trucks, which use only one motor per truck. Style B is designed for single-truck cars, where the motors are attached to both axles. Style C is designed for double trucks, used for heavy, high-speed service. Among the roads which have used these brakes for several months are the Brooklyn Heights Railroad Co., of Brooklyn, which has 40 equipments in maximum traction trucks, the New York & Queens County Ry., of Long Island City, which has 16 maximum traction trucks equipped with the brakes, and the New Jersey & Hudson River Railway & Ferry Co., of Bergen County, N. J., which is operating ten 45-ft., 14-bench open cars, mounted upon Peckham 14-B-3 short-wheel base trucks, and equipped with four G. E. 57 motors. The grades of this road run from 6 per cent to 10½ per cent, with sharp curves. The People's Tramway Company, of Putnam, Conn., is also using this brake, operating six cars, mounted upon Peckham 14-B-6 trucks, equipped with two Westinghouse 49 motors; as is also the Meriden, Southington & Compounce Railroad Co., of Meriden, Conn., which has four cars, mounted upon Peckham 14-B-6 trucks, with four Westinghouse 49 motors. The company also has a large number of unfilled orders on its books.

Price brakes, which are made by the Peckham Manufacturing Co., have been applied to a number of cars of the Metropolitan Street Railway Co. which will be running each day on the Wyandotte St. line.

TRIP TO HEIM'S BREWERY.

At the invitation of the East Side Electric Ry., which is owned by the Heim Bros., a trip will be made on Friday morning to Heim's Brewery and Electric Park. Cars will leave the corner of 5th and Walnut at 9:30 sharp. The association hadge is good for all the privileges of the brewery.

THE TALLYHO TRIP.

A morning made to order could not have been better than the weather man furnished yesterday for the tallyho trip provided for the ladies. The start was made a little after 10 o'clock, and the route was through the best residence districts and parks. There coaches were required to accommodate the party, which was entertained by the Kansas City ladies. After a three hour's drive the party returned and lunched at the Midland.

SUPPLY MEN WILL CELEBRATE FRIDAY.

The supply men are determined to make the most of their day, and will exert themselves to make Friday the banner day of the meeting. A huge stage has been erected at the north end of the hall and here it is proposed to produce a fine vaudeville performance. The city and neighboring towns will be drawn on for talent, and it is needless to say that anything the supply men offer will be the very best. The show will be a continuous afternoon performance. A surprise will be sprung during the morning, and the entire day will be given over to a good time.

The ladies are especially invited to both afternoon and evening functions.

TRIP TO PACKINGTOWN.

Special cars gaily decked with flags lined up in front of the headquarters hotel at 2 o'clock yesterday, and were quickly filled with a jolly crowd of about 300. The run was made in good time across the river to the Armour plant on the Kansas side. There preparations had been made to conduct the party through the various departments, from pens through the killing and other branches to the finished product in a car ready for shipment and export. The ladies bravely followed their guides and never flinched. The visit was very interesting and certainly instructive, especially to the many who had never visited such a plant before.

Mr. E. Kittle, of the Sprague Electric Co., is in town.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

WEDNESDAY, OCTOBER 17TH.

The meeting was called to order at 10:30 a. m. Wednesday by President Duffy, who at once announced the first paper:

THE ROUTINE OF A STREET RAILWAY, ELECTRIC AND GAS LIGHTING COMPANY.

By C. O. Simpson, Auditor Augusta Railway & Electric Co., Augusta, Ga.

In this paper upon the routine of a railway, electric and gas light company, no attempt has been made to go outside of our own office, but I will touch briefly on some points which have come under my observation in the past ten years, or while in the street railway line. I do not, however, confine myself to the street railway business alone, as there are a great many companies like the one with which I am associated, that have the electric light as well as the gas business of the cities in which they are located.

First the railway, starting with the report from the conductor to the accounting department. The office furnishes the train dispatcher the night before with the "Portable" registers, and a list showing the number of same, the register and the register readings. The dispatcher gives out registers only to the daylight and six hour men, as they start out in the morning. All other registers are given out at the office. This list (Form 1) is returned to the office by the dispatcher, not later than 9 a. m. with the name of conductor filled in and certified to by him. This goes to the young man in charge of the car earnings record (Form 2), also the



C. O. SIMPSON.

trip sheets (Form 3) and envelopes (Form 4) containing the conductors remittances after they pass through the cashier's hands. The cash is handled by only one person and goes direct from the conductor to him and from there to bank which furnishes a duplicate deposit slip which is turned over to the chief clerk for entry on general cash book, after a comparison with earnings record.

All money when ready for bank is put up in such shape that it will be accepted by the teller without counting bills, or wrapped silver at time of deposit. Currency is put up in \$50, \$100, and \$250 packages; on the wrapper are marked the company's name, the date and the amount. Silver is also wrapped and marked accordingly, small change to make up balance of deposit is put in envelope.

Cash tickets are checked up with the earning book by the auditor every month and burned. Transfers are counted, and after comparing with the trip sheet are destroyed.

Conductors reports are filed daily, that is, each day is fastened together and kept in a convenient place in the office until the end of month when they are filed in store-room.

A small ledger with index is kept of over and short account. An account is opened with each conductor; the Dr. side is short, and the Cr. side is over. This book is kept where conductors can

see it every day, and if they find a shortage, they make their remittance that much more, or vice versa, to balance the account as shown by this ledger.

The cashier also handles all collections of the electric light and gas departments, keeping a separate petty cash book for each, giving as much detail as possible to the bookkeepers in charge of the different department ledgers, and general cash book (Form 5) into which it is condensed, as the latter is ruled so that only the amounts are necessary, except in the sundry column.

The electric light register (Form 6) is used entirely as a load book, that is, it shows the number of each c. p. light, motor power, fans and if on meter, meter readings in kilowatt hours. The reading of electric meters are recorded on cards (Form 7). These cards are turned over to bookkeeper on the completion of each route, for entry on register.

Bills (Form 8) are made from the register and are then carried to the light ledger, each account is numbered, having the same number in both books. The light ledger (Form 9) shows the balance forward each month, if any; amount of bill for the month; total column, rebate, amount paid and date of payment. These books are made to run six months, with the addition of a short leaf, they can be made to run twelve months, but owing to the accumulation of dead accounts, and new business, this is hardly satisfactory.

The light ledger contains 42 accounts or lines to a page, and the register only 14, which gives three pages equal to one of the ledger, making it easier to balance and check as you go along. The cash column in the ledger is balanced with the general cash book. With this form of ledger, it is not necessary to keep a collection list as the accounts are compact enough if posted regularly every day, from which the collector makes his delinquent list. We use the card system in connection with the changes; that is, one side of the card is used as an order to the electrician (Form 10) the other side (Form 11) shows the work done on the order, and from this entry is made on the light register. At the end of each month a recapitulation is made of the changes to show the loss or gain in any part of the service.

The names of customers are kept in both register and ledger, alphabetically and in the order of the vowels. When transfer is made to new books at the end of six months, we do not give a numbered place in the ledger to accounts that show balance only, but on one of the back pages of the ledger we keep these delinquent accounts under the heading of "Balances." The total being carried under the same heading, and given a number in the front of ledger, until finally paid or written off. Advance customers are treated in a similar manner, except that they are given a number preceded by the letter "A." I also wish to add that all churches and Chinamen are put together under letter "C," but are given a regular number.

The gas books are similar to the electric light books, except the register or load book (Form 12), which only shows the meter reading, past, present, and consumption for both lighting and fuel at the different prices per thousand feet.

The gas bill (Form 13) is almost a copy of the register book, but in addition is ruled to show discount for prompt payment before roth of month, following consumption.

The reading of gas meters are recorded in a book (Form 14) printed and ruled for that purpose. The routes are divided into what we call the up-town and down-town routes, and are read by two men, who alternate every other month. The bookkeeper takes these readings direct to the register or load book.

The recapitulation of the register or load book compared with the register of output at plant will show the leakage.

We use the addressograph in connection with both electric light and gas bills, this machine prints the number, name, address and date of bill, in one tenth the time it formerly took our bookkeepers to do the same work.

We use a bill register (Form 15) in which is recorded all bills due the company for material sold or labor performed. One line is used for each bill and the book is ruled as follows: date of bill, number of bill, against whom item, date rendered, amount, date paid, account credited, and remarks. Each bill (Form 16) is numbered.

All bills and accounts against the company are paid by voucher (Form 17) which gives all the details. There is provision made for inserting a description of each bill and in addition to the description on each voucher, the original approved bill is attached, but the latter never leaves the office. If the voucher is paid through the mail, all bills are attached to a slip, the same size as that of a folded voucher, called a "tracer" (Form 18) and remains there until the voucher is returned, receipted, all papers are then attached to voucher and filed away.

Vouchers are numbered consecutively, commencing with No. 1 each month. The voucher record (Form 19) is ruled to show first voucher number, month, in whose favor, amount of pay roll, or voucher, account charged, store stock, operating expenses, sundries account, etc. The recording of a voucher will occupy as many lines as there are accounts to be charged in the distribution and are charged on the record direct to the operating, construction or other accounts affected. No bill for sundries or material, etc., is vouchered until approved by the purchasing agent and superintendent. It is then made up by the chief clerk and goes to the auditor and president for their approval before recording or payment. The pay roll voucher (Form 20) is made up from reports of time (Form 21) from the heads of departments. The distribution is made and it is entered in the record and filed as a regular voucher.

Unclaimed wages, that is wages uncalled for, after six months are credited back to the account as charged on pay roll, and record made on pay roll accordingly.

General journal entries are made from a manuscript statement, which is a recapitulation of the several books, such as cash, bills and vouchers, and these statements become a part of the permanent file. Therefore the items are not entered in detail in the journal. The traffic statement (Form 22) is made from the car earnings book, and gives all data necessary to make up statistics as to the traffic on the road for the month, but only that portion pertaining to the revenue and how earned is journalized. A recapitulation is also made of the bill book and the entry made charging bills for collection with the total amount of bills and crediting the different accounts, as shown. The recapitulation of the voucher record is made in a little more detail. The operating accounts of the railway and electric light departments are separated as well as the construction and sundry accounts, and the voucher number and amount of each voucher charged to that particular account are given. The entry is then made charging each operating, construction and sundry account with the total for the month and crediting vouchers and pay rolls their respective amounts. The recapitulations of the cash book and light ledger are similar to the others, but more attention is given to the cash book, as it embraces the particulars of receipts and disbursements and clearness in entering transactions is of great importance even in the general cash book.

There are a number of what we call "regular journal entries" such as the transportation of letter carriers. An entry is made charging the United States Post Office Department (which is an open account on the ledger) and crediting the earnings account with one twelfth of our yearly contract and when the quarterly payment is made by the Post Office department it is credited direct to this account on the cash book. Similar entries are made for the rent of power for the operation of a short line running from Augusta over the Savannah River into South Carolina which we do not control. Chartered cars are usually paid for in advance, or on the day following their use and are credited direct to the account through the cash book, if not they are billed and so pass through the bill register. Interest on the bonded indebtedness is charged to "Interest on Bonds" and crediting "Accrued Interest on Bonds." Semi-annually an entry is made charging the latter account, with the semi-annual interest and crediting "Interest-Coupon Account." When remittances are made for this interest to our eastern representatives, it is charged to their open account, and it so stands on the ledger until the coupons are returned to the company, as they are very seldom all paid and returned at one time, or within 30 or 60 days after due. The journal entries then made, or made from time to time as they are returned, are necessarily in detail, giving the series and

numbers of each, charging to Interest-Coupon Account, and crediting our eastern representatives.

We have also an account called "Advanced Expenses" into which we charge direct from voucher when payment is made for such items as taxes, coal, water for power, etc., which are paid quarterly and annually, or extraordinarily heavy purchases of material. An entry is made each month to the respective operating accounts, charging out approximately what would be, or has been used in that month.

The balance of many accounts as shown by the balance sheet the first of each month, for instance the amount in the debit column to gross electric light and power account, will be the same as the total of the balance sheet of the light ledger which comprises something like 1,500 individual accounts. The balance of bills for collection consist of the unpaid bills as shown by the bill register, the balance to vouchers shows those unpaid at that time, also the pay roll account.

We use the ordinary check book, as everything is paid by vouchers, the stubs of which show the name and number of vouchers covered by the corresponding check, which is all that is necessary for entry in the cash book. Separate check books are used, one for the Railway & Electric company, and the other for the Gas Light company, as they are at present separate corporations, but are handled as one as much as possible to reduce expenses.

Monthly statements include the railway and electric lighting departments on one statement, but the earnings and operating accounts of each are shown separate. The Gas Light company's statements are made separate, but the form and accounts correspond with those of the Railway & Electric company as much as possible.

The most valuable of all papers I consider the real estate deeds and plats representing all the realty of the company, whether used in the operation of the road or not. A separate book is used (10 x 14 in. in size) called the Real Estate Book, on the left hand page of which is a plat of ground, and on the right hand, or as many pages following, as is necessary, is a description of the property. The index to this book is complete, indexing perhaps under six or seven headings as the property is referred to a great many times, as the tract of some of its former owners or by the company as the "power house property," "sand pit," "east station," or "west station." The deeds are kept in a bankers' file, and given the same number as per folio in book.

Contracts are also filed in an ordinary bankers file.

Ordinances are usually published in the daily papers, and a copy is pasted in a scrap book; if not printed, a written copy takes its place.

Letters are filed in the ordinary files, but in addition to copying, the stenographer makes a carbon copy of the answer which is attached to the letter before filing.

The stock ledger (Form 23) and the transferring of stock is very simple. The ledger is ruled first giving at the top of the page space for the name, address and any other information as to the payment of dividends, etc. The rest of the ruling shows first date, transferred from, or to; certificate number; Dr. shares; Cr. shares; Cr. balance. All stock certificates when cancelled have written across the face, to whom issued, and number of new certificate. This certificate is then attached to the stub bearing the corresponding number.

As is well understood in this association a frank discussion is invited of the methods and forms I have explained. Any system adopted by a company is more or less a growth evolved from emergencies and circumstances, and side lights thrown by opinions from different points of view are always valuable.

President Duffy: We are very much obliged to Mr. Simpson for his able and instructive paper, and I think it would be well to follow his suggestion concerning the discussion. I will ask Mr. Smith, of Toronto, to open the discussion.

J. M. Smith: This is, I am sorry to say, my first appearance since the organization of the association. I feel somewhat on the outside, with you American gentlemen, for the reason that we do not operate our system altogether as you do here. I think you are all familiar with what they call the coffee-pot system we have over there. We do not use the registers, and in those particulars we are not similarly situated, but we run our accounting departments right in line with yours. We found that we were not in such very bad shape at the time you organized, but we have benefited by the

suggestions of your various committees that have reported from time to time. I enjoyed Mr. Beggs' remarks yesterday and those of Mr. Simpson this morning, and I think we have reason to be very much encouraged from what has been said and done, and the way the efforts of the association have been appreciated by outside concerns.

Mr. Mackay: Mr. President, I would like to ask Mr. Simpson how he handles the meter readings; whether he tries to equalize the lighting bills by reading shorter months in winter time and the longer months in summer time. There is a great difference in the method of reading electric lighting meters. I would like to be informed on that point.

Mr. Simpson: We have always made it a point to start on a certain day of the month. On the 26th we read all our meters, except in the month of February. We make that two days longer. As far as comparing the amount of bills for each month is concerned, we have never had any complaint as to that. The car registers are kept in the accounting department, and go out from there.

Mr. F. E. Smith: And no matter where the car may start, the conductors have to come and get their registers where they first start, early in the morning.

Mr. Simpson: They are sent out from the power house. They are started from there early in the morning. The rest of the day they start from our office. They have the registers there and also get the registers from that point.

Mr. Smith: How about the fellows that get through at one or two o'clock in the morning? Do they leave them in there, too?

Mr. Simpson: No, they are returned to the power house and taken care of there, and returned to us later.

Mr. Smith: Then the register that comes in at one or two o'clock in the morning you are not able to put out again until later in the day?

Mr. Simpson: Yes; we have a double set of registers, using one one day and using another set the other day following.

Secretary Brockway: Mr. Simpson, what style of registers do you have?

Mr. Simpson: We are using the Meaker portable register at present. The first of the year we are going to use the stationary register.

President Duffy: May I ask you what induced you to change your style of register?

Mr. Simpson: I am not in a position to answer because the matter has been heretofore left with the superintendent of the road, and I have paid very little attention to it. As we are situated a man has to come to the office anywhere from a half hour to an hour before hand to get his register and go down and take out his run. Sometimes he is delayed, and that leaves the register in his possession too long in our opinion. That is one reason, I think, why we have made the change.

Mr. Tripp (Seattle): Do you have any difficulty in keeping the expense in the railway department and the light department and your power stations separate?

Mr. Simpson: No, we depend upon our engineers to a great extent. We use very little coal. We use water power, and have two stations, one principally for the electric light and the other for the railway, although we do use the railway station through the day for the alternating current and the day lighting, using what we call the lighting station at night only. We make an arbitrary charge for the station that we run both kinds, making the charge from the electric station to the electric lighting department. We do not subdivide on the Kilowatt-hour basis.

Mr. Mackay: I would like to know how you subdivide your general expenses between your gas, electric and street railway divisions.

Mr. Simpson: Well, it is not charged. I have two sets of books. Being a separate corporation, I make my vouchers on the Gas company. In other words, the railways company pays the expense of the office, the general expense, to a great extent, and I will make my voucher of the gas company in favor of the railway company for its portion, which is arbitrary, and the balance is charged to general expenses, you may say, divided between the two departments equally, railway and electric.

Mr. Mackay: How you arrive at your arbitrary figure? Is it on the basis of earnings?

Mr. Simpson: On the basis of earnings; yes, sir.

Mr. Moore: It might be interesting and supplementary to Mr. Simpson's answer to Mr. Mackay as to meter readings in the matter of light, heat and power, to say that in Pittsburg we read the meters daily, subdividing the city into districts; for instance, taking 20 to 25 meter readers, and each provided with a meter reading book which covers a day's work. Each of the 25 meter readers finishes up his own simple district each day. He follows again the next day, and every 25 days, when the collectable accounts come in they are all in for the current month, and then we put them onto the prepaid meters and simply collect all through the city for the whole amount of prepaid—that is, the slot, meters. When the meter reading books come in in the morning they are passed over to the bill clerks and each one has his day's work allotted; then they pass on to the registry clerks and are entered, and passed out in the mail that night. Thus we are right up to date as to the amount of gas, natural or artificial, or electricity, that has been consumed by the customers in that district every day. Those districts are then allowed 15 days in which to pay, in 10 of which they would get a discount. Five days after that they get a delinquent card. Each clerk having charge of one registry follows up every day, and when he finds, 15 days after he has made his bill, that there is a delinquent customer, the latter then gets his little blue card. They all know what that means. In that way the readings are kept up continuously, the collections are kept up continuously, and I think we have a pretty good system as regards meter reading and billing.

President Duffy: Mr. Moore, may I ask you what particular point you want to cover by having a daily record of the meter readings, or daily reading of them, rather?

Mr. Moore: It is only a daily record every month with each customer. Each house is called on regularly on, say, the fourth of the month, and out of those districts each one comes in, and our revenue comes to us regularly, day after day by the amount of the meters read.

President Duffy: You have meter readers who work daily, but the particular meter in any particular residence is only read once in 30 days?

Mr. Moore: Once every month.

Mr. Heminway: The bills go out every day in every district?

Mr. Moore: Yes; bills continually going out, continual collections.

Mr. Mackay: That has the same effect as though it was a reading of the separate days of the month, only on account of the number of customers you are obliged to record it in that way.

Mr. Moore: Exactly. We pro-rate our work right along, subdivide it daily and close it up.

Mr. Mackay: At the end of the 15 days do you cut a customer off?

Mr. Moore: Provided he has a record, we do.

Mr. Tripp: I would like to hear some more discussion on the question of dividing expenses between the railway and the light department, such as do not divide themselves, as in the case of one power station furnishing current for both the railway and the light department. I would like to hear some one suggest a way to divide the coal or water, general expenses and those things.

Mr. Mackay: I don't understand why the kilowatt-basis is not applicable. You are furnishing so many kilowatt-hours and the same fuel that furnished the railway kilowatt-hour also furnished the light, possibly right at the same time. That is our system. We divide it on the basis of kilowatt-hours.

Mr. Tripp: Suppose a station doesn't have wattmeters?

Mr. B. L. S. Tinglay (American Railway Co., Philadelphia, Pa.): We have one station which is occupied jointly by electric lighting and power plant. We apportion the current by meter, charging the railway company and crediting the light so much per kilowatt-hour for its current. We regularly bill it to them, because in the state where we are operating we are not allowed to consolidate. We charge them a fixed monthly rent for the use of the office, and we apportion the salaries of everything but the station force. That is, the office salaries are apportioned prorata as to the gross receipts of the two companies.

President Duffy: Is there any other gentleman interested in the railway and lighting business that can further enlighten us about apportioning the expenses?

W. F. Ham (Washington, D. C.): We are in the railway and lighting business. We apportion our general expenses of the rail-

way and lighting companies approximately on the basis of gross earnings. It is a fixed scale for the year, however. We do not attempt to change that ratio from month to month. Where there are expenses of a single power station which furnishes power to both railway and lighting companies, the expenses are pro-rated on the basis of the output, except that certain railway companies have fixed contracts with the lighting companies which existed prior to the practical consolidation. In those cases the rate continues as heretofore, and with any increase in the price of coal the railroads get the very much end of the bargain. What is the general custom of the members of this Association, or what is the best way, of filing cancelled coupons? I think that the plan of keeping a record in the general books of the outstanding coupons is an excellent one. I think it is preferable always to keep the general books in such a way as to reflect the exact condition of the companies, and to do away with as many auxiliary books as possible. Therefore, the scheme which Mr. Simpson has outlined shows at all times the coupons which have not been returned cancelled. I would like to know what is the best way to file or to keep the cancelled coupons. The way I have been accustomed to doing it is an expensive way, pasting them in coupon books, and when you have a heavy capitalization, as some of us have, with a great many coupons, it takes much time and considerable expense.

Secretary Brockway: What form of books do you have, Mr. Ham, providing a place for the bond?

Mr. Ham: It is virtually a scrap book. Every page is numbered with the exact coupon which is to go into each space, and it is so arranged that we have at the time of the maturity of a single coupon—not all of one bond to be pasted on one page, but all of one maturity to go on successive pages. For one of our bond issues, we have one book alone for each maturity, 20,000 coupons in a single book; but to sort those and to paste them in the book is a heavy expense. Now, in some cases they file these in boxes or packages, and whether the trustee of the mortgage is satisfied with that record when he is asked to satisfy the mortgage is a question in my mind.

Secretary Brockway: A steam road with which I was once connected filed the two ways, as you are doing, with the maturities, and then when a new issue was made, a very large issue, they adopted the box plan. The Central Trust Co., of New York, accepted it as being conclusive evidence of payment.

Mr. F. E. Smith: The Erie road has been doing that for years. It has a big bond issue.

Secretary Brockway: I use the maturity books, but the books which were in New Orleans when I went there had a page per bond providing a place at the top for the cancelled bond as it came in, or when it does come in. But that required very large books and many of them, heavy and cumbersome, and with our new issue I adopted the maturity plan with one year's maturity; that is, two payments in each book. We do not have 20,000 coupons.

Mr. Ham: Not very long ago I had the coupons audited by a company which I was then with very carefully. They wanted to know that every cancelled coupon which we showed cancelled had been cancelled. Now, if we had attempted to do it with boxes or anything of that kind I think we would have been several months in getting through with it, because that would have meant the recounting of all those coupons. As it was, we had a hundred coupons on a page, and if there was any missing coupon, the blank space would stare you right in the face. So, just as fast as you could turn the pages over you could verify the account. Certainly it is a very nice way, but it is a question whether there is any other way which is equally as good.

Mr. Smith: Suppose you had a box with a number sticking up, say No. 99. You have your number up there instead of your coupon. Wouldn't that satisfy most anybody, if after counting the coupons you found that the original numbers that were in the box agreed with your book account? I should think an auditor would take that.

Secretary Brockway: Yes, if you could satisfy them that all you said were there, were there.

Mr. Smith: I have not attempted to use the box system yet, but I hope to if we get out any more bonds. As I understand it, the Erie road has been doing it for years, is to use a box, say, to hold 1,000 coupons, say, January, 1901, coupons, from such an issue of bonds; blank numbers are stuck in there which are just a little higher than the coupons will be, with the numbers from 1 to 1,000.

As fast as the coupons come in these numbers are taken out and put into the July box and the coupons put in their places. Thus, at all times, they can see the numbers of the coupons which are out, from these little pads that are sticking up. That is the way I am going to do.

President Duffy: Do I understand that you file those coupons in tin boxes like you would throw cash in a tin box?

Mr. Smith: No, in a paper box. Then, when those coupons are all in, have them counted by two or three people and sealed. Then, if anybody comes along, the trustees of the mortgage, you can turn over that sealed box to them. If they are not satisfied with the certificate, let them count them.

President Duffy: Mr. Ham, may I suggest that, in answer to that question as to the verification of the canceled coupons, do you not have a special coupon account deposit with your bank?

Mr. Ham: You might have and you might not.

President Duffy: The point I was getting at was this: If you make a deposit on coupon day, and if your bank book is balanced, and you exhibit that to your expert who examines your books, that in itself is a certificate that a certain number of these coupons have been paid. I think that would cover the point which was raised.

Mr. Ham: In the particular instance to which I referred it would not have answered, but, generally speaking, I should think it would.

Mr. J. M. Smith: I have found a difficulty with my coupons where I have opened a special bank account. There are always a number of these coupons outstanding. I have some outstanding, running over a period of three or four years, and I do not know that that would be proof to the trustees that the whole thing was paid. It is quite an important item. I use a certain file for a certain coupon and paste all the coupons in. As Mr. Ham says, it takes a lot of labor and expense, but I think the trustees would rather see that done than to take for granted that all the coupons are in a box. As the box is a simple method, it is a very good suggestion; but I do not know whether the trustees would accept it.

Mr. Tripp: Is it not a fact that the trustee is usually the man who pays the coupons?

Mr. Smith: Not in all cases.

Mr. Tripp: It generally is with us. In that case it is up to him to show whether it is or not.

Mr. Smith: No; with us there is a trust company that is trustee for the bondholders. We pay through the bank. We have bankers and trustees, so that the trustees have nothing to do with it.

Mr. E. D. Hibbs (Jersey City): We follow the method outlined by Mr. Ham, filing and using a numbered book for the maturity bonds. That is very simple, because the trustees of our mortgage really pay the coupon. We deposit with them the full amount due and open an account with them for each coupon, and on the term of the coupon we credit it. While it does not show the actual number of coupons out, it shows the information which the Manhattan Trust Co., which is our trustee, wants. I do not know of any other methods that would be so satisfactory as the coupon book, the scrap book, and filing.

Mr. W. G. McDele (Cleveland): We had at the time of consolidation three sets, which, of course, are taken care of with the new bonds, but we had them all scattered around and put them in boxes. Each company had different boxes and had them outlined for several years to come. Mr. Davies and myself started the box system. We had a large tin box made of very heavy tin, with little compartments to take care of the coupons still due, and when they came in they were put in that box, putting the date on the outside of the box.

Mr. Mackay then read the following report:

REPORT OF COMMITTEE ON A STANDARD UNIT OF COMPARISON.

H. C. Mackay, Chairman. F. E. Smith and A. H. Ford, Committee.

At the last annual convention of this association, the Unit of Comparison, as treated in the paper presented by Mr. H. C. Mackay, was referred to this committee to report at this convention, action having been deferred for the lack of sufficient time to discuss the matter properly and to admit of further unbiased investigation.

It is a matter that, since the adoption of electricity as a motive power, had received very little serious thought; and the discarding of a unit that had for years been recognized as the standard, naturally brought up questions requiring more study and investigation than could then be given them. It is but fair to say that this committee's opinion was divided as to the merits of the different units advocated, but, after studying the matter in all its bearings, we are convinced that the motor car-hour is the best unit yet advocated; and, being the same on all systems, large or small, it cannot be otherwise than practicable. Since that time, it has been put to practical tests, having been adopted by some of the largest systems; viz., Minneapolis and St. Paul, Minn., and Milwaukee, Wis. This test has demonstrated that the motor car-hour is a stable and correct unit, and it has further conclusively shown that the car-mile is an unreliable unit, even between lines of the same system. To illustrate, we submit the following figures taken from actual service and applied here to comparison of earnings.

Line.	Speed	Earnings	
	per hour.	Per car-mile.	Motor car-hour.
No. 1.....	8.3	33.25 cents	\$2.76
No. 2.....	16.2	28.57 cents	4.63
No. 3.....	10.7	26.79 cents	2.80

The supposition was (up to the time of comparison on the basis of motor car-hours) that line No. 1 was proportionately the best earning line of the three, but the truth is, it is the poorest. This erroneous result was made to appear true on the basis of car-miles, simply because this line was operated at a lower rate of speed, the smaller divisor naturally leaving a greater quotient.

As applied to operating expenses, we submit other figures.

Car mileage	3,653.00
Motor car-hours	350.00
Earnings per day	\$1,367.50
Operating expenses per day (50 per cent).....	683.75
Earnings per car-mile.....	.3743
Earnings per motor car-hour	3.91
Operating expenses per car-mile.....	.1871
Operating expenses per motor car-hour.....	1.955

Reducing the speed of this line 25 per cent, retaining the same equipment and running the same length of day, what is the result? We have, without changing the cost of operation, reduced the mileage made from 3,653 to 2,740.

The expense per car-mile was \$.1871, and is now \$.2495, an apparent increase of \$.0624.

The expense per motor car-hour was \$1.955, and is now \$1.955, showing no change, as none exists.

Speed, then, is shown to be the factor that prevents the car-mile from being used as a correct basis. Speed does not enter into the motor car-hour. The absence of this variable quantity of speed, together with the fact that labor, the principal item of expense, is computed on the basis of the hour, or multiple of the hour, sustains our position.

It is interesting to note the conclusions of the steam railways regarding the use of the car-mile as a unit. The following figures were taken from the report of the 33d annual convention of the American Railway Master Mechanics' Association. The committee emphasized the unreliability of the car-mile by the following comparisons, showing the cost of operating a simple or ordinary engine to be \$.2449 per car-mile and the cost of a compound engine to be \$.2883 per car-mile, an apparent difference of 17 per cent in favor of the simple or ordinary type of engine. Yet, by reason of the greater capacity of the compound engine, the cost per 10,000 ton-miles was \$3.23, as compared with \$4.03 for the ordinary engine, thus showing an actual gain of 24 per cent in the work performed, in favor of the compound.

For special comparisons, it is recognized that special units are required, as for example, the output of a power station would be based on the kilowatt-hour, this being more closely relative to the work, but for all general comparisons of earnings or operating, the motor car-hour is advocated.

As to the question whether a standard unit is practicable or not, it would seem that, given a unit of comparison, which is admitted to be identical in every case, the question is not debatable. If the unit is correct, the result or comparison must be correct, as the component parts of all accounts have already been standardized by this association. It has been claimed that the variation in cost of operating, between a high and low speed line, affects the value

of the motor car-hour as a unit. The high speed line certainly requires more current, and its repairs to electrical equipment are greater, but we are at a loss to understand how this can affect the unit. We could as consistently question the value of the yard as a unit of measurement because one kind of cloth cost 10 cents and another kind 12 cents per yard.

If a manager was shown that the cost of maintenance of electrical equipment of cars was 25 per cent more on his system than on another, it would certainly be to his interest to investigate, to determine whether more improved motors were being used, or if greater care was not being taken in the use of them. Very true, the investigation might develop that the difference in cost was due wholly to greater grades or to excess of travel on his lines, but it would show him the facts, and wherever a difference did exist, would advise him of it. This would be a practical use of a standard unit.

It was contended that the cost of ascertaining the number of motor car-hours would be such as to preclude its use on a large system. As a matter of fact, it is so much more easily determined than is car-mileage, that the cost is naturally less, and the readiness with which it is ascertained is one of the strong arguments in favor of its adoption. Especially is this the case in cities where large numbers of cars are run without reference to schedule time, but wherever and whenever deemed necessary. Experience has shown that reports of mileage made by trainmen are only approximately correct, but the record of the time of the starting and pulling in of a car at the station can be accurately kept and verified by the time of the motormen. The unit of comparison as applied to electric street railways has not kept pace with the rapid changes which have been made in every feature of this industry during the past decade. The unit adopted by the steam railways, the passenger-mile, was adopted by the street railways, but, owing to the impossibility of determining the distance each passenger was carried, that element was discarded, and, though its usefulness as a unit was impaired, it has continued to do duty as a standard unit to the present time. It applied very well to the old horse car, where the variation in speed was an unimportant factor, but time has wrought its changes, and a new unit to fit up-to-date conditions is deemed necessary.

With the past few years, a new problem has arisen owing to the construction and operation of high speed electrical suburban and interurban lines. These are but the forerunners of what will shortly be in active and aggressive competition with the steam railways. These lines will, doubtless, be controlled and operated by the street railway systems of the large cities, or at least in conjunction therewith; hence, creating a necessity for a unit of comparison applicable to both high and low speed lines.

We believe that the objections raised to the car-mile as a standard unit in the paper presented at the last meeting of this association are logical and that the motor car-hour meets all conditions better than any other unit yet advocated.

We herewith offer the following resolution for your consideration: "Resolved, That this association recommends the adoption of the motor car-hour as the Standard Unit of Comparison."

Mr. Mackay then said: In this connection, gentlemen, I wish to say that it is not the intention of our committee to preclude the use of any other unit. We simply wish the car-hour established as a unit of comparison and adopted by all the roads, so that we can make comparisons upon that basis. There is no objection to the use of any other unit, as I say, and we would be glad to hear from you on that subject.

President Duffy: Gentlemen, this is one of the most interesting and valuable reports that we shall have at this convention.

Mr. Dimmock: Mr. President and gentlemen: From the managers' standpoint I consider the adoption of a unit which we can all agree upon is the most important thing in the keeping of the books of an electric railway. When we go to our directors and they wish to know the condition of the road, they will immediately compare the condition of their own road with the condition of other roads, and what brings the conditions about. In our own case we have found that in every instance there has been a difference of opinion and an unsettled feeling as to this unit; but I do feel that we can reach a point where we can all agree upon one unit this association will have done more good for the general managers of the different roads than anything that I can imagine. From my

standpoint, in both departments, I feel if we could get the unit question thoroughly settled we would immediately commence to correspond with one another, especially the managers, as to what their percentages were during the different periods of the year. I was not present when that question was brought up last year, and I would like to hear a brief discussion as to what the motor-hour is based on, or consists of, in order that I may be posted as to what is going on now relative to this question.

Mr. Mackay: The motor car-hour is merely the car-hour for the time that the car is in service. If the car started out at seven o'clock in the morning and ran until ten o'clock, it would be out three car-hours. The only reason why we called it the motor car-hour was that we eliminated the trailer as a factor altogether. It was based upon motor car-hours.

Mr. Wilson: As the car pulls out from the car-house at a certain hour and is returned at a certain hour, supposing it runs 10 trips during that time, and has a lay-over of 10 minutes each trip, do you have some method by which you eliminate the lost time?

Mr. Mackay: Not at all; your expenses are going on just the same.

Mr. Wilson: A great many of your expenses are not.

Mr. Mackay: Your expenses are practically going on, with the exception of your power, and, of course, some maintenance that is eliminated; but that is a feature of operation which is largely controllable, and I do not see that that would alter the case anyway, any more than your mile. If you were using the car-mile your car is remaining stationary, and your expenses are going on in some cases, and not in others.

Mr. Dimmock: The running delays and everything of that kind would be the same for each method, you consider?

Mr. Mackay: It would be about the same on each road.

Mr. Dimmock: Do you divide your total operating expenses pertaining to the service into the number of car-hours, or vice versa?

Mr. Mackay: Using it as a divisor, yes, sir.

Mr. Dimmock: That gives you the cost of one car-hour?

Mr. Mackay: That gives you the cost of one car hour, and as you can readily see, speed cuts no figure in the matter at all.

Mr. Dimmock: If you run three or four cars in one train, do you only consider the hours of the motor, provided there were two or three conductors?

Mr. Mackay: That is a problem, I presume, that the individual road would have to take up. We do not operate, and I think as a general thing two or three cars are not run in a train. Trailers, as a rule, are simply put on to bring the capacity of the motor car up to a certain standard. There are certain cases, and Mr. Duffy's is one of them, I think, in Chicago, where they operate two or three cars together, and in that case it might be necessary to consider each car as a car hour; but that is a matter, for the few roads interested to take up and decide by themselves.

President Duffy: Mr. Smith, of Chicago, is a member of this committee, and he sometimes runs more than one car at a time in a train. Perhaps he can enlighten Mr. Dimmock on this question of whether it should be car-hour or motor car-hour.

Mr. Smith: I do not see why it would not be a car-hour with us. Would it not be with you?

President Duffy: I should think so.

Mr. Smith: I cannot figure on the motor car-hour exactly. I should think it would have to be the car hour.

Mr. Dimmock: You have a conductor on each car in Chicago, probably?

Mr. Smith: But we do not have a motorman. On our cable trains, for instance; four men run four cars. I do not see why we would not have to have it on the car-hour.

Mr. Mackay: It would seem to me that each road would have to decide that for itself. If the car is running its full capacity, and it is simply a question of operation, whether you can pull one car through a street or pull four cars through at the same time; your streets being so crowded, it is a difficult matter to decide how you are to get your cars through and in getting the motor car through, you may just as well pull four or five. It seems to me that is a different proposition altogether from the ordinary railway, which is operating its cars upon regular schedules.

President Duffy: In Chicago some times the third or fourth trail car in a train is a motor car.

Mr. Mackay: Do you mean that there would be three motors followed by a trailer?

President Duffy: No, sir, there is one motor behind three cable cars. It seems to me we would have to use the term car-hour.

Mr. Mackay: You might use the term car-hour, but I think with nearly all roads, with these few exceptions, that the motor car-hour would bring them nearer to a standard basis.

Mr. Tripp: Mr. President, I was not here at the last meeting, and did not hear this discussion. I would like to have an explanation made why speed does not have some effect on the car-hour as a unit.

Mr. Mackay: Because your hour has not the same length.

Mr. Tripp: It costs more to run a car 20 miles an hour than to run it 10 miles?

Mr. Mackay: Certainly, it costs more to run at a higher rate of speed, but your expenses would show in just that same proportion. Now, on the basis of car-miles, the reverse is the case. If you use a car-mile as a basis, and you increase your speed, your divisor is just so much greater, is it not? And instead of showing the actual results, you show that as a decrease. Now, with the car-hour your expenses are increased and your showing is just that much more.

Mr. Tripp: I think that is right.

Mr. Moore: We run trailers in Pittsburg and it seems to me that we would have used the car hour itself, because we would have to man each car. We are like you, we would have to put a man on each car and to get the proper figures we would have to count the car-hours and not motor car-hours.

President Duffy: May I ask you to give us the benefit of your opinion as to the car-hour proposition?

Mr. Moore: It seems to me to be all right, but before following out the car-hour until I would like a year to try them both together side by side, put them in parallel columns as it were.

Secretary Brockway: Mr. Mackay does not contemplate the displacing of one by the other.

Mr. Moore: No, I understand. The resolution might be open to that construction as it is. I would like to try the car-hour right along and I propose to do it when I go home.

Mr. Mackay: In my last paper I think I treated that trailer question pretty thoroughly, and while there are certain exceptions to this rule, as there are to almost any other, I still think that if the equipment were up to the standard, trailers would be a thing of the past, and in that case the motor car-hour does apply to almost all cases. The running of trailers as a general proposition is done simply because of old cars which are really too good for the scrap pile and yet they are out of date.

Mr. F. E. Smith: Are you going to count the motor car and the trailer as one car or as two cars?

Mr. Mackay: As one car.

Mr. Smith: Suppose you put on two trailers?

Mr. Mackay: I would still call it one car, except as I say in the case of your roads.

Mr. Smith: Suppose it was an electric line, say, going to the race track, something of that sort, and they put on a couple of trailers. Now, we have four men, three cars. Are you going to call that one car?

Mr. Mackay: I wouldn't operate it that way.

Mr. Ham: I don't know but that this question of a car-hour is just the same in the car-hour as in the car-mile. What do you call it now? Do you call it motor car-mile or car-mile? It is just the same question, whether you call it motor car-hour or car-hour. If you count your train now as two car-miles for a train-mile where there was a trailer, you would count it just the same with the car-hour. I think that is one point that we might pass upon, and I would suggest as an outcome of that, that where there is an extra crew or an extra conductor, that in that case, we should call it an extra car. If, however, it is operated with one crew, then we could call it a single car. Of course this question is going to become of great importance, especially in an interurban service, where very frequently as time goes on they will undoubtedly operate trains. They do it now on the third rail system where one motor car has a train of three or four cars. Now, in such a case as that I think that each car ought to be treated as a car. As we are situated in Washington, where we have only one crew for the same three cars, and we still continue to operate them, I think that those should be counted as single cars.

But coming back to the main point at issue, a unit should be something which is not variable, if possible. That is what a unit means, something which is not variable. In this matter we cannot get a unit which is not variable under different conditions. Therefore the unit to establish is that unit which is least variable. On the question of expense, for the last year, we have kept our accounts on the basis of the car-hours, or the car-day, which is the same thing, and also upon the basis of the car-mile; and I think that expenses can be determined much more reliably, as to the relation of those expenses to the earnings, on the basis of the car-hour. The platform expense in the operation of a street railroad is the largest single expense that we have. I think it is probably 40 or 50 per cent of the total expense of operating a street railroad. Now, that expense goes on whether the car makes 20 miles an hour or 5 miles an hour, because we pay on the basis of a day or of an hour. Then, the largest item in the expense of a railroad property being the platform expense, putting that in line on the car-hour basis is to put upon the right basis the thing which is the largest item. Now, the other thing to arrive at is maintenance and cost of production of power. I believe those two things are on fully as good basis on the car-hour as on the car-mile. It costs just about as much to run a car in a crowded street in a city, with frequent stops, six miles, as it does to take that same car out in the suburbs and run it twelve miles, where you would make the same time and you have to use about the same power, although in the one case you have only made half the mileage that you have in the other case; and I am told by people who know more about maintenance than I do that the chances are that the car which has been running in the crowded district with frequent stops is liable to require more maintenance than the car that has been running out in the suburbs at higher speed with fewer stops; therefore, that the actual maintenance of that car in the city has been greater than the actual maintenance of the car out in the country, and the speed has been only half as much. I find that the expense of operating a car an hour is a much more permanent quantity than the expense of operating a car mile. The variation is much less between different lines, and I often think that the general manager or the other officials of the company are misled when they see that some particular line is earning only 10 or 11 cents a car-mile, and they say, "Why pull off those cars. They are not getting enough out there to pay expenses, or anything of that kind." Yet, when you can come around and show that you are operating that road for 5 or 6 cents a car-mile on account of the conditions existing there, you are showing that it is a good line to operate. Now, if that same thing were on the car-hour basis you would find that the car was earning up around what the other lines are earning, because, the speed being so much greater, it earns enough in each hour. I only wish we had more of the lines like Mr. Mackay's that earn, say, 30 cents a car-mile, and \$2.96 to \$5.00 a car hour, but ours are not that kind.

President Duffy: Gentlemen, we have Mr. Vreeland with us this morning. Mr. Vreeland, may I ask you to favor us with your impression of the car hour and car mile, or anything else in that connection that you will be good enough to speak on? Mr. Vreeland has a line that earns some times more than 20 or 30 cents a car-mile.

Mr. H. H. Vreeland (New York): Mr. President, I did not come in with the idea of saying anything. I come to gather some wisdom from the deliberations of men who are actually engaged in accounting. It seems to me that they are the men to decide what is the best unit for us to work on. It works out with us with the various kinds of service we have, on exactly the same basis, so far as our purposes of comparison are concerned, whether you put it on a car-mile or a car-hour, because the variation in conditions is equalized by the fact that it does not all go into one pot. Our whole system is operate by divisions or lines. Every particular line we have in New York City is reported, its car mileage, its earnings per car-mile and its cost of operation per car-mile, by the individual lines, so far as the purposes of comparison by the management are concerned. The operating expenses are compiled by lines. The aggregate operations are shown of course lumped, as you may have noticed in our comparisons for the last three or four years of operation. As far as our city is concerned the conditions there are such that men who are deliberating on this modern question do not give me any show. I have four or five thousand horses yet. If you can tell me how to eliminate that proposition

I shall be glad to hear it. I am not modernized enough to enter into any discussion on the high plane of motor car-hours, etc., except to a limited extent. I should certainly very much rather hear from some of the gentlemen that are regularly connected with accounting work in the discussion of this question, because I am one of a number of fellows in this world that do not believe that the combined wisdom and knowledge is all in one man's head.

Mr. Wilson: Mr. President, I regret exceedingly that you have called upon me because because I have not gone into the subject thoroughly enough to express an opinion that would be of interest, and I have not seen the way in which it would be possible for the West End Street Railway Co. to keep the car-hours without an expense which would preclude our adopting it. I should be pleased to be enlightened on any method that could be adopted on our road to give the car-hours with an expense that would warrant its adoption. We run something over 300 different routes each day. One man gives the car-miles for the entire road; the labor of one man? We have a large book in which is entered each day under the different route headings simply the number of trips and the amount that that line has earned. Twice a month a footing is made of the number of trips and of the amount of money. The footing of the trips is multiplied by the length of the route and the money divided by that gives us the earnings per mile. That is all the expense that we have in determining our earnings per mile. Of course the total of that is taken to determine our operating expenses per mile.

President Duffy: Don't you pay your men by the hour?

Mr. Wilson: No, sir; we pay them by the day.

President Duffy: But the day consists of a certain number of hours?

Mr. Wilson: The day consists of not over 10 hours in 12 consecutive hours.

President Duffy: It would be a very easy matter to get the number of days, wouldn't it?

Mr. Wilson: Yes, but what are the hours? One man runs 9 hours and 15 minutes, another runs 9 hours and 30 minutes, another 9 hours and 50 minutes.

President Duffy: Would it not be possible to strike an average of the entire working day, the number of hours put in on all routes?

Mr. Wilson: No, because in Boston, with the congested district that we have in the center of the city, we never know the hours that a man may be out. Mr. Vreeland I think has the same trouble in New York. The car may start out. He is not always sure when that car is going to get back. Mr. Rossiter, I guess, has the same trouble in Brooklyn.

Mr. Mackay: It seems to me, Mr. President, that it is not necessary to know when the car is going to get back. When it does get back it is recorded, and that is all there is to it. All you have to do is to take this record of the time that the car goes out and a record of the time that the car pulls into the station, and you have your complete record. Mr. Wilson, as I understand it, has a record of the number of trips that the car makes, not only a record on this line, but also a record on some other line, because it is liable to be transferred a dozen times during the day. Now, instead of going into all this detail to work that out, all he requires is simply the time that the car starts and the time that the car gets back.

Mr. Wilson: Mr. Mackay, that would require proving each individual car. It might pull into the house once, it might be in three or four times. You would have to make a record perhaps several times a day. As it is, with the plan we have, we simply take the conductor's day card. It is necessary to know the amount of money coming in in order to find out what the earnings are. It only requires one extra column in which to put the number of trips. No return whatever is necessary from any car.

Mr. C. L. Rossiter: Ladies and gentlemen: I am glad to have the result of your arguments. I think Mr. Ham's arguments in regard to the car-hour have a great deal to commend them, yet at the same time I am very firmly convinced that simplicity in the keeping of accounts means a great deal, and I do not think that the car-hour would run into a great deal of additional labor. I cannot quite agree with the chairman that an average will answer the purpose. I think if you are going to have a car-hour, in order to locate your expenses so that your manager can place his services where he requires it, that an average would hardly answer the

purpose unless that average was very correct; and I agree with the speaker in regard to the congested condition of traffic where the cars are making sometimes not one-half, as Mr. Ham stated, but I think really not one-fourth the number of miles in a given time. That certainly would indicate that the car-hour there was a very desirable thing to have. We have, unfortunately, some lines, not like brother Vreeland's, because I think he has no lines that earn less than 30 or 40 cents a car mile, but we do have some lines out in the country that I am sorry to see in the 10 and 12 cent class. While those lines are building up and developing very rapidly, it is quite a problem to so adjust the service to get all the earnings that can be reasonably expected.

I do want to say one thing, that I think this Accountants' Association has done a great deal in the last few years to assist managers in getting information. I appreciate it. I am very glad indeed to have the opportunity of saying so to you gentlemen. I think it means a great deal in the successful operation of a road, having the figures at hand, and I think that you have made very marked progress in enabling us to obtain them.

Mr. W. E. Harrington (Camden): We have some suburban lines and a few city lines where the differences in the car mileage rate were such that it appeared that the suburban lines were running at a considerable loss on the mileage basis, and I was confident that they were. Some time ago, so that we got it in this last fiscal statement, we adopted the car-hour unit in connection with the car-mile unit. It has not increased our office force at all to do it. One of the girls works it up and it comes in each morning with the regular statement of the receipts of the different divisions and lines, each line being considered separate and distinct. I don't see how a road can run without the car-hour unit. The car-mile unit is all right and I use it generally to compare with other roads, because the data are up that way, but I am using entirely for my own comparison, for my own use on our line, the car hour unit.

Secretary Brockway: Mr. President, in New Orleans we have no grades, we do not have to heat our cars, and we have a number of other advantages, but we find that a comparison of units gives us this result:

Line A on a percentage of earnings, is first; on the car mile, it is second; on the car-hour it is second.

Line B on percentage of earnings is third, on car-miles is first and on car-hours is third again.

Line C on percentage is second, car-mileage third and car-hours first.

Line D is fourth in all instances.

Our management wished me to show those three comparisons, and I give them every day, furnishing them all of these details every day, and the line that we thought was our gill edged line on the car mileage basis turns out to be third on car hours. Our speed is very fast in some instances. We run on the neutral ground, and taking all those things into consideration; they feel as though they want all three forms of comparison. We cannot very well tie up to any particular one, which is what Mr. Ford had in mind.

Mr. F. E. Smith: You figure it from three ways. Which is the best paying line?

Secretary Brockway: Line A.

President Duffy: How does that stand on the three units?

Secretary Brockway: It stands first on percentage, second on car-miles and car-hours. Line B is third on two and first on one. Line C is first, second and third. Line D is fourth in all instances.

President Duffy: In answer to what Mr. Rossiter said, that he did not believe in an average, I thoroughly agree with him on that. I believe in the accurate figures if it is possible to get them. I only brought up the question of the average because Mr. Wilson said that it was impossible to get the hours on his road.

Mr. Wilson: I did not say it was impossible. I said I thought the expense would preclude that.

President Duffy: I stand corrected. In Chicago we pay our cablemen by the trip. We pay our electric men by the hour. We know exactly how many hours should be run every day from the time schedules, as well as from the report from the depot that the cars start from. We verify and check and make our payroll according to these records. Consequently, we know actually, not only the hours, but the minutes, run by every man on every car, as a total; so that we can get the hours run absolutely correct. Now, if there is anybody who has such conditions as has Mr. Wilson,

whose company pays its men by the day and for a half or a third of that day, they might be tied up and not work at all—that is a little different proposition. But I think on the ordinary road you can get absolutely and accurately the exact number of minutes that the cars run each day.

Secretary Brockway: My time-keeper furnishes that every day, the actual hours of the motormen and conductors of each line. We have a congestion annually in our Mardi Gras festival, during which practically the whole line, all the lines of the entire city, are tied up near Canal St. In that case the car mileage is not worth anything. Then our car-hour has its advantages. The percentage, of course, still remains the same, because the desire to travel seems to permeate every line in about the same proportion. Everybody goes down to Canal St. at Mardi Gras, but the car mileage is not worth anything as a comparison for that week.

Mr. Ham: Well, Mr. President, the objections which have been raised to this seem to be on the ground of the expense of determining how many car-hours are operated. In the cases of both Brooklyn and Boston I believe that could be obtained very readily with almost no work in the office. Every table is operated on a certain standard. That standard calls for a certain number of trips, a certain number of car-hours. It calls for a certain amount of pay. Now, for all over time above the standard a certain number of hours are made, and that is shown by an increase in the payroll. Mr. Rossiter is very familiar with that. Now, whatever that increase is, it is the item which, added to the standard, gives the total number of hours, and the depot master on the largest division in Brooklyn or Boston could give that information to the auditor on the morning following the day in question. He could have it on his desk at nine o'clock in the morning. Mr. Wilson's scheme of furnishing the total number of car-miles only twice a month, would not answer for the average manager. The manager generally wants to know the following day, if possible what his cars have earned per mile, or per hour if you should adopt that as the standard. Mr. Brockway was asked, and this is something which I think is of importance, which was his best line; and he answered that the best line is the one that has the lowest percentage of operating cost. Now, right there is where we are apt to make a great mistake, and where the management might make a mistake. I think Mr. Vreeland's scheme of finding out the net returns from a line is really the only way. It is possible that with the best line of Mr. Brockway, by reducing the number of cars operated he will decrease the operating expenses, we will say, from 60 per cent to 50 per cent. But what has been the result? Have you as much net earnings? That is what we want to know. What is the final result on net earnings? On the other hand, we may take the line of Mr. Brockway's, which has been operated at 60 per cent, put on extra cars, and bring that up to 70 per cent, and still it may be a better line than it was before, because we are getting more net earnings out of it. That is why we have to be careful, in any of these bases of comparison, to remember that what we are finally looking after is net earnings and not percentages. You have heard the story of the old man who did not know anything about percentages, but he did know, if he sold something for a dollar for which he only paid fifty cents, he was not losing anything.

President Duffy: Mr. Ham, I think you are under a wrong impression as to what Mr. Brockway said.

Secretary Brockway: You misunderstood me.

President Duffy: Mr. Smith asked which was the best line. Mr. Brockway replied line A. Then I asked him if he would state how that best line stood on the three units, and in answer to my question he made that statement.

Secretary Brockway: I am taking income only into consideration. I am not considering the expense at all.

Mr. Ham: Was not your reply based upon the fact that the percentage of cost of operating that line was the lowest of the three lines or four lines?

Secretary Brockway: No; I am taking income only, just treating income in this consideration.

Mr. Ham: Well, how would you determine that, from the gross income?

Secretary Brockway: Gross income, certainly, of the four lines.

President Duffy: He means that the percentage earned by this particular line, of the total amount, was not greater on this particular line than any other. Just the percentage earned; not the percentage of expenses to receipts. Is that correct?

Mr. Brockway: Yes, sir.

Mr. Ham: That may be a longer line. That does not answer it at all. You might have a line that was a mile long, which would naturally be better than another two miles long. That isn't anything at all.

President Duffy: What I wanted to correct was the impression that he was taking that as the better line because of the low percentage. You were mistaken about that.

Mr. Ham: I thought he was, but I do not see that the amount that a line takes in determines the matter.

Secretary Brockway: That bears out what I said, that we cannot tie down to a comparison, we are using the three and showing that only one of the four lines agrees in each of the three comparisons.

Mr. Dimmock: I would like to ask some of the accountants who have been using the car-mile in the past, if, when they had a motor and a trailer in one train and that train should run one mile, if they would consider that two car-miles, if a trailer ran a mile and the motor ran a mile, say, two 16-ft. cars. Now, if it costs you, for illustration, a dollar to run that train one mile, and it actually covered that much ground, would you say that the cost per car-mile was 50 cents? I would like to have that answered.

President Duffy: I will answer that question as far as our company is concerned. We are very much interested in the prorate proposition. To begin with we have three kinds of power, electric, cable and horse. This is further complicated by the fact that some cable trains are operated two cars in a train, some three cars in a train, some four, towing an electric motor car behind a third car on that train. The State St. line is supposed to be a cable line; we run horse night or owl cars on it, we run electric owl cars on it, and cable cars all day, and tow electric cars in day time form 18th St. up. When I first took hold of the accounts there one year ago, I found all these complex elements. I keep a daily record, first, of the number of cars operated, and secondly, the kind of cars. There are grip cars, motor cars, the first cable trailers, second cable trailers, or the first electric trailer, or what I call the tow car. I keep those miles separate, and I show the thing every way. It is the only way that I can get at it understandingly.

Mr. Dimmock: Supposing that you had a road and, to make the question plain, that you just had one train on it, and your road was a mile long, and you made one trip a day one way—that would be making one mile—and there were three cars in the train. Would you have made three car-miles that day, or one car-mile?

President Duffy: You would have made three car-miles and one train mile of three cars.

Mr. Dimmock: We have a suburban car, which is just twice as long, we will say, as a 16-ft. or 18-ft. car, as it might be, holding just double the number of passengers. If you count mileage of trailers and of motors, of the short cars, as against the mileage made by the one car, would that not go to prove that car mileage is imperfect and not of much use to the manager?

President Duffy: That is the argument advanced by Mr. Mackay last year; the special argument was on the trailer.

Mr. Dimmock: The length of the car enters into the car mileage from the fact that if you had two 16-ft. cars, one a motor and one a trailer, and each one would hold 50 passengers and they would run that train one mile; if they should run two car miles and it cost a dollar for expenses the cost per car-mile would be 50 cents, would it not? Now, on the other hand, if a road operated with one car carrying 100 passengers, and the cost was one dollar, that would make the cost per car-mile show so different that it would see that it was almost valueless to make any mention of or for a manager to compare by it.

President Duffy: I think a safe rule to follow would be that every car that is manned, as was discussed here a little while ago, should be called a car. If you have two cars and one motorman and two conductors, that would be two cars.

Mr. Dimmock: I know of many cases as in Omaha, where they run a motor and a trailer and have only one conductor and one motorman.

Mr. Vreeland: We have been a good many years in this work, and I have seen its evolution from the old days when in steam railroading we were like the fellow that kept the store. They asked him why he didn't have a book-keeper. He said he didn't want one. They said, "You might be bankrupt and you wouldn't know it." And he said, "If I was bankrupt I wouldn't want to know it." We are not in that shape. We want to know what our condition is

all the time, and any standard that you gentlemen can arrive at or a thorough discussion of it, is of value. The thing that in my opinion you want to be careful about, and which is very prevalent in street railroad practice—things that 10 or 15 years consideration have been given to by standing committees in steam railroad work, is the attempt of the practical operating men and often of accountants and others to settle, in street railroading, in two hours. I had occasion to speak of this in Buffalo where a subject was up that was up 15 years ago, when I was a member of the American Society of Railroad Superintendents; I was on a committee, and they have a meeting tomorrow in New York, and I was asked to come before that society and speak tomorrow on the same subject that was up at that time. I do not mean to say nothing has been done. It has been carried along. But it was so important a subject that it has been carried from year to year, as a subject of discussion. Our move from a percentage to a car-mile basis was a good move, even if we now go to the hours. A gentleman asked me a few years ago, "What is the cheapest line you have in percent of operation?" I replied, "I have one that operates at 22½ per cent." The man went off and told another man that I didn't know a thing about the business; he said there was not a man in the business who could operate a road for less than 50 per cent. The truth was, it cost me as much per car-mile to operate that as any other under average conditions for 24 hours, paying 25 or 22 cents per car-mile, and percentage did not mean anything there at all, based upon 50, 40, 30 or 20. We are operating many lines now at anywhere from 30 to 35 per cent. Of course the question is entirely one of the average cost per electric car-mile of operation. It stands the same throughout the system. Well, we have made that step since the last seven years, going in New York State entirely from that question of percentage up to the car-mile for a basis. Now, if you gentlemen from your conclusions on this subject show us that the car-hour is a little better, why we assure you we want the best, and we are with you. (Applause.)

Mr. Wilson: While sitting here I have been thinking over the subject a little more deeply, perhaps, than I had in the past. On a big system, a method may possibly be arrived at such that I shall be obliged to take back what I previously said as to the matter of expense. I do not say that it would be absolutely exact, but in the long run it might average so that it would come out in a satisfactory manner. With us there are over 30 car-houses. We are operating over 1,400 cars a day; I might say the 1,400 cars are running on over 30 different routes, the mileage of every one, of course, being different. If we took each car house and had the foreman in charge each hour, or each half hour, simply put down the number of cars that were on the street at that time, and take the total for the day, divided by the hours, or half hours, as the case may be, we would then have very nearly the car-hours of the cars from that house. Of course, it would not be exact, but if a car pulled in five minutes before the half-hour, or the hour, some other car might pull out five minutes afterward, and it might average up.

Mr. F. E. Smith: Why not have your thirty barn foremen send in reports?

Mr. Wilson: They have all they can do now, and a little more.

Mr. Smith: Let some one else send in once a month the regular schedule from each barn.

Mr. Wilson: We haven't any schedule. We have one, but it does not work.

Mr. Smith: Your first man is supposed to make 10 trips a day on some particular run. Now, if all the other men make their regular trips, why can not that first man send in to you every morning the regular schedule time for yesterday? Or if you have to send out an extra tripper, why cannot you say there was an extra made, and so on.

Mr. Wilson: We could, but that is where the trouble comes; there are so many of them, it is an expensive thing to attempt to do anything of that kind. Anything is possible.

Mr. Smith: I didn't think that there would be so many extra trips but that it could be done. Of course, you have regular extras, understand, but I mean trippers.

Mr. Hogarth (Denver): I suppose you are all familiar with the fact that we pay our conductors and motormen every night. We have a system of universal transfers and I would like to talk over later with some of the members here. I find that in the exhibit hall there are registers now providing for fares, transfers and tickets. That is a very important feature with us, and one I would

like to go into and see if it is at all practicable.

President Duffy: Those questions can very well be taken care of in the informal discussion on the last day. I am very glad you mentioned that and brought it up, because it will provide material for discussion there.

Mr. Hogarth: We operate a few trailers, very few. We are joining our grips and trailers, making one large car out of them. The horse ears have been abandoned; the cable has been abandoned. We have nothing but electrical equipment. I think that the hour unit will be the unit for our purposes. The unit ought to be a standard that is not variable, or one that is the least variable. Managers like to make comparisons of their lines with others of the same size. If there are any great discrepancies they wish to know it; they wish to know it quickly; they wish to adjust it; wish to put their lines up to date. I think the hour unit is the coming one. I regret that I am unable to speak more full upon the subject, but I have been with the company only two months, having been theretofore with the steam roads. They have a unit established for freight which is on the basis of the ton-mile; for passengers, the passenger mile. That is the system followed by the Inter-State Commerce Commission, and adopted generally throughout the United States.

Mr. Moore: I would ask Mr. Harrington as to his practice in computing his car-hours, whether he has trailers and whether they are manned by different men, and whether he counts the car-hours for the motor and trailer as well.

Mr. Harrington: We have no trailers and we keep our time right from the conductor's tally sheet, the same as we compute the car-miles. The computation of the car-mileage, of course, is far more difficult by reason of taking the mileage at the different points the cars pass over, but it is very easy to get the number of car-miles from those tally sheets. We pay our men by the hour, and it makes it very easy for us to do that. We have not noticed any increase in the office labor. There has been no complaint on the part of our girls of the additional work thrust upon them, and we have our car-hour and earnings per car-hour on our tally sheet, that is made up by the conductor. As I said before, we have been using it a little over a year and three-quarters and it has proved a great help. We have had suburban lines where the car-mile was low compared with lines in the city which I knew were running at a loss, and it would appear they were running at a loss on the suburban lines, but the cars were running about two and one-half times faster, and by testing it on the car-hour basis it made the resulting figure almost double that which we received in the city, and put it on a basis such that we knew just where we stood.

(Mr. Ham in the chair.)

Mr. Duffy: This closing paragraph on Mr. Mackay's report reads: "We herewith offer the following resolution for your consideration." (Mr. Duffy reads resolution.) I would like to say a few words on this subject. To begin with, I believe that the varying conditions of operation, with the possible exception of speed—and that is the most important and most disturbing element in the proposition—are just as well, if not better, taken care of by the car-hour unit as by the car-mile unit. Certainly we are at no greater disadvantage by using the car-hour unit even to the exclusion of the car-mile unit, than we would be by using the car-mile even to the exclusion of the car-hour unit, and we have the advantage of eliminating the disturbing element of speed. Now, as to the size of the car operated, whether they are operated as single cars or in trains of one, two, or more, these are some of the peculiar local conditions that surround the operation of every road. Every road has its peculiar conditions. They must be studied specially and they must have special treatment. I believe that the safest thing to do is to consider that every car that has a position on a time-table with the run numbered, that is manned by a crew, and sent out for the purpose of hauling passengers, is a car. If you put two of them in a train it makes two cars. We should supply the information as to what that train is made up of. I go further and say that a car is a car whether it makes one trip or ten, whether it is out one hour or twenty, whether it runs at night or whether it runs in the day, whether it is put out for a baseball load or whatever the condition may be. I wish to explain by that that a car that is not on the time-table at all, but is manned by a crew for the purpose of hauling passengers, if it only makes one trip, that is a car; if it only makes one trip or runs one hour it is still a car. If you will establish that as your

starting point you will get the number of cars that are operated daily, the kind of cars they are. I was very glad to hear Mr. Wilson say in his last remarks, that he was satisfied that with his peculiar conditions, which are different from those of any of the rest of us, he could get around the thing; and I have no doubt that anything is possible in the accounting line in Boston, if Mr. Wilson will undertake it. I know that you can get the number of car-hours, the total number of car-hours made per day, more accurately—at least, I believe you can—more easily, more economically, than you can the number of car-miles. Now, why shouldn't we have the car-hour? Mr. Vreeland's remarks, I think, were very good, especially his advice not to start to settle in two hours a question which the steam railroad people have been considering for fifteen years; but it seems to me if you know the number of cars that you operate each day you can very easily keep track of the kind of cars they were, whether they were run in trains or not, how many hours they made, and if you take the schedule speed that your time-tables call for you have something that will give you the number of miles that the car traveled from the car-hour figuring. You may not get it absolutely exact, but you will get it very close. Take a line that has 10 cars on its time-table. Suppose that each one of those cars ran 10 hours. You would there have 100 car-hours. Suppose that, including the lay-over, and including the allowance for stops and other delays, that those 10 cars are scheduled to take 10 hours each out of the 24 on the time-table. They will have run 100 car-hours. If you divide the distance traveled into the number of hours that they are scheduled to require to cover the distance, you get, say, 10 miles an hour. Each car has been in service an average of 10 hours. Each car has traveled an average of 100 car-miles. The other way, you take the distance of the round trip and multiply it by the number of trips that are made. I see very little difference in the basis you are figuring from. I think Mr. Moore's suggestion that we all try it this year is a very good one, and if it meets with the approval of Mr. Mackay, I would suggest that we modify that resolution, that we recommend the adoption of the car-hour, not motor-hour, as a standard unit of comparison in connection with the car-mile, and it is my opinion that this subject should be taken up by each member individually, put in practice and tried for a year. Then we can come to the meeting next year and thresh it out all over again, and recommit this question back to the committee. I thank you for your attention.

Mr. Mackay: The amendment is satisfactory to me.

Mr. Moore: I would like to say just a word for Mr. Mackay's benefit in relation to our own lines. We differ in our equipment from some of the lines that we have spoken of here this morning, inasmuch as we have a new and splendid equipment. The trailers are just as fine cars as the motor cars, just as long and just as good. They are not ready for the scrap pile; they are manned by a conductor, just the same as the motor car is, and in our figures I think it is nothing but fair that they should have hours as well as the motor cars.

President Duffy: I would suggest, Mr. Mackay, that you make that motion with reference to the modification that I suggested, and let the gentlemen act upon it.

Mr. Ham: This resolution as it reads does not say that this shall be the exclusive unit, and therefore I move the adoption of the resolution, reading as follows:

"Resolved, That this association recommends the adoption of the car-hour as a standard unit of comparison."

Mr. J. M. Smith: I think if Mr. Duffy's suggestion were put in force, that if we take it for another year, we would come better prepared, and let each one undertake it, run the year through on both the mileage and the car-hour basis, and bring a report here, I feel satisfied if it is as the gentlemen say, that it will go through without any hesitation whatever.

President Duffy: Mr. Ham, do I understand you that you desire this resolution just that way, without modifying or qualifying it to the extent that it is to be with the understanding that it is to be tried for a year and it is recommitted back to the committee to be reported on again?

Mr. Ham: No, my intention was that we simply adopt it as read, that we move the adoption of that as a standard unit of comparison. That does not eliminate any other standard that we may wish to use or continue to use. It does not interfere with our throwing it out at the end of the year if we wish to. But I

think it is a good thing. If we think, as many of us do, and I believe as most of us do, that it is a good thing to know what the earnings and expenses are per car-hour, then I think we are not making a bad move to recommend the adoption of that as a standard. We will continue to have the car-mile standard, and I do not think we are committing ourselves in favor of it any more than as an auxiliary standard.

Mr. J. M. Smith: I meant to say that while trying it for a year we might get into line with our managers and let them understand this discussion, and consider it with them. Then we can get their views as well as our own. We are not the heads of the roads. I think if we had a year to work with our managers, if it is going to be a success, we can, without any hesitation whatever, adopt it next year.

Mr. Dimmock: If I had not been here and heard this discussion I believe, as the resolution reads, it would be misleading to a manager. He would immediately reach the conclusion that these gentlemen had thoroughly sifted this question, and come to the conclusion that the car-hour was the better unit, while at the same time we have not reached that conclusion until we have tried it longer. My former remarks were made with a view of showing that the mileage basis was misleading in every sense of the word, and that we did need something better, but I do not believe this question has been studied enough to warrant the adoption of the resolution unless it is made in such a way as to show that it is a trial. If the resolution can be made to read so as to not mislead the managers who are not present, when they discover what has been done, then it would be a benefit, and they would immediately say to their auditors and men in charge, "Now let us try this thing. The accountants are reaching a point where they believe this is the best," and yet they will understand that it is only for a trial.

Mr. F. E. Smith: I do not see the use of referring this back to the committee. You cannot change the opinion of the committee on the subject at all. It is for the consideration of the convention; let the convention decide.

Secretary Brockway: That is what the standardization committee said at Boston, and they changed their minds.

President Duffy: The standardization committee didn't change their minds, they changed their classification. I think to recommend is a proper procedure. Does any gentleman wish to make that as an amendment and have it acted upon?

Mr. Wilson: I offer it as an amendment.

Mr. Han: I am perfectly willing to withdraw my motion. That will make it simpler.

President Duffy: My idea would be that this resolution should be, if you will permit the chair to make this suggestion: "Resolved, that this association recommends the adoption of the car-hour as a standard unit of comparison, with the understanding that it is to be put to a practical test by each company represented in the membership of this association, either in connection with the car-mile or not, as they may see fit, and that the committee report back at the 1901 convention."

Mr. Wilson: I don't like that phrase recommending the "adoption." It is true that we go on to explain it afterwards.

President Duffy: Suppose you use the word "use," instead of "adoption."

Mr. Wilson: I think it will be better, possibly.

President Duffy then put the question on the adoption of the resolution as amended, and it was adopted unanimously.

President Duffy: A matter that I would like to speak of is the Railway Officials' Private Report and Reference Book, that I referred to in my Address as President. The publishers, Messrs. Hanna & Gray, have left with Mr. Brockway several copies of the book. Any gentleman belonging to this association who desires one of those books will be very cheerfully supplied, if he will simply fill out one of the cards that Mr. Brockway has, and if he would prefer to have the book stamped with his name, if he will turn the card in Messrs. Hanna & Gray will send the book as soon as they can give the order to the printer. But if members wish the book now, by simply leaving the card with Mr. Brockway, he will provide them.

Secretary Brockway: There is one matter which is very close to my feelings with regard to the association, and that is the membership. It has been, I can almost say, our habit to go away from the

conventions with fifteen or twenty members gained at the convention, and for your information I want to say that we have thus far gained two at Kansas City. We are considerably behind our record, and we are going to need the constant co-operation of all the members to gather in those who are not with us at present; if I can feel sure that everyone is keeping that in mind in talking with other railway men here, I think we can leave here with our usual record.

Mr. J. M. Smith: How would it be for some person or some member of the American Association to take up our cause and speak to the managers who are attending the convention on the other side of the hall, with a view to increasing our membership. There are managers here who could speak for their companies and join us while they are here in convention. If it is left for individuals to go around, we do not meet them to know them at all. I do not know one in ten.

President Duffy: I will speak to the secretary, and see what can be done in relation to that.

Secretary Brockway: We have a plan in mind for securing the co-operation of the secretaries this coming year, the secretary of the American Association working among its members who are not members of this association, and vice versa, but the idea I had in mind was to strike while the iron was hot and while we had them right here, subject to personal influence.

On motion the convention adjourned until 10 o'clock Thursday morning.

COMPRESSED AIR AS A MOTIVE POWER.

In an interview yesterday Mr. Henry W. Cook, president of the Compressed Air Co., said to a "Review" representative that the development of the compressed air motor is proving to be in the best interests of the street railway companies and the public. Already two of the foremost systems in the country are operating compressed air cars. "The Metropolitan Traction Co., of New York," continued Mr. Cook, "has just put 200 air cars on the 28th and 29th St. lines in New York City. That line is entirely operated with air cars. Though the conditions are very exacting, the cars making frequent stops by reason of the many tracks and the narrow streets and also by stopping at any point in the block to pick up passengers, the service is reliable and the cars are a decided improvement over the former cars operated on that line.

"In Chicago air cars have been performing night service between the limits on North Clark St. and the City Hall for the past sixteen months. The motor cars have single truck motors and on North Clark St. when travel is heavy sometimes two trailers are attached.

"The Compressed Air Company is now placing upon the market its double truck 40-ft. motors, and contracts are now pending for these motors to operate upon suburban lines of steam railroads and in cities where the single truck motor cannot meet the requirements of the service. These motors give satisfactory service. There is no noise except in starting, when a slight exhaust is noticeable. This will be overcome when the motorman becomes expert in handling the levers, and does not use more air than is necessary. When the air cars are running they are noiseless, and in this respect they differ from the trolley cars; with the electric cars the noise is greatest when they run most rapidly, and have the heaviest loads.

"Competent engineers who have examined the system endorse it highly, and the fact that the cars are operating in New York and Chicago shows how important the question of air motors now is to the street railway interests of the country. The Compressed Air Co. is controlled by practical street railway and steam railroad men who realize the great value of an independent motor, and believe that the mechanical development of the air motor at this time compares favorably with electricity at the time of its adoption for street railway traction. In many respects the air motor has a decided advantage of all other systems owing to the slow moving character of its machinery, its low cost of maintenance and the fact that it does not require any special track or out-door construction in order to operate its cars. Any good track suffices for the air motor.

"The motors on the 28th and 29th St. lines in New York weigh 19,100 pounds. Those operating in Chicago weigh 18,000 pounds, and being entirely spring supported they save both jar in the mo-

for machinery and track construction. We believe that air with the independent motor will prove a valuable ally to both electricity and cable roads. The cars can be gradually introduced on roads already equipped with other motors, and in such a manner as to improve existing systems to their advantage and the benefit of the public. Favorable reports have already been made by engineers of trunk lines contemplating the adoption of air motors to run in their regular tracks on suburban service.

"It can be truthfully said that air has never been tried in any mechanical position and found wanting, and the air car only proves another demonstration of this fact. Our mechanical department is handled with judgment, care and attention to every detail.

"Theory is one thing, practice is another. In practice the air motors bear out the claims for them, and it is no longer theoretical. So far the Air Company has accomplished a great deal and will accomplish more. It has made a fair start towards winning the confidence of the street railway managers, and I believe that business will follow along these lines and that air motors can be built to fit any required situation. Parties considering the building of new feeder lines or desiring to increase the volume of their business during rush hours may find it to their interest to consider the question of introducing air motors to help them out during these hours. Our company invites careful examination of plans, and the actual operation and results of the motors now in service."

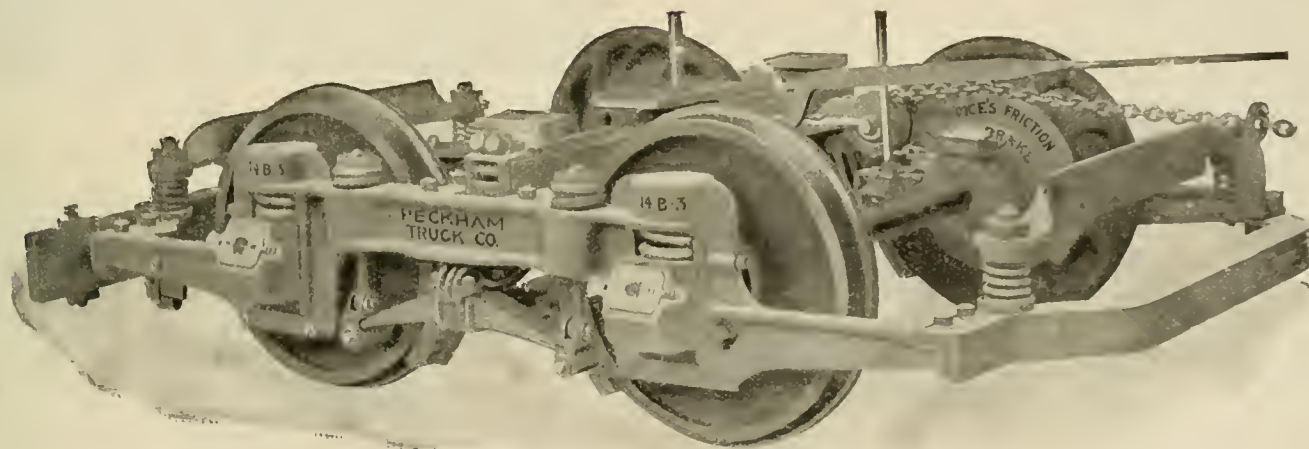
CONCERNING TRUCK PATENTS.

Kansas City, Oct. 17, 1900.

Editor "Review": Referring to the article published in your issue of the 17th inst., page 17, entitled "Brill No. 27 Truck Patent," I desire to state that our company is defending the suit brought by the Brill company against the North Jersey Street Railway Co., and that I am informed by our attorneys that there is no question about their ability to successfully defend this suit; that the half elliptic spring bolster support claimed by the Brill company was shown and patented as far back as 1845, and that this specific arrangement of spiral springs in combination with half elliptic springs is an old carriage spring device and has been in use for years.

As to the priority of invention referred to in the interference suit between Chas. F. Uebelacker and the J. G. Brill Co., the decision in this case was that Mr. Uebelacker was awarded a patent for his specific claims and Mr. Brill one for his, both being awarded patents.

As can be readily seen upon examination of Peckham's No. 14-B-3, short wheel base trucks (made under the patent of Mr. Uebelacker), 50 pairs of which are in use under the cars of the Kansas City railway, the arrangement of bolster springs is different from that shown in the Brill No. 27 truck. The main difference consists in the support of the half elliptic springs upon



PECKHAM No. 14-B-3 TRUCK
Covered by letters patent granted to C. F. Uebelacker.

TRIP TO FT. LEAVENWORTH.

Promptly at 1:30 this afternoon a special train will start from the Union Depot over the Missouri Pacific railway to take all in attendance at the convention to Ft. Leavenworth, Kas., where part of the afternoon will be spent. After visiting the U. S. penitentiary and the government reservation the party will be taken to the Old Soldiers' Home just south of the city of Leavenworth.

THEATER PARTY LAST EVENING.

A delightful theater party was given last evening at the New Coates Theater by the Metropolitan Street Railway Co. The entire house was placed at the disposal of the visitors, who made up small parties and selected their own seats.

The play was "A Runaway Girl," but a few of the hits made by the comedians were not in the original score.

Among those occupying boxes were the Executive Committee of the American Street Railway Association and ladies, Secretary Penington, J. R. Graham, J. A. Rigg and ladies, R. J. Williams and Miss Herford, Mr. Push and ladies, R. E. King and ladies, F. Mae Govern and party, and J. H. Van Brunt.

At a recent meeting of the Dundee tramways committee a communication from the Board of Trade was submitted asking that the speed of cars on certain routes be reduced to four miles an hour. The manager reported he thought six miles an hour was a safe rate and it was resolved to apply to the Board for permission to run at that speed. We wonder why the horse lines in Dundee were ever changed to electricity.

or suspended from the side frames. In the Brill construction the elliptic bolster springs are supported from the side frames by bolts, the heads of which rest directly upon the side frames and not being cushioned become crystallized and break; we have seen Brill trucks of this type in which a large percentage of these suspension bolts broke within a few months after being placed in service. In the Uebelacker construction the elliptic bolster springs are suspended by bolts, the upper ends of which are supported on spiral springs which cushion the shocks received in crossing tracks and switches. The suspension bolts are constructed with eyes at each end through which steel pins are inserted. These pins rest upon the spring caps and are much stronger and less liable to break than bolt heads, and being supported upon springs are relieved from crystallization and breakages caused thereby.

The best evidence of the superiority in design and construction of our No. 14-B-3 truck is the large number (over 2,000) sold since their introduction less than two years ago, to such roads as Metropolitan Railway, of Washington; North Jersey Street Railway Co., of Jersey City; Boston Elevated Railway, of Boston; Union Railroad Co., of Providence; Cleveland City Railway, of Cleveland, O., and the Metropolitan Street Railway, of Kansas City. As you are aware we were the pioneers of the short wheel base truck, which has become so popular and is being copied by the Brill company and the truck manufacturers, who opposed its introduction as not being constructed upon correct lines.

We deplore this newspaper controversy, but it will be evident to all that the statement by the Brill company referred to above compels us in self-defence to explain the true situation.

THE PECKHAM TRUCK CO.

E. Peckham, Pres.

FORT LEAVENWORTH, KAN.

Early in the year 1827, Col. Henry H. Leavenworth, 3d U. S. Infantry received orders from the War Department to proceed with four companies of his regiment to the Missouri River and establish a "permanent cantonment" upon a suitable site within 20 miles of the mouth of the Little Platte. This step was deemed necessary to protect the Santa Fe traders from the incursions of the Indians who had begun to plunder the caravans passing in yearly increasing numbers from the East out into the then unexplored West. The post thus established became at once the Mecca for traders, travelers, paroled soldiers and friendly Indians and during the great hegira to the gold fields of California in 1849, over 70,000 men, women and children passed through the reservation.

The original fort, known as Cantonment Leavenworth, comprised a square, on each of the four corners of which was a log block-house pierced for musketry. In 1832 the name was changed to Fort Leavenworth and the old log buildings gradually gave way to more permanent structures. The character of the post, too, has changed and Fort Leavenworth now partakes more of the nature of an army barrack than of a fort. It is, however, one of the most important home military stations over which the American flag floats. Under normal conditions the barracks are filled with U. S. troops held for reserve duty or fitting out for frontier service, but as a result of the Spanish war and the acquisition of our new foreign possessions, most of the usual occupants of the buildings are doing duty in the Philippines or Cuba, and there remains but a small guard to picket the grounds.

The reservation contains nearly 12,000 acres, distant about three miles north of the city of Leavenworth, and lying along the tops of the bluffs overlooking the Missouri Valley. Within this area are the United States War College, Post Chapel, Barracks, Riding School, Quartermasters' Building, a fine monument to General Grant, a national cemetery and officers' cottages and quarters.

Here also are the United States Penitentiary and a new Federal Prison now being built by convict labor.

The United States Penitentiary was formerly a purely military prison, and so remained, a sort of general guard house for the army, until 1895, when it passed from the control of the War Department to the Department of Justice. The institution comprises a group of three-story stone buildings separated by alleys and court yards, there being round about them all a stone ram-



INFANTRY BARRACKS, KEARNEY AVE.

part pierced by a single sally port, before whose double iron gates a picked sentinel, armed with Spencer repeating shotgun and revolvers, paces every moment of the day and night.

Within these sombre gray walls are confined nearly 1,000 men, who in various ways have brought themselves under the ban of Uncle Sam's displeasure. Some have committed murders, some are counterfeiters, others have violated the neutrality, postal or revenue laws, and a few are serving sentences for willfully misapplying the funds of national banks.

The prison draws its inmates from a section embracing Colorado, New Mexico, Texas, Oklahoma, Indian Territory, Arkansas and Kansas. Included in the number are representatives from the highest walks of life, as well as the lowest, but prison regulations

take no account of past deeds, and here all men are at least equal, if not free. The refined, well-educated bank cashier, who has violated the trust he once enjoyed, lock-steps across the stone paved prison court with the desperado from New Mexico and the murderer from Texas, and it would be hard to pick the one from the other from among the groups of gray-clad, clean-shaven men that file slowly by, each face indelibly stamped an ashen gray hue, known the world over as prison pallor.

The penitentiary is in charge of Maj. R. W. McClaughry, who has given a lifetime to the development of the science of penology. Major McClaughry prefers to call his institution a reformatory,



U. S. PENITENTIARY.

instead of penitentiary, and every rule and regulation for the care and guarding of the prisoners is made, not with the purpose solely of meting out punishment for past wrongdoing, but with the hope and desire that the men may be led to take a higher view of their duties as men and citizens, or at least become convinced of the uselessness and folly of acts contrary to law, to the end that when they leave the institution they may become useful and desirable members of society, or in any event, harmless ones.

But the warden, while working for the good of each of his charges, is not a sentimentalist, and in him the hardened professional criminal finds a stern master, who deals out severe punishment upon the slightest sign of viciousness or insubordination, and if the occasion demands, can shoot as quick and as straight as any crack marksman from the plains.

Somewhat contrary to the usual custom in penal institutions, the prisoners at Ft. Leavenworth do no inside work, with the exception of making their own clothes, but they are taken outside the walls and do general farm work and also railroad constructing. The larger part of the inmates are now engaged in building a new Federal prison nearly two miles from the present buildings, the men going to and from the site under guard.

Although kindness and mild treatment are used wherever possible in dealing with the prisoners, the kindness is re-enforced at every point by iron bars and stone walls and loaded shotguns in the hands of expert marksmen. The work of patrolling the walls, guarding the cells and dormitories, and escorting prisoners when working outside the walls requires the services of 50 guards—a number that on first thought would appear altogether too small to guard a body of men twenty times as large, and including some of the most desperate characters the Southwest can produce. But this proportion is seldom increased, even when the men are taken outside to work, and 30 or 40 convicts, each carrying a hoe or shovel, frequently work all day a mile from the prison with but two guards to watch them. It is probable that if under these conditions a concerted effort to overpower the guards and escape was made, it would be partially successful and some of the prisoners would undoubtedly get away, but there are several circumstances that make such an attempt so improbable that the risk can be safely taken. In the first place, the difficulties in the way of arranging such concerted action are almost insurmountable, for the inmates are never together without at least two pairs of keen eyes watching their every movement. Then each man knows that the first sign of an outbreak would probably mean instant death to several of their number, for the guards shoot to kill, and no one is willing to take the part of martyr. Prison life is a great leveler and the devil-may-care desperado who, in his old life, on a good

pony, with all his weapons and some high sounding nickname to defend, would take any chances that were offered, when shorn of his pomp and equipage is perfectly contented to keep on hoeing corn or laying bricks, and let some one else take risks with the guards' bullets. Just plain 321 of the prison gang is a very different person from the "Killing Bill" or "Deadwood Dick" of the prairies.

The guards all possess high records in both rifle and revolver practice, and for a prisoner to approach an officer nearer than five paces without raising the right hand straight in the air and holding the left rigid at his side is to draw the fire of every guard in the vicinity.

In spite of these precautions outbreaks occasionally occur and then there are lively times. One of the boldest of these attempts to break prison was made a few years ago, but was a dismal failure as far as the inmates were concerned, although its complete success was only prevented by the pluck of one man. The ringleader in the movement was a strapping big convict, who succeeded in smuggling from the table a handful of black pepper. Watching his opportunity while crossing the prison yard from the dining room, he approached a guard as if to ask him a question, and when within a few paces threw the pepper directly into the officer's eyes, at the same time making a dash for the sallyport gate, which stood open for the moment to allow some one to enter. But quick as were his movements the guard was faster, and although suffering intense agony and half blinded, brought his gun to position and fired, killing the convict before he had taken a



R. W. McCLAUGHRY.

dozen steps toward the gate. Another member of the gang, who, realizing what was going on, had started for the opening, was shot through the heart by a guard from another corner of the yard. It was all over in less than a moment, but the effect of such an occurrence lasts for years, as nothing takes the fight out of unruly convicts so quickly as to see one of their fellows killed in this way.

The prison's daily routine is not severe, but it is rigidly enforced. The inmates rise at 6 o'clock, go to work at 7, and are in bed and supposed to be asleep by 9:30 p. m. There is an abundance of good wholesome food, and certain hours for reading, religious services and recreation. The uniform is a plain gray suit, with the man's number stamped on the breast and back.

The grounds for the new prison now being erected contain 1,200 acres, and when the plans are carried out this prison will be one of the most secure and conveniently arranged in the United States. It is 800 ft. x 900 ft., and consists of four long cell-houses, radiating from a central rotunda, from which also leads an enclosed corridor to a separate building, where are the dining room, kitchen, school room, library and chapel. Over the rotunda arises a handsome dome, the top of which will be about 200 ft. from the ground. In the school room and chapel the reformative idea in prison management will be given free scope.

Maj. Robert W. McClaughry, warden, was born in Hancock Co., Ill., July 22, 1830. He enlisted in the 118th Illinois Volunteers in 1862, and served throughout the war. In 1874 he was appointed warden of the Illinois State Penitentiary at Joliet, Ill., but resigned in December, 1888, to take charge of the Pennsylvania Industrial Reformatory, Huntington, Pa. On May 1, 1891, he became chief of the police of Chicago, but in August, 1893, accepted the superintendency of the Illinois State Reformatory at Pontiac, there con-

tinuing until Mar. 1, 1897, when he returned to Joliet to begin his second term as warden. On July 1, 1899, he became warden of the U. S. penitentiary, Fort Leavenworth. Mr. McClaughry deserves special credit for his efforts in introducing the Bertillon system of identifying criminals into the United States, and in establishing the national bureau of identification and the national union of chiefs of police.

The warden is assisted by Mr. Frank H. Lemon, deputy warden.

THE INTERURBAN LINE BETWEEN KANSAS CITY AND LEAVENWORTH, KAN.

The Kansas City-Leavenworth Railway Co. was chartered in April, 1899, and in January, 1900, its road was opened to the public. The line starts at Grand View, Kansas City, Kan., near the terminus of the Metropolitan Street Railway Co.'s Grand View branch, and runs parallel to the Kansas City Northwestern R. R. to Vance, a distance of eight miles. It then crosses the steam line and strikes



GENERAL OFFICES AND CAR HOUSE.

across the country to Wolcott, where are located the general offices, power station and car barns. This town was formerly called Conner, after an old Indian chieftain, but when the electric line was opened the inhabitants by popular vote decided they would rather have the place named after a live street railway manager than a dead Indian, so the town was rechristened in honor of Mr. Herbert W. Wolcott, who was largely instrumental in bringing about the successful completion of the road. Leaving Wolcott the route



CONSTRUCTION CAR

parallels the main line of the Missouri Pacific Ry. nearly to Leavenworth, passing the Kansas State Penitentiary at Lansing, and the National Home for Disabled Volunteer Soldiers about three miles farther north. At Leavenworth connection is made with the Leavenworth Electric R. R., which serves the city of Leavenworth and operates a three-mile line to Ft. Leavenworth.

The road is 23 miles long, single track throughout, with seven turnouts and five Y's for turning cars. The rails are 61-lb. T-section laid on white oak ties placed 2 ft. c. to c. and rock ballasted. American rail joints were used throughout.

The overhead work on straight track is single pole with bracket construction, and on curves double pole with span suspension. Two



POWER STATION.

trolley wires are used to avoid overhead switches. The wires are figure 8, No. 000. All brackets and overhead materials were supplied by the Ohio Brass Co., through the B. R. Electric Co., local agent. The feeder system consists of 350,000-c. m. aluminum cables of which there are 450,000 ft.

The power house contains a 1,000-h. p. simple non-condensing Hamilton-Corliss engine with cylinders 32 x 54 in., belted to two 300-kw. General Electric generators, mounted on one shaft with friction clutches between, by which either machine can be thrown out of service. Steam is taken at 120 lb. from four 250-h. p. Stirling water tube boilers arranged in two batteries.

Car barns and the general offices are in a brick building near the power station. The repair shop occupies one corner of the car

of the tracks in front of the offices at Wolcott, and the reservoirs on the cars are charged after each half trip. The air until recently was compressed by a pump driven from the main engine in the power station, but with this arrangement the entire station had to be started up in the morning a half-hour before the cars were scheduled to leave, in order to have air for the brakes. The compressing is now done by an Ingersoll-Sergeant pump operated by a 10-h. p. vertical engine. Air is stored in the yard tank under 300-lb. pressure, and is carried on the cars at about 200 lb. The vertical



STONE CRUSHER.

engine mentioned also drives a small motor for lighting the offices and power house when the main plant is shut down.

All broken stone used in ballasting the road is crushed in an Austin stone crusher located at a quarry between Wolcott and Kansas City, Kan. The crusher is driven by an electric motor taking power from the line circuit. In building the roadbed regular steam road practice was followed, and in fact a steam locomotive

H. W. WOLCOTT,
Secretary and General Manager.D. H. KIMBERLY,
President.O. D. HENRY
Superintendent.

barn and contains a lathe, drill, punch, blacksmith outfit and small crane for handling armatures, wheels and other small parts.

The company owns six coaches with smoking compartments; four combination express and passenger coaches; three picnic cars; one steam locomotive; one motor construction car; 15 flat freight cars and one box freight car.

The passenger coaches were furnished by the American Car Co., of St. Louis, and are 41 ft. long over bumpers, 31 ft. 8 in. over corner posts, 8 ft. 5 in. wide over sill plates, and weigh complete about 42,000 lb. They are vestibuled at both ends and are fitted with Hale & Kilburn seats; Consolidated electric heaters in all compartments and in the motorman's cab; standard steam locomotive oil headlights; Wilson trolley catcher and Magann air brakes and whistles. Each car is equipped with four 50-h. p. Lorain "Steel" motors geared to 45 miles an hour, and is mounted on Peckham 14 A double trucks; the wheels are 33 in. in diameter with 4¼-in. tread. Wheels were purchased from the Kansas City Car & Foundry Works, which are now owned by the Griffin Wheel Co., of Chicago. The company also has one equipment of Lorain double trucks, type F.

Compressed air for the air brakes is stored in a tank at the side

was purchased and used in the work. The company also owns a motor construction car that has done excellent service in construction and track repair work. This is a regular freight flat car with a cab built in the center to protect the controller and other operating apparatus. The body is 33 ft. long, mounted on Peckham standard double trucks, equipped with four 30-h. p. Lorain "Steel" motors and Magann air brakes. The car has a capacity of 28,000 lb. and will haul six loaded freight cars over a 3 per cent grade.

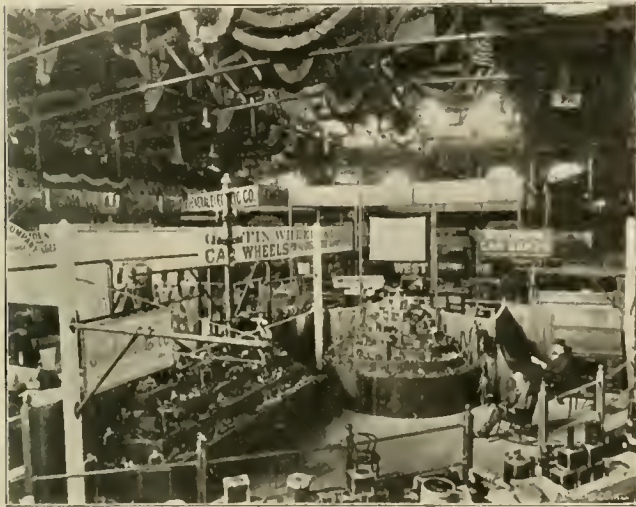
The officers of the Kansas City-Leavenworth Railway Co. are as follows: President, D. H. Kimberley, Cleveland; vice-president, H. C. Ellison; secretary and general manager, Herbert W. Wolcott; treasurer, Chas. O. Evarts; superintendent, O. D. Henry; electrical engineer, Chas. Steig.

Mr. W. E. Pimlott is representing the J. M. Atkinson Co., of Chicago.

Mr. H. F. J. Porter of the Bethlehem Steel Co. extends a cordial invitation to all street railway and supply men to visit Parlor F at the Midland, where he showing samples of work done by tools treated with the Taylor-White process of hardening steel.

OHIO BRASS CO., MANSFIELD, O.

This company is making an unusually large exhibit of its goods, as follows: Flexible pole brackets of all forms; regular line of overhead material embracing various shapes in which "Dirigo" insulation is made; late forms of round top hangers known as type N, and which have attracted considerable attention and favor-



able comment because of their neatness, compactness and strength: third rail insulators; complete line of Fig. 8 and other special material; double Brooklyn insulators and 3-in. globe strain insulators; emergency hose bridge; Monarch track scraper and adjustable track brush holder; high tension insulators for all conditions.

Messrs. C. R. King, R. F. Byrns, Geo. A. Mead, and A. L. Wilkinson are looking after the company's interests.

ATLAS RAIL JOINTS.

The Atlas Railway Supply Co., of Chicago, is showing samples of joints and braces at space No. 16. Mr. J. G. McMichael, who has charge of the booth, is kept busy greeting old friends and making



new ones, and expresses himself as well pleased with the results of his display. The company is also calling attention to the Atlas primer and surfacer. Messrs. R. B. Kent and E. W. Ash are assisting Mr. McMichael.

BIERBAUM & MERRICK METAL CO.

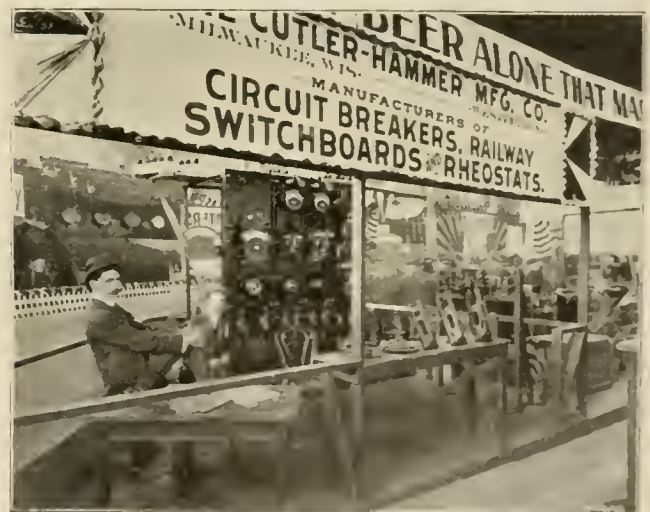
At this company's space, 10, are displayed samples of "Lumen" bronze bearings and "Ideal" trolley wheels. Lumen is a metal made according to a patented formula, and it is claimed, possesses many qualities as a bearing metal not found in phosphor and other bronzes. According to tests made by Prof. Carpenter, of Cornell University, it has a specific gravity of 6.9; average tensile



strength of over 30,000 pounds per square inch; average compressive strength of over 75,000 pounds per square inch; and electrical conductivity of 22 per cent compared with pure copper. Bulk for bulk is from 15 per cent to 25 per cent lighter than bronze. It will not score or cut the shaft, journal or pin, and runs cool under pressures that crush other alloys. Mr. Edward P. Sharp, of Buffalo, manager of the street railway department, is kept busy explaining the properties of the new composition.

CUTLER-HAMMER MANUFACTURING CO.

One of the newcomers into the street railway field is the Cutler-Hammer Manufacturing Co., of Milwaukee, which is showing at space No. 31 a line of switchboard appliances. The display consists of a standard switchboard for a 500 kw. station, the board comprising a generator panel, a motor panel, feeder panel and automatically controlled booster panel with necessary switches



and instruments. This company's circuit-breakers are of special interest. They are provided with powerful magnets for blowing out the arc and also with time-limit attachments, which allow the breakers to remain closed during a sharp peak in the load, but permit them to open instantly on the flow of a dangerously abnormal current, or of a moderately abnormal current, which lasts long enough to endanger the apparatus in circuit. The breakers are sold under the name of "W. T. L.," meaning with time limit.

Another novel device shown by this concern is an arrangement of solenoid switches for automatically throwing a booster into and out of circuit according as the load demands. The company is represented by Mr. C. H. Nowood, of the Milwaukee office.

Burton-on-Trent, England, is to have electric trams.

Russia has caught the exposition fever and proposes to hold an industrial exhibition at Riga in 1901. Electricity in its various applications will take an important part.

S
P
A
C
E
33

HAVE YOU SEEN
THE GARTON LIGHTING ARRESTERS?

HAVE YOU SEEN
The AUTOMOTONEER?

A Regulator to prevent
FAST FEEDING.

GARTON-DANIELS CO., Keokuk, Iowa.

S
P
A
C
E
33

"Serrated Wheels"

(PATENTED)

FOR CARS, SNOW PLOWS AND SWEEPERS

Quincy & Boston Street Railway Company Writes:

"We equipped several plows with 'Serrated Wheels' and ran them in every storm of last winter when all the other plows were stalled because the wheels slipped around. 'Serrated Wheels' are as good to pick snow and ice off of a track as 100 men."

Send orders to

Burnham & Duggan Railway Appliance Company,
NO. 60. STATE STREET, ROOM 701.
BOSTON, MASS.

LATER ARRIVALS.

A. S. R. A.

Allen, Fred C., Venice, Ill.
Baumhoff, Geo. M., St. Louis, Mo.
Baker, C. C., Topeka, Kas.
Burch, E. P., Minneapolis, Minn.
Crowley, H. J., Bridgeton, N. J.
Dimmock, W. S., Omaha, Neb.
Douglass, R. M., St. Louis, Mo.
De Coursey, Harry, Leavenworth, Kas.
Fisher, F. E., Joliet, Ill.
George, M. C., Terre Haute, Ind.
Hutcheson, J. E., Ottawa, Ont.
Hires, T. F., Bridgeton, N. J.
Hogarth, J. B., Denver, Col.
Koss, T., St. Joseph, Mo.
Kamper, John, Meridian, Miss.
Kibbe, A. S., Joliet, Ill.
Lawton, F. C., Colorado Springs, Col.
Minary, C. K., Springfield, Ill.
Minary, T. H., Springfield, Ill.
Miller, J. H., Springfield, O.
Noyes, E. A., Saratoga, N. Y.
Rockwell, H. O., St. Louis.
Rayners, Geo. E., Portland, Me.
Smith, C. B., Topeka, Kas.
Smallwood, F. C., St. Joseph, Mo.
Spencer, E. J., Venice, Ill.
Smith, G. J., St. Louis.

ACCOUNTANTS.

Donnell, F. S., Ottawa, Ill.
Hutcheson, J. E., Ottawa, Canada.
Mitchell, C. S., Pittsburg, Pa.
Moberly, R., Kansas City.
Read, W. P., Salt Lake City, Utah.

MISCELLANEOUS.

Armstrong, A. M., Schenectady, N. Y.
Alvagnor, Herbert, St. Louis.
Allison, J. W., St. Louis.
Anthony, W. M., New Haven, Conn.
Allen, W. H., Clinton, Mo.
Bileston, L. E., Akron, O.
Barbee, J. S., Kansas City.
Brady, C., Philadelphia, Pa.
Buddicke, Wm. A., St. Louis.
Brooks, I. E., Lincoln, Neb.
Brooks, M., Lincoln, Neb.
Brett, Geo. E., Philadelphia.
Bauman, Seth, St. Louis.
Balch, John, Boston.
Barckley, Geo. B.
Colvin, H. S., Lawrence, Kas.
Colvin, J., Washington, D. C.
Campbell, S. C., Lincoln, Neb.
Crate, Amos, Louisville, Ky.
Croninger, Cliff R., Chicago.
Dinsmore, S. M.
Drake, F. S., New York.
Doubt, R. A., Lincoln, Neb.
De Nufe, H. S.
Donohoe, F. E.
Edmonds, F. W., Chicago.
Foutch, E. L., Kansas City.
Farnham, W. B., Dayton, O.
Fredberg, H.
Hurd, D. F., Kansas City, Mo.
Hall, Wm. R.
Hartley, H. C., Lincoln.
Hall, F. A., Chicago.
Hund, B. S., Belleville, Ill.
Jeffery, E. O., Lincoln, Neb.
Knox, G. W., Chicago.
Keanshaar, C. F., St. Louis.
Ludlow, W. E.

Lewis, H. G., Philadelphia.
Lockwood, Joseph E., Detroit, Mich.
Leidinger, P., Dayton, Ohio.
Lynch, James.
Lehman, J. S., St. Louis.
Mac Govern, Frank, New York.
Mayer, C. J., Philadelphia.
Mulkey, J. M., Detroit, Mich.
Marks, Frank R., Cleveland, O.
McRoy, J. T., Chicago.
Mowry, L. C., Chicago.
Moore, R. E., Philadelphia, Pa.
Orton, C. S., Lincoln, Neb.
Peck, C. A., Kalamazoo, Mich.
Penfield, E. W., New York.
Perrine, Charles H., Chicago.
Plumie, C. R., Lawrence, Kas.
Pipperbery, A. J., Lincoln, Neb.
Price, J. E., St. Louis.
Peckham, E., New York.
Robinson, E. J., St. Louis.
Rossman, J. G., St. Louis.
Robinson, John C., Philadelphia, Pa.
Reinaehl, C. W., Stulton, Pa.
Reinoehl, C. W., New York.
Shipman, H. S., Lawrence, Kas.
Stephens, M. M., E. St. Louis.
Shainwald, J. C., Chicago.
Slingluff, Wm. H., Chicago.
Smith, A. B., Lincoln, Neb.
Stanfield, Chas. A., St. Louis.
Skeen, Robt., Belleville, Ill.
Spencer, E. J., St. Louis.
Smith, C. C., Milwaukee.
Schmedder, Gus, Kansas City.
Seymour, E. A.
Stith, Frank, Kansas City.
Sward, J.
Schaefer, J. F., Chicago.
Silver, W. S., New York.
Sutton, R. J., Kansas City.
Snively, J. S., Kansas City.
Voight, G. W., Chicago.
Vail, J. A., St. Louis.
Vanhorn, V. J., Keokuk, Iowa.
Wood, T. E., Cincinnati.
Watts, J. E., St. Louis, Mo.
Wampler, W. M., New York.
Wheeler, Wm. B., New York.
Wickwire, E. F., New York.
Warren, Joseph, Milwaukee, Wis.
Webster, D. F., Sedalia, Mo.
Wendell, Jacob, New York.
Young, C. G., New York.

LADIES.

Mrs. F. H. Jones.
Miss McLean.
Miss Holst.
Mrs. J. F. Walters.
Mrs. W. L. Janks.
Mrs. R. Graham.
Mrs. A. N. Patton.
Mrs. Anderson.
Mrs. W. L. Dimmock.
Mrs. Fred Allen.
Mrs. A. A. Stowe.
Mrs. F. S. Donnell.
Mrs. J. B. Hayarth.
Mrs. W. I. Dumnick.
Mrs. Odell.
Mrs. M. E. Green.
Mrs. W. L. Rock.
Miss J. A. Bendure.
Mrs. O. T. Rayworth.
Mrs. J. M. Roach.

Mrs. F. L. Roach.
Mrs. John Ehrhardt.
Mrs. W. G. McDole.
Mrs. Ira A. McCormack.
Mrs. W. J. White.
Mrs. W. H. Harris.
Mrs. R. S. Goff.
Mrs. H. F. McGregor.
Mrs. J. M. Jones.
Mrs. W. H. Holmes.
Mrs. C. F. Holmes.
Mrs. L. E. James.
Mrs. W. A. Satterlee.
Mrs. J. W. Carter.
Mrs. W. G. Becker.
Mrs. W. E. Kirkpatrick.
Mrs. D. W. Dozier.
Mrs. Chas. Grover.
Mrs. E. Butts.
Mrs. E. S. Foster.
Mrs. Carington.
Miss M. E. Greene.
Mrs. J. A. Benduse.
Miss O. T. Rayworth.
Mrs. F. G. Jones.
Miss McLeon.
Miss Holst.
Mrs. J. F. Wattles.
Mrs. J. G. McMichael.
Mrs. E. P. Morris.
Miss M. Perryman.
Mrs. J. A. Granger.
Mrs. H. D. Cooke.
Mrs. Peter D. Milloy.
Mrs. W. Smith.
Miss F. Weber.
Mrs. Ben Kellogg.
Miss Barris Kellogg.
Mrs. Jas. Conwally.
Mrs. L. R. Crane.
Mrs. M. J. Wilcox.
Mrs. W. Monroe.
Miss Henderson.
Miss D. W. Cullen.
Mrs. Holmes Green.
Mrs. S. J. Minton.
Mrs. F. K. Mills.
Mrs. Jones.
Mrs. Johnson.
Mrs. R. H. Ham and sister.
Mrs. Bailey.
Miss Eush.
Mrs. Harris and two lady friends.
Mrs. High.
Mrs. R. L. Lane.
Mrs. S. C. Munoz.
Mrs. R. E. Mills.
Mrs. Strenge.
Mrs. Spaulding.
Mrs. H. L. Thompson.
M. E. Cook.
Mrs. G. H. Griffin.
Mrs. Garl.
Mrs. Gibson.
Mrs. Russell.
Mrs. Blades.
Mrs. Nitchy.
Mrs. W. L. Jenks.
Miss Mabel Greene.
Mrs. Reaves.
Mrs. E. Moore.
Mrs. H. J. Davies.
Mrs. H. C. Mackay.
Mrs. E. D. Hibbs.
Miss L. R. Klett.
Mrs. J. M. Smith.
Mrs. A. H. Stone.

DAILY STREET RAILWAY REVIEW

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H. H. WINDSOR,	F. S. KENFIELD,
Editor.	Business Manager.

Application made for entry as mail matter of the second class.

VOL. X. FRIDAY, OCTOBER 19, 1900. No. 3.

PROGRAM.

FRIDAY, OCTOBER 19TH.

The entire day has been set apart for the examination of exhibits. Friday night, banquet at Coates House.

NEW YORK IN 1901.

The opening year of the new century will find the conventions in the largest city on the continent, and we may well expect to have the 1901 gathering a notable one.

The attendance from the Eastern states will naturally be very large, and there is no reason to doubt our Western members will turn out in full force. For the two years past we have met in the Central West, involving long travel and shipment for delegates and exhibits, and next year we shall have to return the compliment with interest. By next year the largest power plant in the world will be in operation in New York and with the various forms of electric traction and air will afford attendants a wealth of interesting studies. The exhibit will certainly be a record breaker, and alone well worth the trip.

The announcement of the selection of New York was received with great applause.

PRESIDENT-ELECT HAM OF THE ACCOUNTANTS.

W. P. Ham, the newly chosen president of the Accountants' Association, is conceded to be one of the brightest of that enterprising body of bright young men. He has taken a very active part in its work from the organization meeting at Cleveland, and as a member of the committee on standardization contributed largely to the creation of the new system.

In response to a very tempting offer he recently left his position in Brooklyn as auditor of the Brooklyn Heights road, to become comptroller of the lines in Washington, D. C. He ranks among the foremost accountants in the country and a better selection could have been made. The compliment of election should be particularly gratifying to Mr. Ham, who has his bride with him to join the circle of accountants' wives, in which she has been warmly welcomed.

SECRETARIES RE-ELECTED.

Both associations re-elected their former secretaries, each of whom has so satisfactorily held office for several years. This is a compliment to these hard working officials, and insures the same good business administration which has heretofore marked the management. On the secretary falls the brunt of the hard work, as well as the performance of many a thankless task. The vote of thanks each received was fairly earned. T. C. Pennington, Chicago, was elected secretary of the American, and W. B. Brockway, New Orleans, of the Accountants'.

The Orpheum theatre management reserved the best seats last night for sale exclusively to railway men. There was a good attendance of our people who had a pleasant social time.

PRESIDENT-ELECT W. H. HOLMES.

Mr. Walton H. Holmes, called to be the next president of the American Street Railway Association, is a gentleman whom it is a pleasure to meet and an honor to know intimately. He was born in Kansas City in 1863, his father being Nehemiah Holmes, founder of the city's street railway system, and he knows the street railway business from the bottom up. At the age of 12 he entered the office of his father's horse railway company in a subordinate position, but before he was 21 years old he was vice-president.

Mr. Holmes received a preliminary education at the Christian Brothers' College in St. Louis. He did not receive more because he was too busy and preferred the activity of practical life to the quiet and monotony of the college room. After his father's death, he, in company with his brother Conway F. Holmes, who has always been closely associated with him, organized the Grand



WALTON H. HOLMES.

Avenue Cable Co. and built the Grand Avenue system. Under their management the company's property increased in extent by consolidations and the building of new lines until 1895 it was merged into the Metropolitan Street Ry., of which Mr. Holmes became vice-president and general manager and later president.

Mr. Holmes has not brought his system to its present prosperous conditions by sitting in his office and dictating orders, but when the snow begins to fly or his presence is required in any quarter he dons mackintosh and boots and knows from personal inspection that proper steps are being taken to relieve the situation, and if a helping hand is needed he does not hesitate to take a place beside the men rubbing a little dirt into his palms.

He believes in spending money to make money. His street railways have not grown as the city has grown, but his lines have been run out over undeveloped territory and have caused the city to grow up to them. Parks, the Convention Hall and public improvements of every nature have always claimed and received his support.

Mr. Holmes is interested in several Kansas City enterprises and is president of the Kansas City Electric Light Co.

The change of exhibitors' day from Friday to Wednesday is one of the best things the association has done in a long time, and it suits everybody. The slow ones will now be forced to be ready early, and any who are not willing to do so should be barred. It is unfair to the prompt ones that a few should each year prosecute their disturbing work after the main show is open.

Charles H. Henningway, New York, cashier of the Albany & Hudson, is one of the new members welcomed by the Accountants'. He is greatly pleased with the work being done by the association.

THIS IS SUPPLY MEN'S DAY, AND THEY
PROMISE A HOT TIME.

The papers have all been read and the discussions discussed. The president's gavel has sounded the end of both convention sessions and today belongs to the supply man. That he will make the most of it goes without saying. In fact anything he undertakes goes.

The trouble will begin about 9 a. m. when the parade will be given. A brass band and other things will march to the Coates, Baltimore, Savoy and Midland and give a musical serenade. At 10 o'clock the band will reach Convention Hall and furnish music for the morning entertainment. Just what this will be is somewhat in the nature of a surprise, but will be well worth taking in.

At 2 o'clock the continuous vaudeville will begin on the large stage at the north end of the building. The boys were busily at work late last night getting things in readiness. In addition to the professionals engaged for the afternoon performance there is liable to be some home-made talent. As we go to press (4 a. m.) the boys had hatched out the following and were still spilling ink:

BETWEEN THE ACTS.

Our President Roach, forming a "Buggy" trust.
Our First Vice-President, on the hunt for a better "Rigg."
Our Second Vice-President, welcoming his foreign friends to America, the "Vreeland" of the world.
Our Third Vice-President Jones. He pays "the freight."
Penington looking for the supply man's "Roll."
The Ladies' Pet. Wait and see "Ross-it-cr."
A Well-known "Sergeant" will appear.
"Holmes," Sweet "Holmes." A Duet.
A test of Bread—"Graham."
A "Tripp" from the East.
A dream of the Supply Man—"Wason."
It might be May "Irwin," but it is not.
A Perpetual Ride by "Vreeland."
A Weighty Problem by "Heft."
Across the Creek by "Brydges."
A Mountain of Supplies by a "Hill."
Historical Comparisons—"Baneroff."
Railroad Stories—"Cy Wyman."
Standard System Pudding—"Duffy."
Why we "put up" with Gas Lighting—"Simpson."
A Large Act—"Littell."
A scene from Hamlet—"McCulloch."
Lullaby by "Rockwell."
A Corner on "Beans"—"St. Joseph Market."
Harvest Time by "McCormick."
The Little Minister—"Parsons."
Black Diamonds—"Coleman."
How to Eat—"Fiest."
Decorations—"Draper."
A Barrel Act—"Cooper."
Electrical Wonders, "Collins."
A Trust in Providence, "Potter-es."
The Wrong Way, "Wright."
A Glove Contest, "Mitten."
How to Make a Touch, "Con Holmes."
A Charitable Act, "Beggs."
An Old Affair, "Young."
A Little Jockeying, "Sloan."
A White Affair, "Miller."
A Dollar Man, "Nichol."
A Moving "Van" around the "Horn."
A Christmas Carol, by "Ely."
Odious Comparisons, "MacKay."
Why "Smith" left Home, "Smith."
Elevated Underground on the Surface, by "Wilson."
A Noted Hold by Himself, "Nelson."
Not Our Mary, but an "Anderson."
Looking for Carl and McDonald, "Barnaby."
Bearding Bennett, "McGraw."
Daily Doings, "Windsor and Kenfield."
Not Baking Powder, but "Price."
Quail Shooting, "Fiske."
Ice Cream and Cucumbers, "Grover."
A Sleepy Act—"Wakeman."

REVIEW DAILY WILL ISSUE SATURDAY.

The Daily Review will be issued at the usual hour to-morrow morning containing a full report of the banquet and illustrations and descriptions of the exhibits.

In addition to delivery at the hotels and Convention Hall, there will be a sufficient supply at the Union Depot so that delegates leaving on the morning train can secure a copy. Don't fail to get one to read on the train.

DATA ON ELECTROLYSIS WANTED.

Mr. Albert B. Herrick, of New York, who has made the question of electrolytic action a special study and has been employed as expert by a number of street railway companies, is in attendance at the convention and desires to meet all delegates who have had any trouble with electrolysis, either real or supposed, for the purpose of obtaining data on the subject. Any information he secures in this way, or any that he may have Mr. Herrick will cheerfully and freely place at the disposal of street railway officials, as he believes that by working together in this way much better results can be secured in defending suits. Mr. Herrick will be at the booth of the Street Railway Review in Convention Hall today from 10 a. m. to 4 p. m.

EXCURSION THIS MORNING.

There will be an excursion this morning over the Heims' line, including a visit to the Heims' brewery and park, and the company's railway plant. General Manager Hands invites us all to come and promises a big time. Guides will meet the party and conduct them through the ice factory, brewery and park. Special cars will leave 5th and Walnut Sts. promptly at 9:30 a. m. Should any miss the special they can go out on the regular service. Badges good for transportation; also ice and amber fluid.

TALLYHO RIDE THIS AFTERNOON.

The delegates to the Accountants' Association and their ladies will take a tallyho ride around the city this afternoon as the guests of Mr. J. A. Harder, auditor of the Metropolitan Street Railway Co., of Kansas City. The party will leave from the Midland Hotel at 10 a. m.

EXCURSION TO FT. LEAVENWORTH.

The excursion to Ft. Leavenworth yesterday was made in a special train which left the Union Depot at 1:30 p. m. About 100 went down on the electric line joining the others at the Fort and making a party of about 400. On arrival the party were met by army officials and conducted through the barracks and fort. The military prison was inspected under the guidance of the warden and assistants, visiting the receiving and examining rooms. From there a visit was made to the mess room where a regulation meal was spread and 100 prisoners marched in. Maj. McClaughey then led the way to the prison chapel where the visitors rested while he explained the details of prison life and the system of identification by means of physical measurements. After a visit to some of the work shops the party took the train to the Soldiers' Home, arriving at five p. m. A fine lunch was waiting and quite acceptable after the journeying. The return was made by steam train and trolley. The day was a perfect one for such an outing, which was one of the most enjoyable of the week.

W. Worth Bean arrived yesterday in time to attend the closing session and save his record as the only delegate who never missed a meeting. Mrs. Bean remains at home on account of the death of her mother.

Mr. E. P. Morris, of Morris Electric Co., had a colored orchestra entertaining the delegates in the McGill, Porter & Berg booth yesterday.

PERSONAL EXPERIENCES OF WELL KNOWN MANAGERS

SORRY HE DIDN'T LOOK SORRY.

General Manager Vining, of the Market Street consolidation, San Francisco, is not only naturally of a genial disposition but always takes time and great pains to treat everyone with marked politeness.

One day, a lady, from the Emerald Isle, took a transfer and then stopped over in the neighborhood of the transfer point for the purpose of doing some shopping. On taking the car an hour or two later she attempted to ride upon her expired transfer. The conductor explained that, in accordance with the terms printed upon its face, the time limit had expired, and he was unable to accept the transfer for passage. The good woman insisted, however, upon riding upon it, and the result was that ultimately she was assisted from the car without the use of an unnecessary degree of force. This led her to visit the general manager, with blood in her eye, and he, in accordance with the duties of his office, attempted to assuage her grief, by explaining as pleasantly as possible the necessity for the rule in question, and the compulsion that the conductor was under to enforce it. After soothing her as well as possible, he wound up with the statement that the rule had been found necessary and the company was obliged to enforce it, but that he was sorry that through a misunderstanding of the subject she had been subjected to annoyance. Whereupon the good lady, rising to her full height—six feet, more or less—retorted, "Sorry! You are not sorry; you don't look like it."

All of which should be a lesson to general managers, not to be too genial on occasions of this kind.

WHAT'S IN A NAME?

When Judge Joshua Jump was appointed receiver of the Terre Haute (Ind.) Electric Railway Co. in the latter part of 1897 he occupied the old office of President (now Lieutenant-Colonel) Russell B. Harrison. Naturally one of the first things he did was to substitute his name for Mr. Harrison's on the placards for the office door and callers were then admonished to

JUMP		JUMP
	or	
IN.		OUT.

as the case might be.

HE GOT HIS PASS.

Tom Lowry, who has controlled the street railways of St. Paul and Minneapolis for the past twenty years, is well known as a great joker and a man of prolific and original ideas. It was he who got hold of Minnehaha Falls after they had gone dry, and made a pretty pleasure resort at the end of one of his lines, and put in pumps to keep the falls falling. He attended the Republican convention at Philadelphia last June as one of the delegates from his state.

Among the other delegates from Minnesota was a member of the state legislature. The two chanced to meet in a hotel corridor. When the member spied him he said to the man with whom he had been talking: "Well, here is Tom Lowry; by thunder, there is no man on earth ever did more for Tom Lowry than I have done. Why, he never asked me for a thing that I did not give it to him. He never wanted anything when I knew it but I went out of my way to get it. I have gone out of my way many a time to do things for him, and do you know, I never got a thing from him; no, sir, I never even got a pass on the Minneapolis street railway. Not even a pass."

"Say, old man," said the Hon. Thomas, "I will tell you what I will do. If you set up the champagne I will give you a pass on the Minneapolis street railroad."

"By Jove, it is a go," said the member of the legislature, and he took the party into the cafe and set up two bottles of champagne. When the wine had been downed the Hon. Thomas drew a nickel from his pocket and, handing it across the table, said: "Here, old man, it's good on any line in Minneapolis, and will take you anywhere you want to go."

THREATENED TO SUE HIMSELF.

A good one is told (now for the first time) on Harry Steadman, the transfer ticket man. A certain manager in the West who had been using the Steadman ticket and was about ready to order again, inclosed one of the transfers and asked for a bid on several hundred thousand. The sample sent was one which had been printed by Steadman, who had, however, in this instance neglected to put his imprint on the ticket. A price came back promptly with an urgent letter to furnish the name of the party who had printed the former supply and which was a distinct infringement on his (Steadman's) patent rights. The "pirate had copied the ticket in every detail, in fact must have made a photographic reproduction to get it so exact" and somebody was going to get the law on somebody else just as quick as he found out who it was.

When the answer went back Steadman concluded not to push the suit.

HERRMANN AND THE CONDUCTOR.

The late Herrmann, the prince of magicians, once had considerable fun with a conductor in St. Louis. Herrmann was on a downtown Washington Ave. car; the conductor came through, collecting fares and Herrmann had in his hand to give him a ten dollar gold piece. The conductor glanced at the coin and said: "I can't change that; is that the smallest you have?" "You can't change that?" said Herrmann, and in his hand was a fifty-cent piece. The conductor glanced suspiciously at him, reached out, taking the coin, when to his surprise it was again a ten dollar gold piece. "Did I not tell you," he said, savagely, handing the coin back to Herrmann, "I could not change it? You will have to give me something smaller or else get off the car. The company does not make change for anything over two dollars." "Well, you will have to change this, then," said Herrmann, and there in his hand was the fifty-cent piece. "Say, what is this, anyway?" said the conductor. "Have I got them?" "I don't know," said Herrmann, "whether you have or not, but if you don't change this coin and stop annoying me, I shall report you to the company." "Well, I'll be damned," said the conductor, as he rang up several fares by mistake, and the crowd who had recognized Herrmann roared with laughter.

RIDE AND REALIZE.

"The manager who neglects to ride frequently on his own cars fails to realize on many a pointer which often is of the greatest possible value," remarked General Manager Nicholl, of Rochester, N. Y. "It may take the bloom off of some pet peach of an idea occasionally, but the practice is a good and meritorious one.

"We were congratulating ourselves on having our transfer system down to a fairly fine point. One night I boarded a car to go home after an unusually hard day, and I made for a vacant seat next to a small boy at the front end of the car. When the conductor began his collection the small boy jabbed me with his elbow and said, 'Say, mister, you don't need to pay no fare; father got off at the transfer point to stay down town, and I got two transfers. You just better keep your money.'

"The conductor had taught us in time to hear the latter part of this speech and effectually put a quietus on the transfer of the transfer with, 'Well, I need just two transfers from a boy about your size,' and lifted them both.

"Now, would you have recognized the well-meant intention of the boy to me in my individual capacity, or reproved him from an official standpoint? Well, I did a little of one and considerable of the other."

ACCOUNTANTS' EXHIBITS OF BLANKS.

Secretary Brockaway has certainly assembled a notable collection of blanks and forms representing every branch of the street railway accounts. Already several thousands have been classified, and are so arranged that one can turn to the desired branch in a moment. The forms are pasted in large hooks of uniform size and made especially to order for the purpose. The accountants' association already has several hundred dollars invested in the books, which could not be duplicated for several times their cost. It is the most complete collection of the kind in existence.

These books are arranged on tables at the north end of the roof garden, and require 150 feet of tables to display the set. Managers as well as accountants will be well repaid in an examination of the exhibit. The books are numbered and the contents are as follows:

- No. 1. Income "A."—Reporting and handling actual cash income, earnings, reports and records.
- No. 2. Income "B."—Tickets, transfers and registers and their records.
- No. 3. Labor "A."—Application, investigation, engaging, disciplining and discharging employees.
- No. 4. Labor "B."—Paying employees, from reports of time to comparisons of pay rolls.
- No. 5. Material only.—From request for, through purchasing, and receipts to inventory.
- No. 6. Maintenance.—Work done, not strictly labor or material, but the result of their combination. Wheels and axles, etc.
- No. 7. Power house.—Labor, maintenance, operation and efficiency.
- No. 8. Transportation "A."—Actual operation of cars and bums, from time tables through handling and running.
- No. 9. Transportation "B."—Miscellaneous needs and result of operation of cars, instructions, secret inspection, lost articles, clearing snow, car mileage, benefit associations etc.
- No. 10. Injuries and damages.—From original report to settlement and records.
- No. 11. Vouchers, bills, journal entries and various office stationery.
- No. 12. Monthly and annual reports.—Comparative statements of earnings and expenses.
- No. 13. Records.—Accounts payable, accounts receivable, check and cash books, general records.
- No. 14. Electric lighting.
- No. 15. Glasgow Corporation Tramway, Glasgow, Scotland.
- No. 16. Rubber stamps.

DEARBORN DRUG & CHEMICAL WORKS.

As is well known this concern has at Chicago one of the finest equipped laboratories in this country where it has perfect facilities for making chemical analysis of feed waters for the purpose of determining the scale forming substances they may contain. After analyzing the water the company is prepared to make vege-

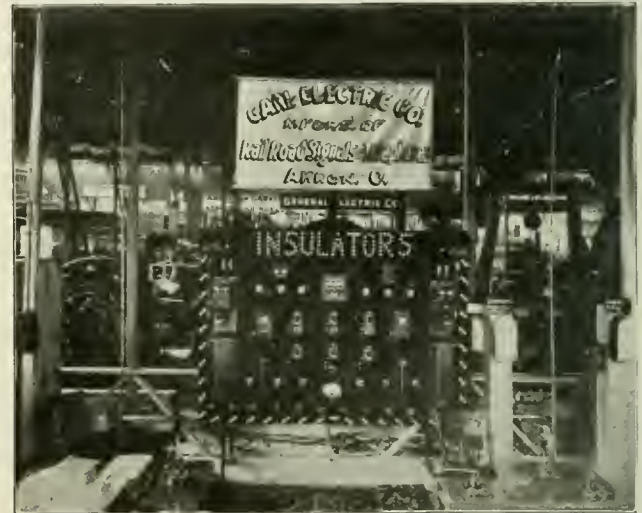


table compounds for neutralizing the galvanic action in each special case as may be shown to be necessary by the analysis.

Samples of scale formation are shown at the Dearborn booth space No. 51, and also vials filled with the company's various high grade oils and lubricants. Messrs. Robt. F. Carr and C. A. Stanfield are making everybody welcome.

GARL ELECTRIC CO., AKRON.

A full line of the Garl electrical signaling instruments and telephones are on view at space No. 9. These include complete apparatus for talking from a car to the dispatcher's office; for calling and speaking with conductors anywhere along the line; for noti-



fying a motorman that another car has entered the same block and for signalling the engineers on a steam road, crossing an electric line that a trolley car is approaching the crossing. Messrs. Max Schumacher and M. Garl are giving demonstrations of how the signals work.

HAM SAND BOXES.

The principal feature of the exhibit made by the Ham Sand Box Co., of Troy, N. Y., is a number of orders for boxes which have

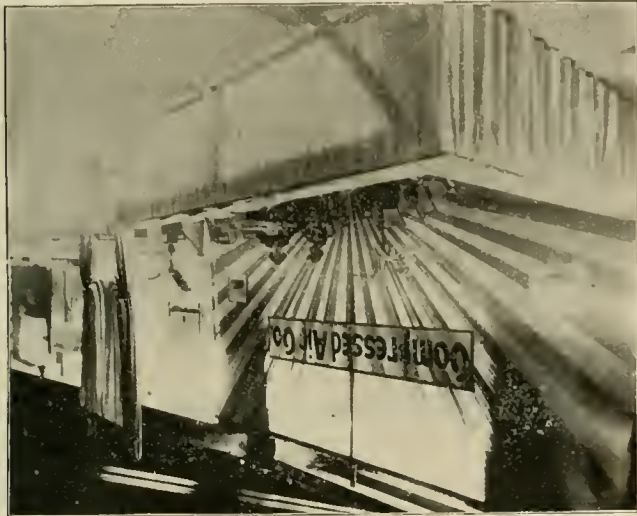


been received in the last 18 months. Although these represent but a small portion of the company's business for that period they show the popularity of these devices. Among the orders are some from the Glasgow Corporation Tramways for 1300 boxes; from the Electric Railway & Tramway Carriage Works, of Preston, Eng., for 4,000; from car builders in America, for 1,500; and many others.

The company which is represented by Mr. H. H. Ham is showing three styles of boxes, Nos. 1, 5 and 7, which are fitted with a new spiral spring hose for feeding the sand to the track. The hose is cleaned of snow and ice by pulling the spring and letting it snap back.

COMPRESSED AIR CO.

Mr. H. W. Cooke, president of this company is keeping open house at space No. 80, where he is kept busy telling about the possibilities of compressed air as a motive power and explaining his



company's apparatus for making these possibilities realities. The Compressed Air Co. is now placing on the market its double truck 40-ft motors which are giving satisfactory service.

CHRISTENSEN ENGINEERING CO.

In space No. 30 are three Christensen compressed-air equipments, installed and in operation as if in regular service. These are as follows:

No. 1 is all the apparatus necessary for the brake mechanism of a 5-car train of heavy elevated cars operated by the Sprague multi-unit system and is the exact duplicate of the equipments being installed at present upon 100 cars of the Boston Elevated Ry. Each car has complete air brake equipment including motor compressor, automatic controller, engineers' valves, etc., and the entire



train may be operated from either end of any car in the train, or be broken into sections of one or more cars, when each car is equipped to take care of itself, without regard to other cars in the train. The brakes on this train are automatic and are supplied with the Christensen quick action triple valves.

No. 2 is a school equipment, showing the operation of the independent motor driven air compressor with brake equipment for single cars, straight air.

No. 3 is a D-4 portable equipment consisting of a 47-cu. ft. compressor with reservoirs, automatic controller, etc., mounted on truck. This compressor also furnishes the air for operating a 6-in. air hoist and a 6-in. air jack.

The company is represented by Messrs. N. A. Christensen, P. C. Randall, Geo. S. Hastings, J. S. Leet, W. J. Richard, J. S. Hamlin, A. Beveridge, J. R. Sutton.

THE B. R. ELECTRIC CO., KANSAS CITY.

This company is agent for the Ohio Brass Co., R. D. Nuttall Co., Hazard Manufacturing Co., Cutter Co. and Packard lamps and transformers. At its booth space No. 63 are samples of the sup-



plies it carries. Messrs. F. M. Bernardin and E. R. Royer are representing the company. Mr. Bernardin is a member of the exhibit committee.

CRANE CO., CHICAGO.

This company's exhibit consists of brass and iron valves of different sizes in gate, globe, angle and check patterns for standard (100 lb.) and extra heavy (250 lb.) pressure; blow-off valves; several valves cut open to show interior construction; several parts



of different valves, standard and extra heavy flanges and flanged fittings.

Mr. J. A. Minnegin, of the home office, is making visitors welcome at space No. 25 A, where he is distributing catalogues and circulars to all interested. A pamphlet issued by this company describes the piping system in the new Armour power plant, Chicago, which was furnished by the Crane Co.

BARRETT JACKS.

The Duff Manufacturing Co., of Allegheny, Pa., has a number of Barrett jacks of various sizes at space No. 25 D. Mr. J. Barrett explains that these devices are positive and quick in action; the movements are simple and easy; and the materials used in their



construction, of the strongest and best. The wearing parts are removable, and readily renewable at slight expense. The jacks are made in 20 different sizes and to lift from 10 to 20 tons. They are used by many leading roads.

WM. WHARTON, JR., & CO., INC.

This concern has a very attractive exhibit of its special work at space No. 82. Although the Wharton company makes all kinds and classes of special track work for street railways and steam roads, in arranging its displays, particular stress has evidently been laid on the importance of manganese steel special



work, which is growing more and more in favor on account of its phenomenal wearing qualities. One manganese frog is shown that has sustained the traffic of 1,657,000 cars on a curve of 44 ft. radius, the head of the rail having been almost entirely worn away while the manganese steel center is still in fair condition. Other features of the exhibit are samples of manganese steel works for girder and T rails; Wharton unbroken main line switches; Nichols protected heel switches; bent pieces of manganese, showing the ductility of the metal; photographs and blue prints of special layouts. The display is in charge of Messrs. Victor Angerer, W. Rodman Wharton and J. C. Robinson.

CINCINNATI FOR 1902.

New York secures the 1901 convention, but the fight put up by Cincinnati makes that city the logical convention city for 1902; it is hinted in fact that such a compromise was effected.

Cincinnati's central location, its enormous permanent convention building and well known hospitality make it an ideal city for the meeting.

A small pocket mirror is being distributed by Mr. E. H. Chapin, of the Fiske Bros. Refining Co., of New York.

Our society editor slipped a cog yesterday and announced Mrs. E. P. Shaw as accompanying her husband to the convention. General regret was expressed by the visiting ladies who so well remember her hospitality at Boston, upon learning that she had not come. Mr. Shaw, who is at the Coates, compliments Kansas City highly upon the excellent manner in which the convention has been cared for.

Mason D. Pratt, street railway engineer of the Pennsylvania Steel Co., is at the Coates.

W. S. Dimmock and wife, of Council Bluffs, are among the arrivals yesterday.

James F. Wattles, secretary of the Rand Avery Supply Co., Boston, is distributing a handsome leather pocket book.

When this city was chosen for the convention there was considerable doubt on the part of usual exhibitors as to the wisdom of coming so far, and some even predicted that the display would be a failure. The result therefore has been genuine surprise, for it is one of the best in years. The supply men do not count on making heavy sales at these meetings, and are not much disappointed when nothing is sold. But this year the general expression from all departments of supplies is that sales have been numerous and some quite large. The orders are far in excess of last year and very gratifying.

One exhibitor decided at the close of last convention not to attempt another exhibit, but at the last moment changed his mind and now says he would not have missed the opportunity for a good deal. Others express themselves as equally well pleased.

Many exhibitors would like to see some action taken toward securing a uniform regulation in regard to signs. Many at present displayed are altogether too large for any necessity and often hide other exhibits. Smaller signs for all would be of equal benefit to each booth, and the managers will find the one sought just as well.

TEST OF MAGANN AIR BRAKES.

All of the delegates who went to Leavenworth yesterday afternoon by the electric line were very much interested in the demonstration of the Magann air braking system with which all the cars on the Kansas City-Leavenworth road are equipped. The long 40-ft. cars were brought to a stop from 40 miles an hour easily and quickly and without jerk. The cars were mounted on Peckham trucks with Lorain "steel" motors.

LAWYERS AS POETS.

A few months ago a Brooklyn road was sued by Mary Harkins, 14 years of age, for \$15,000 damages. In getting off the car Mary says she slipped and sprained her ankle.

The testimony of some of the witnesses for the plaintiff was contradictory. Frank McCann, a boy who had been 17 months in the House of Refuge, and three boys named Moylan, Connor and McLain said they were playing craps on the sidewalk at the time of the accident. Connor said that when the plaintiff fell off the car he remarked:

"Here comes Harkins the Tough."

It was shown by the testimony that the plaintiff had frequented Wallabout Market and that her father had been told if he did not keep her out of the market a complaint would be made to the Children's Society. After rehearsing the testimony Mr. Baldwin, attorney for the street railway, fired a parting shot into the jury as follows:

And now, kind friends, I yield the floor to one
Who'll likely try to undo all I've done.
The testimony need not block the way;
Outside the evidence he'll have most to say.
But if you're fond of verse, 'tis worth the time.
He cannot talk to juries, save in rhyme.
See, there he sits, implacable as Jove!
Aflame to argue Mamie's ailing from a shove.
He'll crown her Virgin Queen of Wallabout,
Her many virtues we'll all hear about.
And interesting it will be, perhaps,
To hear his version of that game of craps,
And how that naughty bud of Teale's court, F. McCann,
Within the House of Refuge bloomed a holy man.
And lastly we may not feel we've had enough
Unless he tells us why she's called "The Tough."

Even the judge smiled. When quiet had been restored, the counsel for the plaintiff gravely arose and returned the compliment in like manner, thusly:

Oh, woman's lovely ankle!
How sweet, how neatly turned!
You kindle all the fires
That Cupid ever burned
On his asbestos altar,
You made King David falter,
Taught him song and psalter,
And at the dance where music floats
In soft and rhythmic strain,
Your flash, through lace and petticoats,
How many hearts has slain?
Take from us all the pictures
That man's hand e'er portrayed,
But leave, ye gods, oh, leave us
The ankle of the maid.

The jury awarded Mary \$100, but the company took an appeal, and her lawyer may have to write some more verses.

A FLIRTATION.

I sat beside her in the car,
She smuggled up to me;
I never saw her face before,
But it was fair to see.

I looked into her soft, blue eyes,
She smiled a little, and
When 'ere the car shot 'round a curve
She grasped me by the hand.

Ah, but no wild, ecstatic thrills
Coursed through me, I confess!
Her mother sat beside her—she
Was seven or so, I guess.

—Chicago Times-Herald.

SPIRIT OF THE RURAL PRESS.

TRACK TO BE "TOOK UP."—Eugene, that lively village which is the head of education and navigation, has lost its boss-car line, or rather one-mule car line, for it never rose to the dignity of a street railway or the luxury of having its citizens ride behind a car drawn by a real team of horses. It is by all odds the prettiest city in the state but its appearance was always marred by that relic of barbarism, bobtail cars drawn by shaven-tailed mules and nobody in the cars. They went along tingling a ghost like bell through the quiet Sunday-like streets of a University city, the residence part of which always bears the air of a deserted village or a summer resort out of season. The track is to be took up and Ira Campbell and Harrison Kincard are to lose their free passes over the mule road and will have to walk just like common people. They can no longer put on the swollen air of a born aristocrat while the boy goes through the cars and makes the lower classes put up their fares or be ejected and liable to be kicked into eternity by a one-eyed mule. Eugene may lose its mules, but it will never lose its editors and so the town will live and flourish with the intensity and strenuousness it has always heretofore manifested. It had too much, anyhow, to have an university, too such editors and a mule-car line besides.—Salem, Ore., Journal.

TROLLEY FOR CHAMBERSBURG.—A little bird tells us that a trolley scheme is dead ripe in town and ready to drop at any minute. Some one said that the move was made only to knock out the automobile line, but hardly anybody would be willing to believe that.—Chambersburg, Pa., Repository.

THEY WERE SO GOOD.—Surely the street car accommodation on circus day could not have been better. How they were so good was a mystery to many who came from other cities.—Madison, Wis., Journal.

COMING OUR WAY.—Detroit papers say we will soon connect with Pontiac by an electric line. Dollars to doughnuts they are right about it. Everything is coming our way now.—Oxford, Mich., Globe.

A SOONER LINE.—The surveying party has finished its work on the trolley line to a point above Lemont and the track laying has begun. It looks like a finish to Lemont soon and "O Let it be Soon" as the song says.—Lamont, Ill., Advertiser.

TROLLEY ROAD GWINE.—We suppose that if the "new trolley road" connects Lebanon with Washington, C. H., it will hit Wilmington, either a gwine or comin'.—Wilmington, O., Republican.

BIG SMASH UP NEAR CHARLEY'S.—Some miserable sneak smashed several of the tile left by the electric road coming south of Charley Mason's one night last week.—Wilmington, O., Enterprise.

DESERVES A FRONT SEAT IN THE MILLENNIUM.

A real genuine candidate for the millennium, one of the advance guard as it were, hails from Syracuse, and his unusual case is related by General Manager Connette.

It seems his company has a little transfer line on Green St., the only one of its kind in the system, on which no fares are collected either way. A few days ago the old gentleman in question called on Mr. Connette to report the conductor. The complaint was he refused to collect the O. G.'s fare. When it was explained this was a free transfer line he replied:

"I understand all that, but I see I have not made myself clear to you. I am getting along in years and somewhat feeble. I do not go downtown every day. But to keep in my own mind the delusion that I am still a man of affairs I set out every morning on the Green street car and ride to the bottom of the hill. A little later I ride back again. And the driver-conductor absolutely declines to accept my 5 cents. I am abundantly able to pay my fare on the car as long as I shall desire to ride. I have no wish to 'sponge' upon the Rapid Transit Co. The object of my call today, sir, is to see if we cannot make some arrangements by which I

may pay you in a lump sum the fares which the driver will not accept."

The manager told him to consider himself the guest of the company and to ride as much as he wished.

AT THE LOST ARTICLE WINDOW.

The applicant had proved up on his 75-cent umbrella, says an exchange, and after tucking it under his arm remained to take an ocular inventory of the contents of the long row of shelves.

"Great place to study character," he remarked. "Do you ever try it?"

"Well, hardly, I have enough else to do," replied he of the lost umbrella stock.

"It's easy though," said the visitor; "just fish out something and I will show you how to amuse yourself on dull days."

So the clerk handed out a purse, explaining a lady had advertised its loss in the morning papers, evidently thinking she had dropped it in the street. The notice stated the finder could keep the money, and claim a reward besides. The clerk had sent her a postal card notice to call and get it.

"Well," exclaimed the visitor, "if women only knew what a revelation of character could be found in a lost purse, they would never run around with their portemonnaies in their hands."

"And it is all so plain," added the visitor, glancing at the miscellany which had been taken out of the lost article. "See now. The owner of this purse is well off. She has literary tastes. I think she is in mourning. She keeps house. She is middle aged and has a circle of desirable acquaintances. She is of a humorous turn of mind. She is a club woman. She is more or less accomplished, and she intends to go to the Paris exposition."

"Oh, you know her then?"

"Not at all. I never heard her name before. I will explain," he said. "That purse of genuine sealskin was evidently a last Christmas gift, from the name and date upon it. A poorer woman would have kept that purse laid away and not carried it habitually as the owner evidently has. Her literary tastes are evinced by the several newspaper clippings. They also bear witness to her humorous turn of mind since I notice the poem of 'Hoch der Kaiser' is among them. Most women have so much religious sentiment and so little political comprehension that they would be shocked at the refrain of der kaiser—'Myself—und Gott.'

"There is a clipping about marketing. Evidently she is a housekeeper. One of her calling cards has the penciled addition to her name 'and daughter.' If she has a daughter old enough to make calls with her she must be middle-aged. If she had not a circle of acquaintances she would not carry cards in her portemonnaie. Here is a receipt for dues paid in the Culture Club, and the address of another club. That settles it as to her being a club woman."

"And the mourning?"

The visitor picked out a sample of black silk and a little cemetery time table card and silently laid them side by side.

"And the trip to Paris to the exposition?" doubtfully suggested the superintendent.

"Observe that receipt for advanced French lessons given by l'Alliance Francaise. The lady is already an accomplished French scholar. She is perfecting herself in order to fit herself for a visit to Paris. Don't you know all the women are com—"

"Excuse me," said a well-bred feminine voice just outside the railing where stood two ladies dressed in black, "but have you a purse here to answer this advertisement? These are the names on a check inside the purse. Oh, thank you, very much! I was afraid I had lost it for good, and I stopped the payment of the check!"

"But, mamma," expostulated the younger lady in a low voice, as they were turning away, "you know you gave the change in the purse to the finder and offered a reward besides."

"But, my dear, that was for anyone who picked up the purse in the street and returned it. I certainly should never pay a street car conductor for being honest. Why, it is only what is expected of him.

"Thank you very much, sir. Good morning."

Over 1,000 admission tickets to Convention Hall had been sold up to 8 o'clock last evening.

HE THOUGHT THE FARES WERE HIGH.

A gentleman who resides in the County of Cook, Illinois, better known as the city of Chicago, had occasion not long ago to visit, for the first time in many years, the scenes of his boyhood in northern Ohio. Not being a street railway man, he possessed neither a pass nor a knowledge of the scheme for handling fares. His wife accompanied him, and when they reached Cleveland it was his wish to complete the journey on one of the electrics in order that she might see the country over which as a boy he had tramped many times. When the first collection was made he paid twice and received from the conductor a couple of paper slips to which he paid no attention, but stuffed them down in a pocket to give the children at home. When he had gone a short distance he discovered an old land-mark, and must needs get off and look it over. So they left the car, and when the next one came along they continued the journey, of course paying again and receiving two more slips which went to join the first. They had not gone more than a mile when he made another discovery, and, stopping the car, got off to gaze. In this manner, with stops every mile or two, they traveled some twenty miles, and the wad of slips made quite a handful. But he was so delighted at the ride and the ability to ride along the old familiar highway that the item of expense didn't count, although he did remark once he guessed the fares down there were more than in Chicago. Finally the old homestead was reached, and the conductor let them off directly in front of the gate, on which, as a boy 30 years ago, he had swung many times. Then the sight of a wagon passing was a great event; now a modern electric car whizzed past every 15 minutes. The following day they concluded to go on to the end of the line some 15 miles further, and this trip occupied a whole day with the former system of getting off every little way. By the time he returned to Cleveland the bunch of slips made a big fist full.

On his return home he was relating the wonderful change in that country to a visitor, and to illustrate something called for one of the slips with which the children were playing. Examination for the first time revealed the fact that each was the unused portion of a return ticket for which he had paid each time he tendered fare.

He has not yet been able to satisfactorily estimate just how many miles are coming to him from that road.

SUNDAY CARS A MORAL FORCE.

In the Evangelist, Rev. Dr. C. E. Jefferson, writing on the question of Sunday cars, gives his views as follows:

Does the Sunday street car in large cities minister to the higher life of man? Undoubtedly it does. When several hundreds of thousands of human beings are crowded together on a few acres of land many things become necessary which were not called for before. A new world is created, and the new world necessitates new forms of activity and gives rise to new obligations and duties. . . . I cannot understand how any man with a Christian heart can think it wrong for these people to escape to the country on Sunday afternoon. . . . The Sunday street car ministers to the social life of our cities. The day of rest from the beginning has been pre-eminently a home day. Such it was among the Hebrews, and such it has been among all English-speaking peoples. It is a day for family reunions. It is a day when the married son and his wife can bring their children and take dinner with grandpa and grandma; when the daughter who lives on the other side of the city can come home and spend a few hours with her widowed mother; when sisters separated by the diameter of the city can come together for an afternoon; when the servant girl, chained all the week to her irksome work, can find relief and new life in the companionship of her mother and sisters in the old home. . . . The Sunday street car ministers to the spiritual life of cities. The problem of the downtown church is difficult at best. Stop the street cars and the problem becomes well-nigh hopeless.

The annual banquet at which the president-elect will be duly installed in office will take place at the Coates House, this evening at 7 p. m. Tickets can be had by applying to Secretary Penington.

AMERICAN STREET RAILWAY ASSOCIATION.

THURSDAY'S SESSION.

The clear air and warm morning sun contributed to a general feeling of good nature, and every-body was in good spirits and attendance was the largest of the week, every chair being occupied.

President Roach called the convention to order at 11:10 a. m. Secretary Penington announced that the following 16 companies had joined at this meeting:

Dallas Consolidated Electric Street Ry. Co., Dallas, Texas.
 Danville Street Railway & Light Co., Danville, Ill.
 Detroit, Rochester, Rome & Lake Orion Ry. Co., Detroit, Mich.
 Jackson Railway, Light & Power Co., Jackson, Mich.
 Kansas City-Leavenworth Railway Co., Kansas City, Kansas.
 Lebanon Valley Street Railway Co., Lebanon, Pa.
 Meridian Street Railroad & Power Co., Meridian, Miss.
 Skuykill Traction Co., Norristown, Pa.
 Hoosac Valley Street Railway Co., North Adams, Mass.
 Ottawa Railway Light & Power Co., Ottawa, Ill.
 Ottawa Electric Railway Co., Ottawa, Ontario.
 Holmesburg, Taconey & Frankfort Electric Railway Co., Philadelphia, Pa.
 Monongahela Street Railway Co., Pittsburg, Pa.
 Rockford Railway, Light & Power Co., Rockford, Ill.
 Saratoga Traction Co., Saratoga, N. Y.
 Terre Haute Electric Co., Terre Haute, Ind.

The President: Gentlemen, we will now proceed to the regular order of business this morning. The paper on the program is entitled:

DOUBLE TRUCK CARS; HOW TO EQUIP THEM TO OBTAIN MAXIMUM EFFICIENCY UNDER VARYING Conditions.

By N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

In order to prepare a paper which would be of any value to the members of this association, it was necessary to learn the conditions governing the operation of double truck cars on different systems. The conditions under which cars are operated, vary to such an extent that it is impossible to construct and equip a car that can be operated with equal economy on all systems. In order to keep within the time allowed by the committee, and the more readily to convey to the members the writer's opinion as to the most desirable double truck car, the subject matter will be taken up under the following divisions: Trucks. Electric motors. Double truck car body and equipment.

TRUCKS.

The double truck for use on street railways has not received the attention it merits. These trucks have been constructed along the lines of the single truck, and to meet the varied views of railway managements. One has only to observe the different styles of trucks now in use to find how at variance have been their views.

The 55 years experience of the steam railroads in the development of the double truck now used by them, should be a warrant to the street railway managements in adopting only trucks that conform to the lines used by these roads: the diameter of wheels, with the tread and depth of flange should be changed only where conditions prevent using the Master Car Builders' standard.

I present drawings of a double truck designed along steam railway lines to meet the varied condition of street railway service. In the design of this truck it has been the aim of the designer to include all known good features of the present street railway truck and to add improvements of value. This truck is constructed with a minimum number of parts consistent with safety, strength, accessibility, lightness and cost of maintenance.

In giving a brief description of this truck, it will not be necessary to mention the wheels further than to say that they are cast chilled, 33 in. in diameter with a 3-in. tread and 1 in. flange,

formed to fit the modern rail, and weight 380 lb. The axles are of forged steel, high in carbon, with a 2-in. hole bored through the entire length. The key seat at the gear wheel-fit is cut above the line of motor bearings and journals, in order not to weaken the axle.

The oil boxes are constructed so that the journal brasses may be readily removed, and with dust guard placed in position from the underside of box. An extra guard is placed from the same side and where it will retain the oil at the highest point.

The journal brasses and boxes are finished in such a manner as to obtain the full journal bearing under all conditions.

The side frames are made from two ¾-in. steel plates, thus allowing the main equalizer to be supported between the two frames on long helical springs. With this arrangement the bar can be removed for repairs without in any way taking the truck apart. This form of frame allows the greatest freedom of access



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to all parts, and the use of the extended equalizer bars gives extended spring movement, with a perfect side movement on curves and at low places in the track, minimizing the blow to the car body, rail joints and special work and reducing the cost of maintenance of track and equipment. The side frame is so strongly constructed at points where the transom joins the frame that it is not necessary to continue frame around the end and connect it with the other side of frame to keep the truck in alignment. This also allows the placing of the truck near the end of the car body without coming in contact with the steps.

The brakes are placed inside of the wheels, without using a brake beam. This position insures the most positive action, with either hand or power and independent braking on each wheel. The wheel base, 5 ft. 6 in., allows the motors to be suspended between axles and transoms.

MOTORS.

The writer, having had experience with heavy and light motors, mounted with two motors on one truck, the other truck being an idle or trail truck, as well as with one motor on each truck, has found that, while greater efficiency is shown with the latter method, the two motors mounted on one truck show a saving in labor, first cost of the trail truck, and cost for maintenance.

Maximum efficiency, with minimum cost of maintenance, with both heavy and light motors, has been obtained by mounting two motors on each truck, making a four-motor equipment. With this form of equipment, higher speed and quicker acceleration are obtained with lower power consumption, both in the average and total for the whole trip.

After an experience extending from the time that the first railway motor was constructed, the writer knows of no mechanical apparatus in which the development has been so rapid and the point of perfection so nearly attained. Yet the future promises even greater development, both in the direct and alternating

current motors. With the great corps of engineers employed by our large manufacturing concerns working with the men who are operating these motors and constantly suggesting and demanding improvements, the ideal commercial car equipment will be developed.

The writer desires to call the attention of electrical and mechanical engineers to improving ventilation, increased copper, insulation, bearings, hollow armature shaft, decreased armature speed and gearless motors.

The controllers have not, as far as space and weight are concerned, kept pace with the motors. This part of the apparatus should receive the attention of the best talent of our manufacturing companies. The four-motor controllers, in their present form, are large cumbersome affairs, placed in that portion of the car body where it is inconvenient and expensive to support. A more satisfactory controller can be produced by using a small pilot controller placed on the platform, with some developed form of main controller underneath the car body.

DOUBLE TRUCK CARS AND EQUIPMENT.

From information furnished by the operating department and from personal observation, the writer is led to believe the following dimensions are the most desirable: Length over all 40 to 50 feet. Width over all 7 ft. 6 in. to 8 ft. 8 in.

With the increasing demand from the traveling public for the extension of present systems to suburban districts with a more frequent service and increased speed, also the construction of long interurban lines, the present managements, to meet this demand, are turning to the double truck car constructed along the lines of the steam railroad coach.

The drawings show a double truck car, which the writer believes will become justly popular. This car combines the largest number of good features and is so constructed as to admit of placing the electrical equipment where it is accessible and less liable to come into contact with the truck or brake equipment.

The car body can be carried at the lowest point and the trucks placed near the end of the body. This car gives the maximum efficiency, durability, speed, safety and seating capacity, attractiveness and ease and comfort to passengers, coupled with the minimum cost of construction and maintenance, and less dead weight per passenger, based on seating capacity.

The total weight is made up as follows: Trucks, 3,970 lb. each; four motors, 2,385 lb. each; car body and equipment, 12,300 lb.; a total weight of 29,780 lb. This amount divided by 63 passengers gives a dead weight of 473 lb. per passenger. The cars of today show a dead weight, based on the seating capacity of 750 lb. to 1,100 lb. per passenger.

While the writer does not claim that the truck and car body described are perfect, yet he believes they are along lines that will become attractive to managers when taking up the cost of operation. Decreased cost of operation can only be obtained by purchasing equipments that are designed to perform a specific duty where all weights and speeds are known.

The President: Gentlemen, we invite the members to come forward and inspect the plans prepared by Colonel Heft at considerable trouble and expense, showing the details of the construction of the car he has spoken of. (A number of the members then inspected the plans of the car.)

President Roach: I would state, gentlemen, for your information, that all of the cuts as shown here will appear in the minutes of the meeting to be printed hereafter and distributed among the street railway men of the United States and Canada. I desire personally to thank Colonel Heft for his able paper that he has read here, and we will be much pleased to hear it discussed by the members of the Association. To start this discussion, I take pleasure in calling upon Mr. E. C. Foster, of Lynn, Mass.

Mr. Foster: I have listened with a great deal of interest to the paper read by Colonel Heft, and have also given a casual glance at the drawings submitted. I think that Colonel Heft is on the right line in the way of making improvements. We all know that it is desirable to have cars constructed as light in weight as possible, and yet to be sufficiently strong to meet all the requirements and conditions. I am very glad that Colonel Heft has taken up this subject. We all know that the varying conditions under which we operate in the various states and municipalities require a different kind of equipment. There are places, of course, on the

interurban lines where an equipment designed similar to that submitted here could, without doubt, be operated very successfully. The Lynn & Boston Railroad Co. is operating lines running into Boston. We operate one line over a distance of 16 miles from a small town on the coast, Marblehead, through Swampscot, Lynn, Revere and Chelsea to Boston. On that line, we are operating 12-bench double-truck open cars, equipped with four motors. The box-car equipment is a 25-ft. box-car, double truck, with four motors. We have been operating over this line about 15 months, and we are running at a maximum speed of 30 miles an hour, and we have found by experience that the operating of four motors is more economical than the operation of two motors over the same line under the same cars and under the same conditions. To be sure, there is an increased consumption of power. We are all willing, I believe, to concede that, and I think Colonel Heft will agree with me, although he shakes his head to the contrary. From tests made, we are sure of it. The operation of four motors, of course, depends upon the speed you wish to attain, and that it is desirable to attain. In operating upon a line where your speed is more than 12 to 15 miles per hour, I question whether it would be wise to adopt the practice of using four motors. We are also operating on many lines, 16, 18, and 20-foot cars. With those cars, we operate, as is customary, the usual two motors. We have various types of motors, but we have learned by our experience that the double truck car, with two motors, or four motors, is more desirable and profitable to operate; and we are now rebuilding some of our smaller cars and converting them into 25-ft. cars. We are doing that successfully. We are also building a large number of new 25-ft. double truck cars.

Mr. Chamberlain (Brooklyn): You will appreciate that the average mechanic in this country has his "hobbies" as well as the average professional man. Without referring to any part of the electrical equipment which Colonel Heft has designed for his peculiar class of cars, there are two or three innovations from the present practice in the construction of the car body, which may well attract attention. With most of us, innovations of this character are subject to adverse criticism. I know of nobody who would be subject to adverse criticism less than the author of this paper, who has had such a vast amount of experience in this direction, and it seems that it is right and proper he should make an innovation of this character. I speak more particularly of the construction of a car without longitudinal truss rods. I think that Colonel Heft has designed a car of something over 42-ft. in length, and gains his body support by a number of cross transoms built in the form of the ordinary iron body bolster, welded at the ends, filled in with wood, and supported through the center with longitudinal I beams running from one end of the car to the other. The author of the paper has evidently, by this plan, succeeded in obtaining the minimum of weight with the maximum carrying capacity, and I think you who are practical men, and you certainly all appear to be, will agree with me that that is the object to be sought.

One question I would ask is with regard to what might be the result of an end collision. I do not know whether this truss running longitudinally through the car from one end to the other, would be adequate, and would perform the functions and give the proper camber to the car, that the ordinary longitudinal truss rods do. You will recollect some years ago, that the managers of the steam roads went wild, in following out the idea of reducing the weights of their rolling stock, until they reached a point where they almost passed the limit of safety factor. Colonel Heft advises me that he has carried through on this device a factor of safety sometimes reaching as high as 25 per cent. If he has done that, he has certainly covered all the ground that is necessary to make the vehicle safe and one that would do good service in actual practice. I was very careful to inquire of the Colonel whether he placed all his strength on a line with the sills. When we have a collision, we do not collide with the clear story of the end of the bonnet; but we generally get it on the end of the buffer. Of course, we all know there are some roads which never have any accidents, and they do not have to experience any difficulties of that kind. I was particular to ask him whether the strength was on a line with the longitudinal timbers, and whether the frame above that included posts and trusses in the framing, and the clear story was lightened up correspondingly. It would be a difficult matter to put all of your strength in your clear story, or on a line with the roof, because when you do that, and your car runs into any ob-

struction, your roof would probably keep going on and the body remain where it was.

Not to occupy any more of the time of the meeting, I would like to ask the author of the paper whether he has sufficient strength with the transverse brace to overcome the difficulties which I have outlined?

Mr. Heft: I have endeavored to get all of the strength longitudinally, lightening the upper portion of the car, but constructing it in such a manner that the upper portion is braced to the lower portion and tied to it, both longitudinally, vertically and otherwise. We have five of these cars under contract and expect that the first one will be turned out in from four to six weeks. We expect to operate this car from Port Chester, N. Y., to New Rochelle, N. Y. I would be very glad to show the car, when in operation, to any of the members of the association. I may be wrong in my ideas concerning this car, but we are putting up our own money to build it. If it is a failure, we will have to foot the bills.

Mr. W. E. Harrington (Camden): The question of four-motor equipments seems to be one of a mooted character. There are a large number of roads using four-motor equipments, but there seems to be relatively very little known as to the number of watt-hours per car-mile which the different equipments require, and with the idea of bringing out that point as a feature of discussion, I would like to place this question before the meeting. What is the experience of those present, who have made tests, as to the watt-hours required by the different equipments mentioned? Mr. Foster says it takes more power with the four-motor equipment, and Colonel Heft says it takes less. They are both highly representative men, and yet they differ on this point. Our road is about to place some equipment orders. I have been urging four-motor equipments, and yet I must confess I am somewhat in the dark as to the relative merits of the different equipments. I know from tests I have made that the double-truck, 40-ft. car equipment, with two 38-h Westinghouse motors, on maximum traction trucks, have taken an average of 2,000 watt-hours per car-mile, whereas the same weight of car, with the center pivotal truck, with No. 49 Westinghouse motors, 35-h. p., under identically the same conditions, takes an average of only 1,200 watt-hours per car-mile; a single truck car, under similar conditions, an 18-ft. body car, takes an average of 900 watt-hours. I would like to know if there are any data from actual test to show the number of watt-hours consumed by these different equipments. I have made a series of tests on different classes of cars, showing the watt-hours. I deem this matter of very great interest, and I will file with the secretary the results secured in these tests. I did not encounter any difficulty in getting information of this character, and I think the information obtained by me would be interesting to the other members, in showing the number of watt-hours per car-mile with the various forms of equipment.

Mr. Heft: I do not remember the figures, but we have made a series of tests during the last three years with double truck cars, equipped with one, two, and four motors, as I have stated in the paper, and we have kept a very close and accurate record of the results. The weights of the different trains on which these tests were made varied from 15 to 250 tons. The speeds varied from 10 to 65 miles an hour.

There is no place where the car is operated with an increase of current with the four-motor equipment, except while accelerating, but you gain a quicker and higher acceleration by this increased consumption of power. The average consumption of the current, however, and even the total consumption of the current, in the running of the cars, is less with the four-motor equipment than with the two-motor equipment. That is beyond dispute. I can furnish data to that effect, and I think the General Electric Co. and the Westinghouse Co. also can furnish any of our members with data which will substantiate that statement. It is unquestionably correct.

Mr. Wason: I would ask if the additional cost for the drilling of the hole through the axle and the armature shaft is commensurate with the results, and whether he is seeking to lighten the axle, or to be assured of the quality of material?

Mr. Heft: I am willing to admit that the drilling of the axle is a debatable question. About five years ago, we commenced to use hollow axles on our high speed motors, and the results have been so favorable in the way of reducing the number of hot boxes, hot journal bearings, and everything of that kind, that we have decided

to adopt that form of axle. It decreases the weight about 25 per cent, with a loss of strength, varying according to the size of the axle, of from only 3 to 5 per cent. We have never had any of them break. We had a great deal of trouble with our axles on our heavy high speed motors, and we found it necessary to increase the diameter and weight of the axles. We were loath to do this, and so we adopted the plan of drilling a hole through the axle to lighten it. We not only lighten the axle, but we get the benefit of having a ventilated axle. It overcomes crystallization in the axle.

Mr. J. I. Beggs: In connection with the statement that four-motors take no more current than two motors, I would ask Colonel Heft whether he meant four-motors of the same size, or two motors having the same capacity as the four might have had?

Mr. Heft: We have made experiments with motors of different capacities, but all of the motors were of the same size, and used on the same class of equipment.

Mr. Beggs: I do not know whether I made myself clear. We made some very exhaustive tests, and they were so opposed to the position which Colonel Heft now takes, that I took occasion to have Mr. B. E. Sunny, the western manager of the General Electric Co., and also Mr. Theodore P. Bailey, the manager of the railway department of the General Electric Co., Chicago, to come and witness the tests made on this mooted question of the amount of current consumed by these different equipments. Of course, this matter is a very important one to all of us.

We adopted double truck cars as a standard for our entire system five years ago. We have been using them ever since, and are continually increasing the number. We have given a great deal of attention to the development of the most advantageous car, the most durable car, the car which will best stand the strains to which Mr. Chamberlain referred, as ours is one of the roads that has collisions and a number of them, unfortunately, and some pretty severe ones. We operate 350 miles of road, and have one electric line 61 miles in length. We try to build the equipment so that it will be interchangeable, in city use or in suburban service, as we have a consolidated system, and we run the cars interchangeably. I must take issue with Mr. Heft's statement, to the effect that four motors do not take more current than two motors. If you equip a car with two G. E. 1600 motors, or four G. E. 1000 motors, I think the four motors will take 20 per cent more current than in the two motors; but the service with the four motors will be 50 per cent better. That has been our experience. Our cars for three years were equipped with two motors. For the past two years, after careful experimenting and taking into account the various costs entering into the matter, of which the smallest is power, we have adopted four motors as a standard, be they of whatever size they may. We can get much better results from 150 h. p. in four motors under a car, than we can with 250 h. p. in two motors under the car. The results may differ in various sections of the country, but with us, the four motors have certainly taken from 20 to 25 per cent more current than the two motors, running exactly similar conditions; not for the purpose of test, but in regular service on long distance or city lines, with wattmeter, voltmeter and ammeter on the car, so as to cover all the points. The use of these four motors is a very important thing on our standard car, which is 41 ft. over all, and seats 44 passengers, with cross seats, and weighs somewhat more than the car referred to by Mr. Heft. I trust that Mr. Heft will succeed in making his car all that he desires.

I was very much interested in the points raised by Mr. Chamberlain as we have found that, in order to put a car on the tracks in our city so that it will stay there, in spite of a head-on collision, as we some times have, even with the greatest degree of care, it requires some weight and strength to withstand the shock so that the car will not be absolutely shattered. We had a case recently with a green motorman on a curve, where our car was thrown off the tracks across the street, with the result that the car was not much injured except that a corner post was knocked off. I think Colonel Heft has seen how our cars are braced. We use the longitudinal truss rod and truss plank, with a rod through it. We do not feel that we can take chances with the longitudinal brace; we want the strongest construction possible to put in the car. Therefore, I should take issue with Mr. Heft on that point.

As stated, the results of the tests made were somewhat contrary to what the experts had led us to believe we might expect would be the draft upon the power plant, and for that reason, I

had Mr. Sunny and Mr. Bailey come to Milwaukee on two or three different occasions to make those tests, not simply tests on a special car, but on the regular service, equipping different cars on our regular service, with different types of motors; two G. E. 57; two G. E. 1000, and four G. E. 1000 under different cars. I do not believe there is any question that the four motors will take more current, but as has been said, you get quicker acceleration. You have no slipping wheels. We are going to put two additional motors on all the cars we equip in the future. The higher speed you can make compensates for the increased power consumed. In the city service where we use these cars, as we do entirely, with blocks running from 200 ft. in length, it is an important matter if you can save a second or two on each street corner in getting the car into rapid motion; and when the car gets on a slight grade, or starts on a slippery rail, it will immediately pick up and get off without spianing the wheels. That is what the four motors will do. I believe that four smaller motors are much more effective than perhaps 50 per cent increased capacity in two heavier motors. We have some 300 of these double truck cars running. We control all the city lines in Milwaukee and Racine, 25 miles south, and run 35 miles south to the city of Waukesha. We run a complicated system, but it is run as one entire system. If we have a call for cars on any of our interurban lines, we can take our city cars for this purpose, because they are interchangeable.

In order to compete with our friends of the steam railroads, we are now giving our attention to the development of a new car that shall be 50 ft. over all, upon which we propose to mount four 75-h. p. motors, such as you will find in the exhibit hall below. The steam railroads throughout our Western country are beginning to realize that they have a real competitor in electric lines for distances of 50 or 60 miles, and as a consequence, they are reducing the rates of fare very materially and putting on additional high speed trains to run short distances. We propose to build an electric car for the double purpose of being able to make 60 miles an hour with four of these motors and with the further purpose that in case we have a congestion of travel on any of the lines running to our summer resorts, we can hitch three or four trailers to the car and make 35 to 40 miles an hour, and to handle a larger body of people at a much reduced cost. We may have peculiar conditions in our city, but that is one of the things we have in mind. With these cars which we are going to build, and under which we are to put four motors, we should want a more substantial construction than the cars shown in the drawings which have been submitted to us, although these cars may be all right for the service for which Mr. Heft designed them.

Mr. Heft: Mr. Beggs' statement is true, judged by his conditions, but I also insist that my statement is true taken from my conditions. Mr. Beggs' cars, I believe are operated largely through city streets and are stopped and started; and as I stated in my reply to Mr. Foster, there would be a greater current consumption in producing the acceleration of the car when starting and stopping so often.

Mr. Beggs: This test was not made on a city line. It was made on our Waukesha line, a 20-mile road, with a train every hour each way. We make the run in 52 minutes, and keep up an hourly service with two cars. The test was made on that high speed line, upon which there are very few stops and sometimes no stops in a distance of ten miles.

Mr. Heft: Then I must insist, under that condition, that my statement is correct. (Laughter.) I will say, to satisfy Mr. Beggs, if he will come down to inspect our system, I will give him an opportunity to witness a test, and if he does not agree with me I will pay his expenses to Meriden and back.

Mr. Beggs: It will be a pleasure and worth all the expense to spend a day with the Colonel, outside of the test; but I shall take advantage of the opportunity he offers to have this test made. I shall, however, want to know how his instruments are calibrated. I shall also want to take some expert along with me to see these tests. I am not an expert in electric railroad matters, except on the commercial side; but I feel sure there is some mistake in the readings of the meters. I was told what the Colonel tells us, but it did not agree with my own practical experience, and what I considered would be the result when I was seriously considering three years ago, this very question of whether or not we could afford to go to the current consumption required for four motors. The first report which came to me from a gentlemen whom I considered to be a highly scientific, technical engineer, harmonized with what

Colonel Heft has told us, and the report went further and said that four motors saved 10 per cent, and he submitted the figures to demonstrate it. Then I concluded I would call in other experts and I did call in Mr. Sunny and Mr. Bailey, and I went on the cars myself with these gentlemen, and spent several days with them, with the result that I found it took fully from 20 to 25 per cent more current with the four motors than with the two motors, on the same character of service, the same cars and load, and running exactly during the same hours as we made the tests on different days so as to get exactly the same conditions.

Mr. Foster: The conditions under which Colonel Heft has been making tests are different from the ordinary conditions under which street railways operate, as I understand it. The conditions there are these: That the test was made upon a steam railroad roadbed, with the stops made at infrequent intervals; that is to say, that the run would be made from one station to another, and it might be two or three, or five, or even ten miles distance. That being so, I think it is possible, and without a doubt it is true that they do operate as he says, without consuming a greater amount of current than they would with two motors. Our experience has been in operating four motors on the same type of car, over the same road, under the same conditions, as near as it is possible to obtain them, that it requires from 15 to 23 per cent more current to operate four motors than two motors. We make tests twice a year, and pay for current on that basis, and we believe that the tests are carefully made, as they are made by the representatives of the Boston Elevated Railway Co., over whose tracks we operate, and which furnishes power to our company, and the tests are also made by experts representing our company.

Mr. Wason: On one of our suburban lines, we started two years ago to put on two 75-h. p. motors on each car, and found it almost impossible to make our time in the city, or in the country where there was any grade. We did that for the purpose of eliminating one-half of the repairs, as we supposed. Later, we removed the two 75-h. p. motors and put on four 50-h. p. motors, with much more satisfactory result, as we were able to make our time, and consumed but a very small amount of power more than the two 75-h. p. motors. The results were very much more satisfactory, and I think there is no question but for all suburban work, four motors are preferable to two motors, no matter what the amount of power you put into the motors is.

The lightening of a car for suburban work seems to me a little questionable. I think Colonel Heft will, a year from now, be able to give us some more definite data on this point. We have been strengthening our cars from the start, rather than making them lighter. They sometimes now leave the track for a shorter road across the fields which is not always advantageous for the rolling stock. It seems to me we ought not to consider making the cars lighter, unless we are running a car shop—possibly some of these gentlemen are interested in the manufacture of cars—and want to have the repairs of our cars or supply us with new equipment. The ordinary railroad man buys his equipment and expects it to last a reasonable length of time, and it seems to me that it must be strong. Of course, the strength should be put in the best possible places, and I think that, rather than making the car lighter, we should make it stronger. In the steam railroad practice the car is cambered up in the center. In the first of our suburban cars, the makers insisted upon putting the camber in the center, but we found after using the car a short time, we could put the camber there ourselves. The trouble was to keep it from hulging up in the center, so that a truss rod in a long car, a 40-ft., was a useless thing.

Mr. Harrington: I would ask Mr. Beggs what the tests showed where they ran two No. 57 motors, compared with four G. E. 1000 motors; whether the results from the four G. E. 1000 motors showed a lesser consumption in power than they had in the use of the two No. 57 motors.

Mr. Beggs: The current was less on the four G. E. 1000 than on the two No. 57.

Mr. Harrington: Did you get better results?

Mr. Beggs: We got quicker acceleration. Whether your service is for eight miles an hour, about the standard for city service—our city service is maintained pretty close to nine miles an hour on the average—whether your service is for eight miles, or fifteen miles, or for fifty miles an hour, put four motors on a double truck car. The distance does not make any difference whatever. The main question with many roads in this matter is the increased in-

vestment, but you will save the interest on the increased investment in reduced cost of maintenance. It costs considerably less to maintain four motors under a car than it does to maintain two motors under the same car. The difference in cost of maintenance will more than offset the interest on the increased cost of the investment.

Mr. Heft: To remove any doubt from Mr. Wason's mind as to this car, I will say that at the present time, I have not a dollar's worth of stock in any car manufacturing plant.

Mr. Connette: Mr. Beggs has just answered the question I was going to ask, whether or not the increase in the efficiency of the motors by reason of having four motors rather than two, would compensate for the increase in the investment. I presumed that would be the case with four motors as compared with two motors. Mr. Beggs states that the maintenance is less. I wanted to know something about that point, and as that question has been answered, I do not think I have anything further to say.

Mr. H. H. Vreeland: Our peculiar conditions in New York are such that we cannot go into the character of construction which warrants the use of the standard double-truck car with four motors. We do it on a number of lines controlled by the syndicate which owns the New York lines, and wherever it is possible, and we are not held down to the matter of a sixteenth of an inch in step heights, as we are in Greater New York, we go to the square body car, and use the four motors. In New York longitudinal lines, by reason of Central Park, have to use very narrow streets. We have to conform to the old type of construction, with sunk panels, to keep the cars moving. We have a number of cross streets through which the important lines operate, and the difference between the sunk panel car and the square body car, means keeping the line in operation all the time, as against stoppages every once in awhile of from ten to twenty minutes, owing to the numerous teams using the streets during the day. Take on our 59th St. line, running across town, if an ordinary truck is standing at the curb, the hub will go under the sunk panel of our car; and if we used a square body car, we should not be able to pass. We also find it necessary to have step raisers.

We are not trying to do gilt-edge railroading in New York. I mean that these things are not necessary. I had a man recently say to me that he thought it was an unwise thing to have step raisers under the control of the motorman of an open car. It means to us on the down-town streets of New York that the motorman can signal the conductor to raise the step and pass a truck without a stoppage of the car, which, under the ordinary conditions of a solid step, means a stoppage of the car, and when you are running the cars five seconds apart as we do in Center St., down-town, it is a great advantage to be able to raise the step and allow the car to pass.

The question under consideration is so local with us in that respect, that to discuss it from the standpoint these gentlemen have discussed it would not amount to much, except as concerns our experience with the consolidated system in New Jersey, where we run high speed, long distance, interurban cars. On that system, we use the large car with four motors. We get the largest carrying capacity car we can with the highest speeds, and do not considering particularly whether there is more or less power consumed, if we can compete successfully with the surrounding steam railroad conditions. We have long lines and in every instance they are in competition with the steam railroads.

We made some experiments and found that, with the same sized motors on single and double truck cars, there was an increase of about 20 per cent in the consumption of current in the double-truck car. I speak of this, because I am uncertain whether it was due to the increased weight of the car or the increased length of the car. As far as the question of general car construction is concerned, which has been discussed here, we have not to consider so much the question of collisions at high speeds, as we have the question of a "hogging" of the cars, as we term it; and as our friend, Mr. Wason, says, it is no trouble at all to get any kind of a camber in our Broadway cars, as the normal condition of the cars is such that my friend Colonel Heft says that he usually prefers to walk down town and leave room for three passengers in the car.

Mr. Sergeant: I have been extremely interested in this paper which Mr. Heft has presented. I want to say that I have seldom seen so much valuable matter so admirably put in such few words. I think this paper is a model of brevity and information. On the

question of power for four-motor cars there seems to be a considerable difference of opinion. While we have had no experience in actual service with four motor cars, for the purpose of determining what the power consumption was, we made some very careful tests, under what would be ordinary conditions, with the ordinary railway motors of different types, two to the car, and under these conditions we found that we got a little better acceleration with the four motors. We got, as a matter of fact, ten per cent decrease in time, better speed, but we had to use 50 per cent additional current to get it. I should suppose the question is one of local conditions. Certain electricians have been trying to persuade me for years that two motors consumed less power than one motor. We have records covering a good many years that one motor consumes less power than two motors.

In regard to our elevated equipment, possibly we have been making a mistake. We are intending to use motor cars having one motor truck with two 150-h. p. motors on that truck. One motor truck and one trailer truck, every car a motor, using the multiple control system. I hope that inside of the next year, if you come to Boston, we can show it to you in successful operation. It will be the only elevated road which will go underground as well as elevated, and we have to overcome long grades of 5 per cent, and have descending grades of eight per cent, and therefore, we feel we want the greatest acceleration we can get.

Mr. Heft: There is a gentleman in the room who has had a great deal of experience making tests with trucks mounted with one and two motors. I think he will give a reason why any car equipped with four motors, with all the eight wheels available as drivers, gives better results than a two-motor equipment. I would like to hear from Mr. Ira A. McCormack, of Cleveland.

Mr. McCormack: While I was with the Brooklyn Rapid Transit Co., the president of that company thought it was advisable to have double-truck cars, and the first car that was built had the wheels all of one size, and the question came up whether it was advisable to put four motors on the car or two motors. Tests were made and it was finally decided to equip the cars with two motors on account of maintenance. An order was placed for double truck car bodies. We had not yet determined whether we had the right kind of truck and whether it was still advisable to use the four motors or to use the two motors. We had some maximum traction trucks on the road, and in making the test in regard to the power and the efficiency in acceleration, it was found that the maximum traction truck was giving much better service. In consequence, we adopted the maximum traction truck, and I believe it was the only truck we could work with two motors and continue the service in Brooklyn. The 15 cars referred to were equipped with wheels which were all of one size, and we had to pull those cars off the road. I complained to the president but he thought I was wedded to the maximum traction trucks and insisted on running them. One day, he happened to be at Richmond Hill going to Brooklyn. It was a 24-minute run from Richmond Hill to Ridgewood. The president got on one of the cars with wheels all the same size, and he was 52 minutes getting there. He thought the wheels traveled a thousand miles. These cars were equipped with two motors. The next day, we discontinued the use of the 15 cars, equipped with these trucks because we had so many delays. They dragged the road and it was found impossible to operate them.

In Cleveland, when I went with that company, I found that all the cars were double truck cars with wheels the same size. Some time ago I had a cyclometer put on the driving wheel, the wheel equipped with the motor, and a cyclometer on the idle wheel, and the record showed that the driving wheel made many more revolutions than the idle wheel. Mr. Heft's paper gives us more food for thought and study than any other paper presented to this association. There is one important thing he speaks of, and that is doing away with the brake beams, having the brakes hung and operated direct without brake beams. I think that is something that can be appreciated, particularly in view of the trouble we have had in regard to chattering brake beams and brake beams catching up rubbish on the road, and sometimes when we have accidents, we will find that brake beams are a large factor in them.

Mr. McCulloch (Chicago). Colonel Heft's paper has been discussed almost entirely on the question of economy in power, and from the standpoint of the strength of the car in its construction to resist damage from collisions. Most of us who have been in the street railroad business a good many years remember when our cars were only 10 ft. in length, and today we have them 46 ft.

in length; then they weighed 4,000 lbs; now they weight 40,000 lbs. Then we had only one horse or two horses; now we have 268 h. p. We did not consider the question of power at all, nor the question of the strength of the car to withstand shocks. We were considering how we should be able to carry more passengers, and how we could better please the man who has the nickel. I do not think it is a question at all of whether we shall use a little more power or not if we can carry in greater safety the passengers who are in our cars, and we can carry a larger number of passengers, we can very well afford to burn an additional bushel of coal, if we can carry a few more passengers to pay for it.

As to the collisions which have been referred to, and the construction of the cars to withstand the shocks, I suppose the only way to prevent collisions is to run a road with only one car. When we have a collision, we do not consider what has become of the car, whether its transverse section is weak, or how much it will cost to repair it. What we do is to institute inquiries to find out whether there was some woman in the car whose transverse section was weak, and we shall have to pay for it. (Laughter.) I move that the paper be received and placed on file, with the thanks of the association to Colonel Heft for having written it.

The secretary announced that the members of the Association were cordially invited to visit the plant and park of the East Side Electric Railway Company. An invitation was also read from the Country Club of Kansas City, Mo., extending the privileges of the club to the members of the Association. A further invitation from the American Stoker Co. was read, inviting the members to visit the power plant of that company.

President Roach: The next order before the convention is the report of the Committee on Nominations. This committee will also include in its report a recommendation as to the next place of meeting.

Mr. McCulloch: With the consent of Mr. Rigg, the chairman of the Committee on Nominations, I would like to make a statement. In suggesting those who shall be our officers for the coming year, some member of our Nominating Committee has guaranteed strict attention to the duties of the office by each one of those we recommend, and we will ask any of the gentlemen who are nominated if he does not mean to attend to the duties of his office, if he is elected thereto, and give his earnest support in helping to carry the association along in a successful way, and give his personal attention to the meetings of the committee, we would like to have him decline the election, and let some one else be put in his place who will attend to the duties of the office.

Mr. Rigg, chairman of the Committee on Nominations, presented the following report:

Your committee respectfully recommends New York City as the next place of meeting, and the following gentlemen for officers of the association for the ensuing year.

President, Walton H. Holmes, president Metropolitan Street Railway Co., Kansas City, Mo.

First Vice-President, Herbert H. Vreeland, president Metropolitan Street Railway Co., New York, N. Y.

Second Vice-President, N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

Third Vice-President, J. B. McClary, general manager Birmingham Street Railway Co., Birmingham, Ala.

Secretary and Treasurer, T. C. Penington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee: The president, the vice-presidents, and John M. Roach, Chicago; F. L. Fuller, Wilkesbarre, Pa.; George W. Baumhoff, St. Louis, Mo.; John R. Graham, Quincy, Mass, and John Harris, Cincinnati, O.

The following resolution was unanimously passed by the Committee:

"Resolved, That the next meeting of the American Street Railway Association be limited to three days instead of four, and that the day set apart for the personal examination, by members, of the supply men's exhibit, be the middle day of the interval."

Mr. Bean, (St. Joseph): I move that the secretary be authorized to cast the unanimous ballot of the meeting for the gentlemen nominated. Carried.

The secretary duly cast the ballot and the president declared the gentlemen nominated to be duly elected as officers of the association for the ensuing year.

President Roach: There will be no further meeting of the asso-

ciation, but we will adjourn until tomorrow night at 7 o'clock to meet at the Coates House for the annual dinner.

I desire to thank the members of this association for their kind consideration while I have been your president, and if there is anything I can do at any time to help the association, I shall be pleased to have you call upon me while here and at home. (Applause.)

I will state in reference to the paper which was to have been presented by Mr. Nicholas S. Hill, Jr., general manager of the Charleston Railway, Gas & Electric Co., of Charleston, S. C., on "The Storeroom and Storeroom Accounts," that Mr. Hill has been ill for a long time, and has been unable to prepare the paper.

On motion of Colonel Heft a vote of thanks was given President Roach, and on motion of Mr. Vreeland a vote of thanks to the Metropolitan Street Railway Co., of Kansas City, and the citizens of the city who have so generously entertained the convention.

Adjourned to meet at the banquet Friday evening.

MAGANN AIR BRAKES.

The G. P. Magann Air Brake Co., of Detroit, made no extended exhibit in Convention Hall but by invitation a number of delegates rode over the new Kansas City-Leavenworth Electric line all the cars of which are equipped with Magann apparatus. The



freedom from complicated parts in this braking system, and its quick and accurate operation won for it many words of commendation. Mr. E. C. Rutherford, of the Detroit office, is in attendance.

The Ohmer Car Register Co., Dayton, O., has mailed a letter to delegates stating it will make no exhibit this year. The company is just completing the installation of a large amount of special machinery in its new factory and will soon have its plant in operation. The intention then is to actively enter the market with a register which gives a printed classified statement of fares collected. It registers transfers issued and collected, passes and any denomination of cash or ticket fare.

Mr. F. G. Bolles, representing the Bullock Electric Manufacturing Co., is in attendance at the convention and has distributed some very popular souvenirs. These were sealed glass tubes with Bullock literature externally applied, some were filled with Kentucky dew, warranted to be as smooth as Bullock machinery, and others contained cigars. We know that Bullock machinery is smooth.

The tickets elected in both associations are received with the greatest satisfaction. Both elections were unanimous and hearty. Mr. Holmes as head of the American, and Mr. Ham of the Accountants are both representative men, representing the younger and progressive element in the industry and will serve with honor to themselves and the bodies over which they preside.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

THURSDAY OCTOBER 18TH.

President Duffy called the meeting to order at 10:40 a. m. and at once announced the first paper.

DEPARTMENTAL ACCOUNTS.

By H. L. Wilson, Auditor Boston Elevated Railway Co., Boston, Mass.

In an unguarded moment I yielded to the request of our worthy president and agreed to prepare a paper on what he has seen fit to call Departmental Accounting. Three weeks ago the task was taken up for the first time, and it at once occurred to me that it was too broad a subject to attempt to cover in the limited time that should be devoted to a convention paper, and I so informed him and begged to be allowed to change it, but while he acknowledged it would be a difficult matter to digest, and as he put it, could be extended to the "length of the Holy Bible" he still insisted on my sticking to this title. If I was only sure that a book of this kind would have as large a circulation as the one he mentioned, I would give up accounting and go into the publishing business.

I will try, however, to give simply a rough outline of the system that we have adopted as the best method of handling labor and material accounts so as to have the maximum amount of quickly available information with the minimum amount of clerical help and expense, and trust that the members present will ask any



H. L. WILSON.

questions that may suggest themselves and in that way bring out any important points that may have been overlooked, as this is not submitted as any pet scheme but simply as the best method that experience has suggested up to the present time.

In the first place I am strongly in favor of having all accounting so far as possible, done in the main office of the auditor, rather than at the shops or department headquarters. There are several reasons for this, prominent among which are: That there must always be a responsible head to properly direct the efforts of others, and if it is all done in one place a really bright chief clerk may be employed, to whom a proper salary may be paid, who can have a supervision of all details, and any questions that arise can at once be referred to the auditor for his personal attention. Again there are times when the entire force can be put on some special and important piece of work that it is necessary to have completed at once; there are other times during the month when the pressure of work is such that some of the clerks can be engaged in collecting together the less important matters that have been allowed to accumulate during the busy time.

Another and very important reason is that there may be instances where estimates have been given of what certain work would cost, where the expenditures have greatly exceeded the estimate, and where it might be thought advisable by the head of the

department to make transfers to other and improper accounts in order to substantiate the original figures.

When information is desired a question can as well be asked in one place as another and certainly a more prompt and probably a more intelligent answer can be obtained from the place where all accounting is done than it would be possible to get by consulting several separate departments.

If, as is the case of the Boston Elevated Railway Co., there are several departments, any one of which may do certain work properly chargeable to another, it simplifies the accounting to be able to post the details to the proper account direct, and avoid the trouble of making charges and credits back and forth which would be necessary if the accounting of the departments was done at separate places.

The four departments into which the Construction, Equipment and Maintenance forces are divided are as follows:

Department of Motive Power and Machinery.

Department of Wires and Conduits.

Department of Buildings.

Department of Maintenance of Way.

No claim is made that the system as it is at present arranged is applicable as a whole to all companies, but the fundamental principle which is the order number system can certainly be applied to any road.

The method of issuing order numbers varies somewhat in the different departments.

In the shops the method is to have the superintendent or foreman give each class, and in many instances each piece of work performed, an individual number. The first order is numbered one and then they run along consecutively for two or three years or until there is no chance that by beginning over again the numbers will in any way conflict.

When an order is issued a copy of it is sent to the Bureau of Audit so that the auditor may determine from the nature of the work the account to which it should be charged, entry is then made upon cards provided for this purpose which have headings for the Order Number, Account Charged, Date Issued, Date Completed and Description of the work. Below are printed spaces for the Month, for Labor, for Material and Invoices, for Shop Expense and for a Total of the above charges.

These cards are made double or folded over at the top, so that by using a small carbon sheet a duplicate can be made with only the labor of one entry. The advantage of this system, is that by separating the card when the order is completed you have an opportunity of making any number of separate and complete lists without in any way interfering with the original files which can still be kept in their numerical order.

If you want to know what the charges have been to any account, what kind of work has been done for any department, an alphabetical list of all work or anything of this kind, it only requires a new deal of this extra pack, to have the information in such shape that it can be quickly utilized.

The labor is reported weekly on sheets which have a heading for the Name, for the Date, for the Rate of Pay and for the Occupation; below are provided columns for the Order Number, for the Days of the Week, for the Total Hours and for the Amount. This sheet has some 35 lines and provides in this way for a man who may work on 35 different order numbers during any one week.

The pay roll of course can be made by simply taking the total hours from the bottom of the sheet, while the charges to the order numbers are made by taking the amounts from the Amount column. These labor charges are abstracted on sheets of the same size as the time blanks and all are then bound together in book form with these abstract sheets as the front pages, and the entries made upon the cards from this form. The advantage of this is at once plain: you have the card which shows you the date and you can quickly refer to the abstract and if necessary by referring to

the following pages you can at once tell the names of the men who worked upon the order as well as the days of the week and the hours each day that they devoted to this particular order.

The material used each month is reported on a sheet which has provision made in the printed heading to put in the Order Number, and below spaces for Quantity, Kind of Material, Price and Amount. These sheets are abstracted and bound in the same manner as the time sheets mentioned above.

We require all parties of whom we purchase supplies to use bill heads which we provide. These have spaces at the bottom in which to place all approvals and a space for a notation of the account to which the goods should be charged. Before adopting this idea, bills frequently reached my office in such a condition that it was difficult to read them, they being pretty well covered with rubber stamp impressions and signatures.

When charges apply to any department the bill is entered upon an invoice book which has spaces in which to make a copy of the invoice and enter the total amount, and separate spaces headed with the name of each department. These last spaces are subdivided into columns for Amount and Account to Charge.

By abstracting each of these columns you have all the information necessary to make your entries to the proper accounts and the totals of all will prove the total of the invoice book.

Any general expenses of the shops are charged to an account called shop expense and this is divided each month among the different order numbers under which work is being done.

The Department of Motive Power and Machinery has several subdivisions such as Machine Shop, Car Equipment Shops, Car Repair Shops, Armature and Field Winding Shops, seven Power Stations and has also charge of small maintenance crews in each of the 30 car houses.

I have explained the system of reporting all labor, material, etc., consumed at the shops, and the methods of making returns from the other places are so similar that I will not occupy your time with a description of the minor differences.

Blanks vary somewhat in the headings but the idea that we have attempted to carry out, is to have them all of a nearly uniform size so that they may be bound in the little booklets before referred to.

A large number of them are arranged in manifold books so that there is always an exact copy of what has been sent to the main office and as each blank is numbered we at once know that something has gone astray if they do not run along consecutively.

By having a large cabinet with drawers arranged for each kind of report, ready reference can be made to any or all original time or material sheets.

In order to make a monthly report of the expenditures it is of course necessary to compile the information you have on all these abstracts.

This is done on separate sheets for each shop, power station, etc. By having these sheets graduated in size so that the upper one is the narrowest and each succeeding sheet just one column wider, you have all the totals together in a horizontal line and a grand total is easily and quickly obtained by simply adding across. The widest or bottom sheet has on the right hand side a sufficient space for the Names of the Accounts and a place for the ledger folio. In this manner the necessity of writing the title more than once is obviated and all necessity of journalizing is done away with, as these sheets bound together make a more complete and readily accessible journal than is possible to have by any other method.

For the Department of Wires and Conduits a different system of order numbers is used. It might be well to here call the attention to the fact that the company with which I am connected owns no surface tracks or their equipment, yet has in its immediate control, and operates all the surface lines in the city of Boston and near by suburbs under a lease for a term of years from the West End Street Railway Co.

This lease stipulated that the Elevated company should build no surface lines of its own, but that all additions to the surface lines or their equipment should be charged to and become the property of the West End Street Railway Co. and that credit should be given to the latter for any removals that were made.

It was therefore necessary to have a very complete and exhaustive record of all property, that could be quickly referred to and easily handled, and books of all kinds were considered but none of them seemed to cover both of the above desirable elements.

Cards were then taken under consideration and the great elasticity of this system at once recommended itself.

First index cards were prepared having for headings the names of each street, car house, bridge, etc. on the entire system.

The Electric Line Equipment had always been divided under five general headings: These were Poles and Setting, Overhead Feeder Lines, Overhead Trolley Lines, Underground Cables and Conduits, and Submarine Cables.

Cards were next provided for each separate kind of line equipment, and it was found that to give a complete analysis of the above five accounts would require the use of forty different forms of cards, and for quick reference it was decided to use several colors as well as number each card on a small tab or projection from the top.

For Poles and Setting 13 buff cards were used which are numbered from 1 to 13 consecutively. The first 4 are used only for the 4 sizes of iron poles which are the sole property of the West End company. The next 6 are used for wooden poles which are owned jointly by the West End company, and some other company. No. 11 is used for wooden poles owned exclusively by the company, No. 12 for special poles and bases, and No. 13, for span attachments to buildings.

For Overhead Feeder Lines 8 cards were provided: they are blue in color with tabs numbered from 14 to 21.

The first 5 of these cards are used to designate the amount and size of different kinds of feed and return wire. No. 19 is used for feed taps, No. 20, for switch boxes and No. 21, for track connections.

For Overhead Trolley Lines 3 cards are used, being salmon in color, numbered, 22 which is used for bracket construction, 23 which is used for insulating joints and 24 which is used for trolley wire.

For Underground Cables and Conduits 8 cards were provided: they are buff in color and are numbered from 31 to 38.

The first 2 numbers are used for Feeder Cables, the next 3 for Return Cables, the next for Feeder Cable Connection, the next for record of Conduit and Manholes, and the last for Conduit Connections.

The next 8 cards are used for records of Submarine cable for return wires; the first 4 numbered from 51 up are used for the Feeder Cables, the next 4 are used for Return Cables, and the last for Cable Houses, Switch Boxes, etc.

In order that the Wire and Conduit Department should report its expenditures in such a way that the Accounting Department could make the charges to the proper locations, a system of order numbers was devised to be used whenever additions to or removals from existing construction were made.

First each kind of equipment called for by the cards was given a number which corresponds with that on the tab of the card, and each Street, Car House and Bridge on the entire system was given an individual number commencing with 100. By preceding the number designating the street by the number designating the kind of equipment you at once have all the information necessary to tell to what location and to what account the labor and material should be charged.

This method furnishes many thousands outstanding order numbers anyone of which can be readily selected from the printed list containing less than 600 numbers.

The labor is reported on the same form as that previously mentioned for shops, but the material sheet is somewhat different.

It is impossible for a foreman to always know exactly how much material will be used on any one job, and frequently he is called upon to do work on several locations without going back to the stock room, and thus it is necessary to provide some form by which he can draw stock and report what he uses.

This is provided by a manifest on the face of which is entered the material drawn. The back of this sheet provides for a report of the material used and a report of the Material Returned. The "Note" printed on the front side of the sheet reads as follows, and explains its use:

"NOTE:—This manifest is to be retained by the person responsible for the material issued upon it until every article is accounted for on the opposite side of this form.

"All material issued upon this manifest which is unused on the last day of the month must be returned to the Storekeeper for inspection. The Storekeeper will receipt for it, re-manifest it or stamp this manifest 'Inspected' as occasion requires."

These manifests are made in duplicate by the manifold system, and a correct copy of the original issue of stock is always in the keeping of the storekeeper.

At the end of the month the reports of the Material Used are abstracted on the same form mentioned for shop orders and are bound in the same manner.

The Department of Buildings is chiefly occupied with the repairs and renewals of buildings and in order to answer all questions propounded by the management and by the Bureau of Real Estate a system of order numbers was gotten up for its use. The principle here employed is similar to that of the Department of Wires and Conduits each kind of work has a classification number and each building has one or more numbers which designate the building and in some instances the different portions of the building. The method of reporting labor and material is the same as that used for the shops.

The Department of Maintenance of Way as its name implies, has charge of the repair maintenance, inspection and construction of track and paving.

Order numbers are issued for any new work or for any extensive renewal or repairs by the Civil Engineer, who sends a notice to the head of the Department and also to the Bureau of Audit.

The department is divided into eight Divisions, called sections, and each carries a supply of the material they are continually using.

Each section's stock is carried under the following 13 accounts:

- Gravel
- Paving Stone and Flagging
- Lumber and Ties
- Nails and Spikes
- Rail Fastenings
- Tie Rods and Buttons
- New Rail
- Old Rail
- Special Track Work, Frogs and Switches
- Miscellaneous Material
- Track Welding Material
- Scrap Material and
- Track Wiring Material.

When material is received at a section which is to be included in any of the above stock accounts, the person in charge immediately enters upon a form provided for that purpose, the date, the firm's name or section from which it is received, and the quantity and kind of material.

These reports are numbered consecutively, and are sent to the Bureau of Audit where all bills are entered on an invoice book which is abstracted each month, and from this abstract charges are made to stock accounts or to jobs direct.

When material is used or sent away, entry is made on a form which gives the Date, Where Used or to Whom Sent, Quantity and Kind of Material, Price, Amount, Account to Charges and Account to Credit.

These sheets are abstracted twice, one to get totals for the charges and once to get totals for the credits, and are bound and filed away in the usual manner.

When material is received from track taken up, or is returned from any work, it is entered upon a sheet which provides for the Date, Where From, Quantity and Kind of Material, Price, Amount, Account to Credit and Account to Charge. These are abstracted and bound in the same manner as the Material Sent Away sheets.

All labor is reported on a form which has the usual heading, and provides below for a separation of Maintenance and New Construction charges, as well as the location where the work was done and the particular kind of labor that was performed. These are also abstracted and bound.

We will now suppose we have four kinds of bound books from which we are to make up our monthly report for the department.

We take a report blank and head it with the name of the section. This blank has columns provided for Approved Entries, for Each Kind of Material, for Approved Bills, for Labor, for Total Charges and Credits and for Net Charges and Credits; and down the right hand side has accounts to which charges and credits are to be made.

We then take the abstract of the invoice book and enter with red ink on the first line opposite the headings Approved Bills

Charged to Stock the total charge to each kind of material, next we enter with black ink in the Approved Bill column, all other items on the abstract putting each one on the line opposite to the account to which it is to be charged.

Next we take the Material Used or Sent Away abstracts, and under the proper material heading and opposite the proper accounts, we enter in black ink the credits.

Next we take the Material Taken Up or Returned abstract, and with red ink enter under the proper material heading and opposite the proper account, all these items.

Next we take the labor abstract and enter in red ink under the proper material headings the charge for labor on account of each stock account, and then enter in black ink in the column headed Labor and opposite the proper account all other charge.

There is one other column on the report sheet of which no mention has yet been made; this is the first one on the left hand side, and is headed Approved Entries. This was provided to take care of journal entries, as the use of this report obviates the use of the customary journal.

Any entries necessary to transfer one account to another are made on journal blanks, and these are dated, numbered, bound together and abstracted, and from this abstract entry is made upon the report sheet.

By now footing these sheets across, you get the total charges and credits to each account, the black figures being debits and the red figures credits, and by footing the columns of material up and down you get all the debits and all the credits to each kind of material account; in this instance, however, the red figures are debits and the black figures credits.

Only one section has the accounts printed down the right hand side of the sheets; the others all leave off with the column headed Total Charges and Credits, and by placing these sheets side by side you have all debits and credits from all sections opposite the account, and the net debit or credit can at once be ascertained by adding these amounts together, and by carrying the net result into the column headed Net Charge or Credit you have only one amount for each account.

All items appearing in this column are then posted to their ledger accounts, and the footings of all material columns are debited and credited to their proper ledger accounts, and the sheets are the most complete and compact journal it is possible to have, as you can tell at a glance every item that went to make up the total of any account and what section furnished the labor or material.

When any work of this kind is completed the Superintendent of Tracks sends a report to the Auditor giving the date that the track was finished.

A detailed statement of all labor and material charged is then made up and this is sent to the Civil Engineer who can at once tell from this report whether or not the proper amount of material has been charged, and he reports back in such a form that the information can at once be distributed on the cards provided for a report of the track mileage.

These cards number some 17. The first 4 are used to designate the different kinds of rail and have spaces provided for the Date, Kind of Paving, Remarks, Added, Removed and Amount.

The last 3 are used for a record of the three kinds of special track work namely Girder, T and Tram, and have additional columns in which to record the name of the maker and the type of work.

These cards together with those provided for the electric line equipment are filed in a cabinet back of the proper index cards giving the name of the street or car house.

If at any time you wish to verify the records of any street it is a simple matter to take all the cards for that location put them in your pocket and check them on the spot.

In closing I would say that I have a set of blanks with me which I will be glad to show and explain to any member who wishes to look them over and if it is thought advisable to publish this paper in the report of this convention it will give me great pleasure to arrange them in such a way that they can readily be referred to.

Mr. Hibbs: I would like to ask Mr. Wilson what clerical force he employs. It is rather an elaborate system.

Mr. Wilson: We have fourteen men. It is the system that makes it possible to handle it with that number of men. You avoid a great deal of work that it is customary to do. It might

be interesting to know that in that office, with these 14 men, with the order numbers and the records, are over 60,000 accounts, all of which, are liable to be active at any time.

Mr. F. E. Smith: You file these away from month to month, don't you; what you might call the journals?

Mr. Wilson: Yes.

Mr. Smith: Suppose you do some more work in the following month on the same job. Is there any reference made on the first entry that it is continued in another month?

Mr. Wilson: No. You would take it from your cards, and your cards would show what month it was charged in. All you have to refer to is the report of that particular month. The same order number applies in different months. The order number is fixed like an account number.

Mr. Tripp: I would like to ask Mr. Wilson if he makes two postings, one to the cards and one to the expense ledger. I assumed that he keeps an expense ledger as distinct from the cards.

Mr. Wilson: That comes from this report. As I say, it is made up; you make one posting from that, of details. The details are posted from the cards, the details of your expense ledger.

Mr. Moore: I would like to ask Mr. Wilson, in the case of the storekeeper issuing materials on these manifests, what record or account does he charge that to in his record so as to keep tab of it as it goes out and comes back.

Mr. Wilson: That is done in the manifold book. It is to all intents and purposes in his stock until it is reported consumed or returned.

President Duffy: You spoke of 60,000 accounts, and said each order number had a standing account. Now I would understand that account No. 1, for instance, maintenance of track and roadway, had a certain number of subdivisions. You spoke of some six or seven. Then there is a second number of order numbers in each one of those subdivisions, like the paving, the rails, and so on. Isn't that the way it operates?

Mr. Wilson: No. Any maintenance charges would be charged direct to the operating expense number, unless it was a very large track job, where the street was being relaid or something of that kind, and then the engineer would give it an order number. For the ordinary matters we do not have the order number.

Mr. Tripp: Mr. Wilson, if a street was numbered 100 and the figure 1 represented track maintenance would 1100 mean track work on a certain street?

Mr. Wilson: Yes, the Maintenance of Way Department; we do not use those numbers except for extraordinary work, but number 1100 would mean that it was No. 1 pole on a certain street. If it was 2100 it would mean it was a No. 2 pole on the same street. We have about 100 operating expense accounts. We have no subdivisions of those accounts whatever, but by this system I speak of, by reference to the monthly reports of the department, you at once know every labor item and every material item, or any entry, by referring to the report. If you wish any further information you go to the drawer, pull out this little booklet I referred to, and then, if it is a question of labor, you can tell the men's names, the day of the week and how many hours of each day they worked on it, because it is all there together. In the same way, if you wanted to know the material, you could tell with the minutest detail what the material was.

President Duffy: You have your expenses divided into 100 accounts, where the classification has only 38.

Mr. Wilson: Yes. The Boston Elevated Ry. has not adopted the standard system of street railway accounting because the railroad commissioners of Massachusetts are the only ones in the United States that have not adopted it.

President Duffy: The reading of this paper and the important paper that is to follow suggest something to me that was discussed with us today by a gentleman very prominent in the other association. That is the practice of some associations of printing their papers in advance and sending a printed copy to each member, so that before they come to the association meeting they can digest the papers and can select from them particular things that they want to be informed upon, and can bring up points for discussion. This practice in associations of a similar character to this one has proved to be a wise one, and I think it would be well worth the consideration of those who are to direct the affairs of the Association next year as to whether we should take up this practice.

The next paper is:

MATERIAL AND SUPPLIES ACCOUNT.

By W. M. Barnaby, Accountant, Brooklyn Rapid Transit Co.

I wish at the outset to state just what I am going to try and explain, and also to give the explanation with sufficient clearness to be understood.

Material and Supplies Account is but a branch of the bookkeeping of any concern and the method of keeping is to be determined by the results looked for. Some one has said that "bookkeeping was but common sense properly applied." I trust that I can prove the truth of this saying as applied to the keeping of Material and Supplies Account. In the first place what are the results to be obtained?

A correct record of all material and supplies received, showing kinds, quantities, price and from whom bought. A correct record of how used, showing the quantities and values as applied to operation, maintenance or construction as the case may be.

A record which will show at any time, the quantity of any particular stock on hand. A record that will show the various kinds of materials and their value charged to any particular expense or account.

These I think are the main results looked for in keeping Material and Supplies Account. As a basis for accounting in this department of bookkeeping the Stock Ledger is the first consideration. This book should contain the record of all receipts and all expenditures of Material and Supplies and when inventory time comes around gives the value to material and supplies on hand. A Stock Ledger laid out with three accounts on



W. M. BARNABY

a page is suggested, a book of 800 pages giving some 2400 accounts. This should be opened with the accounts running alphabetically for convenience in locating. This is made so as to give each month practically a separate record. A trial balance can be taken monthly if desired.

The postings to this book are made from the record of materials received and from the consumption sheets which I will explain further on.

After the Stock Ledger, comes the book containing the record of materials received, which for convenience, we will call Book No. 2, the Stock Ledger being No. 1.

This book gives a complete record of all stock received, showing from whom received, quantity, price, kind, value, order number, Reg. No., how shipped, etc., in fact a complete record of each invoice. From this book the postings to the Stock Ledger are made. This book is made on the loose leaf plan, which permits a page, when filled up, to be taken out, allowing the posting to the Stock Ledger without interfering with the work of the receiving department.

We now come to the taking out of stock, and the method of changing to the proper expense or construction account.

All materials and supplies drawn from the stockroom should be drawn by order on the stock clerk, properly signed by those authorized to do so. The form of order is in duplicate, so that each department has a record of what materials or supplies it has used during the month. The order must also state for what purpose drawn. By taking the classification of Expense Accounts, as adopted by the Street Railway Accountants' Association of America, and giving the numbers and letters, the accounting part becomes very simple.

Any special expense or construction account can be kept by the mere giving of some special number or letter to indicate it. In this connection, it should be remembered that labor charges should be similarly treated to have uniformity of accounting.

Orders on the stock clerk are charged daily on the Consumption Blotter, which is made up of a number of sheets properly ruled. The Consumption Blotter is the record of quantities and values of materials and supplies used daily, the name of the materials or supplies being written in the margin and the quantity and the expense account being indicated. The unit of value is also given, being taken from the Stock Ledger.

After orders on the stock clerk have been posted on the Consumption Blotter the amounts thus charged are analyzed; first, as to the amount charged to each expense account; secondly, as to the value of each kind of material charged. The first result is, in turn, posted on blanks which are the final accounting as to expense or construction charged. The various accounts to be charged are written in at the top and the result of the analysis of the Consumption Blotter is set down daily under the proper heading. At the end of the month the footings of these sheets give the cost of materials and supplies charged to each expense or construction account. The second analysis of the Consumption Blotter is transferred to other blanks for the record of amount used daily of each kind of materials or supplies and from this the postings to the Stock Ledger are made, the value of the materials used balancing with the total amount charged to expense or construction accounts. This form has an additional value, in that it shows just the quantity of each material or supply used monthly, which is a good help to the stockkeeper in determining how large a quantity he should carry, and also enables him to make out his requisitions on the purchasing agent, with intelligence. When more than one stock account is kept and goods are being transferred from one store-room to another a proper transfer order should be used which will indicate the kind, quantity and value of stock so transferred, and also indicate from and to what stock account transferred. These orders which should be numbered are treated by the stock clerk the same as any invoice and should be posted in the record of materials and supplies account and charged out in the regular course.

On the question of putting through material and supplies account bills covering large items chargeable to construction such as car bodies, trucks, motors, generators, etc., I think the method of direct charging preferable. At the end of each month the stock clerk should report to the auditor the amount of materials and supplies received giving a list in detail of bills passing through his record of materials received, also the value of materials and supplies received through transfer from other stock-rooms. This blank gives the quantity on hand on the first of the month, shows all debits and all credits to Materials and Supplies Account, and enables the auditor to check the Materials and Supplies Account as shown by the stock clerk with the general books of the company.

In connection with the Stock Ledger a card system is recommended. Each kind of stock having a card showing the quantity on hand also stating the number of the bin, shelf or drawer in which it is kept. As the orders are filled by the stock clerk the cards are credited with the quantity taken out so that the quantity on hand at any time can be ascertained. Some may say that the time involved would not warrant the keeping of such a system of cards, but I can state that a system covering between 5,000 and 6,000 different stock items can be posted in three hours. The value of knowing that a certain article is needed is obvious to any one familiar with the keeping in repair of car and motor equipments. By such knowledge an emergency order for the particular material or supply needed can be given and a "multitude of friction" thus covered. On this card in addition to showing quantity on hand, a provision is made to show the quantity of such materials and supplies ordered, but not received, which provides against duplicate ordering.

In the matter of manufactured articles such as commutator bars, field coils, etc., where the amount made up in a month might be sufficient for a much longer period and it is desired to charge to the expense account only the amount used, the stock clerk would have to set a value upon the product, debit his Material and Supplies Account, the same as for any purchased material or supplies, and set it upon his Stock Ledger and reduce by a

like amount his report of such expense accounts for the month. The custom, I think to charge direct to expense, all material taken out or supplies for such manufacture as though actually used during the month. Only a few of the larger companies do any manufacturing.

I think I have covered the principal features of Material and Supplies Account. It may be that some of the minor details have escaped in condensing this into such a short article, but if there be any particular point not touched upon which someone is interested in, I trust he will not fail to make it known.

In any system of accounting, accuracy is the keystone, and that particular feature should never be lost sight of.

Mr. F. E. Smith: I would like to ask Mr. Barnaby if the material charged out in any one month is charged out at the average prices of the material on hand at the first of the month.

Mr. Barnaby: The unit of value of stock is determined by bringing down what you have on hand at the end of every month, and you establish probably a new unit of value. Of course, in taking up what we call the consumption sheet, we use a certain quantity of any article, which, at the unit of value, gives a figure for the expense, and we bring down the balance in the bin or shelf, and get a value of stock on hand. If it happens to be bolts or gears we know what we have up above, and at a glance can tell whether the price which the unit giving the results, is a fictitious one or not; and it can be adjusted and checked. Practically the unit of value is reset every month, on the first of every month.

Mr. Smith: You might have had a lot of material, say, on the 5th, and used it on the 15th, and that may have changed the price, the average price of what you have on hand. Now if it was used on the 15th, would you charge it out at the average price of the 1st or as of the date that you used it?

Mr. Barnaby: By the use of this consumption blotter, if we had 1,000 on hand at 10 cents, we would charge out the first 1,000 at 10 cents, and just as soon as we got into the next lot we have our price indicated.

Mr. Smith: You charge them off then at two different prices, not as an average?

Mr. Barnaby: We would, then, yes.

Mr. J. A. Harder: Our store-room accounts are not conducted on a very thorough system. We aim to charge out material at an average price and let it go at that, and take an inventory occasionally to see whether we are running short or over and adjust it from that on. We do not keep a very elaborate set of books.

Mr. Stone (Worcester, Mass.): I can say very little to add to the information that is desired on that subject. The road that I represent is a comparatively small one. Our system is accordingly a small one. It is accurate so far as it is carried out. It is a very simple system and would not apply to the larger roads. We charge directly every purchase to the particular account for which it is bought. We take an inventory at the end of each month whereby the stock on hand at the first of the month is given. Added to that is the purchase which has been charged up to the particular account, which is set down, and an inventory is taken at the end of the month both by a book record and by an actual record. At the end of each month we have practically an inventory that covers the maintenance items and the construction items, separated each month and credited back to the several maintenance accounts and the several construction accounts, which ever they may be, and we charge to supplies and credit to operating expenses or construction accounts whatever material remains in hand; charge up each month again and start over. It is very simple and at the same time it is a system that can be applied to a small road so as to arrive at very accurate results. I am quite interested in hearing these papers, particularly the paper that has just been read, because a different system of accounts may be applied to our road later on, and that which applies to the larger roads is what I am particularly interested in.

Mr. Frank J. Suda (St. Louis): All the material that comes into our store-room is given a lot number and we use the card system. On this card we place the lot number, the name of the article, from whom purchased, the date received, the quantity received, the valuation, which is taken from what I call the receiving sheet, which is kept by the storeroom keeper. When the article is given out it is given out by the lot number, and in that way I get the quantity and the valuation. At the same time I get

the account in which the material is charged. Every man that comes into the storeroom gives his individual receipt for the material that he gets, and must state for what this material is used. These little slips are then taken up twice a month, on the 15th and on the 31st, and are entered on what we call our maintenance sheets, which are properly headed with the accounts to which these various items are charged. That also applies to castings. Every casting receives a number. No pattern is made without a number being given it, and when it is charged up or given out, it is given out by this lot number. I lot everything except screws, bolts of all kinds, cotter keys and such minor things as those, and at the end of stock-taking time, I offset one way or the other. So I think on the matter of lotting the articles and the castings I offset at the actual valuation both ways every time. If by some means or other the entry clerk makes a mistake in charging out, if he charges out \$10 too little, when he comes to balance out that particular lot he knows exactly whether he has been charging it properly, on the right valuation, and he can also check the storekeepers at any time by referring to his cards and asking the storekeeper how much material he has of this particular lot, and he knows whether the storekeeper has let any of this material slip through his fingers without getting a charge for it. Our system is not exactly as I would like to have it, and I am looking for some improvement if I can get it.

Mr. P. V. Burlington (Columbus, O.): We do not run a supply house account. We take care of all the purchases and use of material and supplies through general ledger accounts. The larger purchases, such as rails, ties, wheels, poles, perhaps all together 15 or 20 such accounts, we hold in what we term an open account, and we charge out approximately each month what would naturally belong to that month, and so far we have been very successful in approximating and have kept our operating expenses per cent at a very regular figure. We have had no difficulty whatever. Of course we do maintain in our shop our supply account, but it does not come into the audit office. It is simply as a matter of record for the shop department. All other materials, track, overhead, etc., are taken care of as I stated.

Mr. Mitchell (Pittsburg): We run our shop accounts, material and supplies, in about the same way. We find it works very satisfactorily. We take an inventory about once a year.

Mr. W. G. McDole (Cleveland): I would like to ask Mr. Barnaby what he does with his freight and cartage and handling of materials?

Mr. Barnaby: All the trucking we do we run it through a department and they have a car system there, and all the expenses of that department are charged to a trucking account. The cards are analyzed and the value of the truck per day is set down at a sum per day. The cards are charged out, as the cards indicate what work they perform, and it is set up as an expense item, charged to the account, and the trucking is credited. Of course at the end of the month, or a period of months we get a slight debit or credit which we adjust by taking off a slight per centage of the charges. The bigger charges that we have through the trucking department; there is very little of that trucking that we get, as our purchasing agent makes it a rule to purchase everything f. o. b. dock, and the handing of supplies from the shops to any minor jobs we charge to a shop expense account direct.

J. M. Smith (Toronto): Our system of material and supply is somewhat similar to some which have been explained here. I run what we call a material order book in which every requisition for material is first entered, and as the goods are received they are reported to me on a daily sheet, all the materials received. I might say, first, that I control all of the clerical work in connection with it in my department, that I got this daily sheet of all goods received, fully explaining it, giving them a number, etc., and they are checked and entered as against the requisitions, in the material book, so that we have the requisition entered as filled. Then, for any freight, duty, or any charges like that I have separate columns, and that is added to the cost of the goods to give me the price of that material. The material is summed up at the end of the month, and then I have a sheet that is sent to me daily of all materials delivered out of the stores, giving the classification and accounts that these are to be charged to. That is then kept track of in a subsidiary book until the end of the month, and then posted to this material order book and sub-

tracted. That, you will see, leaves me the balance of material that is there in hand and can be taken off, as I do, giving the full detail of all the materials on hand at the end of the month, practically an inventory of the goods. I have found that it was very satisfactory, and I have a pretty good check on the storekeeper, because if he is making any charges that are not correct he will find himself short at the end of the month. I am always open for suggestion and I appreciate this paper read this morning very much.

Mr. Hibbs: I would like to ask Mr. Smith under whose direction or supervision the storekeeper comes. I understand from Mr. Smith that the requisitions go direct to him. Is that as it ought to be?

Mr. Smith: The storekeeper is practically under my own control. All requisitions are made out and then a copy is sent to me; the requisition is forwarded to the merchant and a tissue copy is sent to me and entered.

Mr. Ehrhardt: We charge everything direct as it is purchased and ordered, probably the same as you do, or used to. Of course, we have a storeroom and keep a stock on hand but we make no charges nor entries from that storeroom. Everything is charged as it is purchased.

Mr. Burlington: It seems to me from inquiries made when this paper was brought up that it might be a valuable work for this association to appoint a committee to formulate a uniform system in this particular line. It is a vital question and I realize that the property with which I am connected is getting a little too unwieldy for the plan on which we have been operating our material and supply account, and I am very glad to have the privilege of listening to this discussion, because it is coming right in the line that I desire. I would like to hear some expressions on that. It seems to me that it is a valuable work that this association might take up. We have to have something to further perfect our system of accounting, and would it not be proper and wise to give this matter some attention?

Mr. Mackay: I would suggest that we might take up in each meeting a few of the necessary blanks and forms, and establish those few. We could standardize a few of the forms, and in that way gradually get the whole thing in shape.

As far as our storeroom accounts are concerned, I think I explained at the last meeting that we charge out all reconstruction work direct, the items not passing through the storeroom account at all. In all expense accounts most of the items pass through the storehouse, but where an item is purchased and sent direct to the work, for instance, oils or material for power plant, it is charged direct to the plant. We always make it a point to charge it out. Anything that goes through the storehouse is charged out at a figure which exceeds the cost sufficiently to take care of the cost of handling and to take care of the breakage or depreciation in the value. In that way at the end of the year our inventory always runs in excess of the ledger account.

Mr. Tinglan: I think however that on the intake I can give you a little light. Our requisitions are all made in duplicate. On the back of the duplicate requisition there are ruled columns for the data of the receipt of the material, the quantity, price, and if it comes in car load lots there is a place for the car initial, number and weights and a complete record up to the date of the receipt of the invoice. We use our own invoice forms, which is in duplicate, the duplicate remaining in the city railroad office, the original returning to my office. On the face of that is a place for freight charges, the initials of the man who receives the goods, the certification that they are correct as to quantity and quality and the approval of the superintendent and the account to which it is to be charged. All our purchase orders are issued in triplicate. On the back of the triplicate purchasing order is a ruling identical with that on the back of the duplicate requisition. We take the bill which is returned to our office, and keep a duplicate record of the receipt of the material and all the details that go on the back of the original. The storeroom ledger is kept in the subsidiary office. We keep a storeroom account on our general ledger for that particular office in my office. These two ledgers must balance at the end of the month. On each job the foreman gets from the superintendent what our boys call a green goods order. It is a duplicate order numbered consecutively, but in front of the number is a place left for a letter designating the class of accounts, "a" being for track, "b" for ties, and so on.

When a man comes to the storeroom with this order, the letter is put in front of it, he gives that up and receives a material sheet on which is entered all the material drawn from the storeroom. There is a place for a credit back if he returns any and a place for this order number. That is all he knows. He does not know anything about the account. He is given a number and a letter by the superintendent, and that is placed on his storeroom order. When his material is returned the proper credit is given him at the storeroom for any return, and that sheet is at once sent to the office. If it is a running job we have what we call standing orders for the track repair man and the overhead repair man, but any special job is returned as soon as it is completed. At the end of the month these are formulated and on the report which comes to my office is a charge from the storeroom for each bit of material, giving the quantity and price. From that we check up our storeroom account on our ledger. That is, in substance, the way we keep it. My record in my storehouse, I am frank to confess, is a little bit lame, and I came here with the hope that I would get some information.

Mr. Wilson: I would like to ask Mr. Barnaby one question. He said it took about three hours to post on the cards the material that was issued during the day. I thought it was your road that had the cards upon the bins.

Mr. Barnaby: That has been discontinued. It has been decided that it was easier for a man to have the cards, and get a better result than to go upon a ladder and try to post that card on the bin, more apt to get correct posting.

Mr. Wilson: Do you attempt to find all the issues of one stock and make one posting on the card, or do you make as many as may be necessary?

Mr. Barnaby: No. In analyzing the consumption blotter where it is first entered you get the entire quantity used that day.

Mr. Wilson: From this blotter, you cannot analyze your stock, but you put it down in such a way that you know what the charges are to be from the blotter.

Mr. Barnaby: On the consumption blotter is indicated the value charged to any expense account. As the orders are analyzed they are entered twice. That is, the first analysis is as to the charge that the goods are to be put to. That is indicated as the samples show there, (referring to exhibits accompanying Mr. Barnaby's paper,) the job number and the value. That is then tabulated to get the quantity of any particular material put on this consumption sheet as against that material. From that the cards are posted, so that with the quantity of goods set up on the card and the daily postings, from this analysis of the consumption blotter one can tell at a glance, as soon as these cards are posted, what is still left on hand of those particular goods.

Mr. Wilson: Then you practically analyze it twice?

Mr. Barnaby: It has to be analyzed twice practically, once for the charge and once for the quantity of goods.

Mr. Ham: I would like to ask Mr. Barnaby whether the clerks who do this storeroom accounting are subordinate to the storekeeper.

Mr. Barnaby: They are subordinate to the storekeeper and now the storekeeper is subordinate to the auditor. That is something, that, when you were there Mr. Ham, was not so.

Mr. Ham: The point is whether there is any scheme yet devised which is a check upon the storekeeper, or whether we still have to rely upon the honesty of the storekeeper. That is one of the objects of the storeroom accounts; and I am quite strongly of the opinion that it is a physical impossibility to check the storekeeper.

Mr. Barnaby: In that regard I refer to Mr. Wilson's paper. As I take it, his orders that he receives direct from his storekeepers must be certified by someone in charge. Of course, honesty in accounting finally resolves itself into whether it is the clerk who is the honest man or the auditor. At some point the honesty has got to be determined. The signing of the order under Mr. Wilson's plan is the point where the honesty has to be determined, and if he knows that that man is honest, his accounting is honest, for he takes his result, and it is a final accounting.

Mr. Ham: That is only one-half of it. The other half is the receipt of the material.

Mr. Barnaby: You have the same thing in reference to the receipt for the goods? Someone is in authority to receipt the voucher as to the goods received.

Mr. Ham: I am not criticizing the method at all. But I wish to know it is possible to check the storeroom keeper with any sys-

tem of accounts. I have found that possibly we thought we were doing this but were succeeding very poorly, and I am galled to give it up. I do not think it is practicable, for the same reason that we see an immense department store with very little of that kind of accounting; as I understand it, none at all. But we are attempting, as Mr. Suda of St. Louis, said, to keep track of all of these items, and he says that if there is a mistake on the part of his storekeeper he can locate it on the particular account; but after he has located it the question is what good it has done. The real point in this that appeals to me is whether it is wise to keep separate accounts of individual articles. I mean by that, a separate ledger account or separate accounts to show stock on hand of each article. It entails an immense amount of work. Is it necessary or can we get the same results by surrounding the storeroom itself with every safeguard, that is, as to material going in and material going out? Many of us have possibly kept accounts very carefully in storerooms where the storeroom itself was laid out in such a way that anybody could go in and help himself to material. It seems to me that it is the storeroom itself that should be watched. I would like an expression of opinion on this. I am keeping these individual accounts, and if possible I would like to do away with them.

Mr. Wilson: When I started storekeeping a number of years ago I started with the idea that you must keep an account of the different kinds of material, and I continued it for some two or three years, but give it up. At the present time the entire material in our stockroom is simply one lump of stock. Since doing so the results have been very satisfactory indeed. The material is received from the persons from whom we purchase goods and certified to on the bottom of these invoices. If you recall to mind my paper, I stated that we require everybody from whom we purchase goods to use our bill heads and not theirs. There is a place on the bottom of these bill heads for the approval of the person who receives the goods, for the approval of the head of the department who has the requisition for it, of the clerk who has entered it and the purchasing agent, who states that he ordered the goods and that the price is correct. Then all these bills are charged direct to the storekeeper, or to the storeroom. Material that is delivered is never delivered on any order or requisition signed by simply an employe of the company, but it must be by the foreman or person in charge. I think that answers practically Mr. Ham's question as to having a responsible person whom you can hold for the goods which have been issued. By having these original orders and demanding personal requisitions signed by the person in charge of the shop or department, it must be collusion between him and the storekeeper to work any mischief which it would be a difficult thing ever to guard against; or if it was a question of the receipt of goods, between the storekeeper and the person he would receive them from. That would be a safeguard which it would be difficult to provide.

Mr. J. M. Smith: In that regard there is one thing I did not mention. I have a check on the goods received, for the reason that I do not let an invoice go in the storeroom house at all. I said I had a daily report come to me of all goods received. They are given a number, each package just as it comes in on the counter, and are entered on this sheet. The requisition is referred to the merchant whom these goods are received from and then it is sent to my office; so that they do not get the invoice at all. I know that the requisition has been received by myself, and then that invoice is treated in my department, is given its proper number, and forwarded to them to check the prices; the storekeeper being the one who has purchased the goods, knows all about the prices. So that I get a full check and know that everything is received. If an invoice comes in that has not been advised of, I can call him to time, but our record shows it at once.

Mr. Harder: Following up one of the questions Mr. Ham asked of Mr. Barnaby, I would like to know how many companies in this association have the storekeeper under the jurisdiction of the auditor so far as the storeroom accounts are concerned.

A poll showed 18 where he was and 2 where he was not.

Mr. Mackay: I seem to be quite a minority here. In our company the storekeeper is really under the general manager, so that, while in a certain sense the auditor is brought in relation with it, still he is under the general manager.

Mr. Barnaby: I would think that it would be well to ask Mr. Ham and Mr. Tripp who are members of the committee appointed by the association to report on a system of account for lighting.

gas and power companies, to report to us next year as to action taken.

Mr. F. E. Smith: I move that a committee be appointed to prepare a uniform set of blanks for the approval of the association on stores, from the purchase to the inventory.

Mr. Mackay seconded the motion which was carried unanimously.

President Duffy: I will appoint on that committee Mr. Burlington, Mr. E. F. Smith and Mr. Tinglay.

There is another important matter here that should be taken care of at once. That is, the proposition to change the by-laws, as to the time and place of meeting.

It was moved and seconded that there be no change. The motion was carried unanimously.

The executive committee reported that it had held two meetings; that it had taken three mail votes, admitting 25 companies to membership; that the books of the treasurer had been audited and found correct.

The report was accepted.

The Committee on Resolutions reported resolutions of thanks to the hosts of the convention in Kansas City, which were unanimously adopted.

Mr. Wilson, of the Nominating Committee submitted the following list:

President, Wm. F. Ham, comptroller Washington Traction & Electric Co., Washington, D. C.

First Vice President, J. A. Harder, auditor Metropolitan Street Railway Co., Kansas City, Mo.

Second Vice-President, J. M. Smith, comptroller Toronto Railway Co., Toronto, Canada.

Third Vice-President, W. G. McDole, auditor Cleveland City Railway Co., Cleveland, Ohio.

Secretary and Treasurer, W. B. Brockway, assistant secretary, New Orleans & Carrollton Ry., New Orleans, La.

Executive Committee: C. N. Duffy, auditor Chicago City Ry.; C. S. Mitchell, auditor United Traction Co., Pittsburg; C. M. Hemingway, cashier Connecticut Lighting & Power Co., New York; D. E. Tripp, auditor Seattle Electric Co., Seattle, Wash.

The gentlemen recommended were elected, the secretary casting the ballot of the association.

Mr. Harder then extended an invitation to the accountants to bring their wives, sweethearts and sisters and go for a trolley ride on Friday. The party will leave from the Midland Hotel at 10 a. m.

Mr. Ham was invited to the platform, and President Duffy said: Mr. Ham, permit to turn the chair over to you and to congratulate both the association and yourself.

President-elect Ham: Gentlemen of the Association; I wish to thank you for this honor. I consider that everyone of us should be proud of this Association. Personally, I have devoted some time to it, some hard work, but for every stroke of work that I have put in I have been amply repaid. If I have done anything for the association, it has done ten-fold more for me, and I believe that any man who can come to the conventions of our association will be greatly benefitted, and his company will be benefitted. It is by coming in contact with other men in the same line of work that we are enabled to free ourselves from the dust and cobwebs which accumulate in our craniums, and I think that accountants, bookkeepers, something like school teachers, are very apt to get in ruts. Each one of you can help the association very materially by doing anything in your power toward increasing our membership, in order that it may be a representative membership. We have 98 companies, and I was very sorry that we could not have made it 100 at this convention; but if each member would take a little interest in it to see that his immediate neighbors, or the companies with which he has some influence, or can get some influence in some indirect way—if he can present the matter to them and they can be advised of the work that we are doing, I think no company will care to remain outside of our association.

I am very glad that we have decided to meet at the same time that the American Association meets, as much as anything for the reason that we are brought in contact with the general managers and the general managers are brought in contact with us. I think that the effect of that will be that our work will be more appreciated, that we will come into closer touch with the operating department, be more valuable to the street railroad work, and that

the position of accounting officer will become a more dignified and honorable one.

Mr. Moore: Mr. President, it seems to me that inasmuch as the various consolidations of street railway and traction companies have not reduced our membership, as we expected it would a year ago, and as our treasury is fairly full, it would be proper at this moment to recognize in some measure the work of our efficient Secretary. To that end, I make a motion that the salary of the secretary for the incoming year be advanced from \$200 per annum to \$300 as a recognition for his attention to duty.

Mr. Harder: I second the motion.

Mr. F. E. Smith: I would like to amend that. I do not think it is enough. I wouldn't do it for that, and I don't believe there are many here that would. I will move to amend by making it \$500.

Mr. Moore: I will accept the amendment.

President Ham: I understand, then, that the original motion is withdrawn and that the motion now before the house is that the salary of the secretary and treasurer for the present year be \$500.

The president put the question and the motion was carried unanimously.

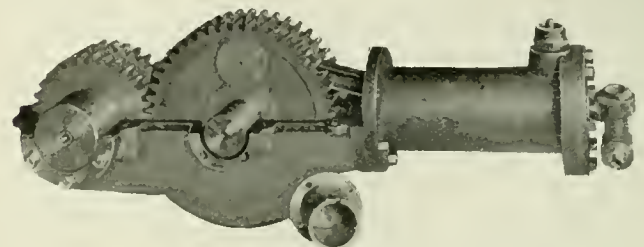
A resolution of thanks to the association's hosts in Kansas City was passed, it was ordered that the portrait of the ex-president be inserted in the published proceedings, and the convention then adjourned.

KNELL AIR BRAKE .

The Knell Air Brake Co., of Battle Creek, Mich., has a very interesting exhibit of its apparatus at space No. 26 B, which has attracted much attention. The accompanying illustration shows a view of the Knell axle-driver compressor with the upper part



of the casing removed. The gear case is dust proof and is partially filled with oil, the movement of the crank carries the oil to every part of the mechanism insuring the thorough lubrication of the crank pin, cross head pin, cylinder and gears. At the front end of the cylinder is an automatic pressure regulating valve; when the pressure of the main reservoir on the car has reached



the fixed maximum, the compressor cylinder is connected with the atmosphere, and the piston then works against atmospheric pressure only till the reservoir pressure falls to the determined minimum. The Knell system of air brakes has been in use for some months by the Michigan Traction Co., of Kalamazoo, and has given satisfaction.

JEWETT CAR CO.

The Jewett Car Co. has recently completed its new works at Newark, O., and the whole plant is now running at full capacity. The company in designing the new plant carefully arranged the various buildings and yards so as to reduce the cost and labor of handling the material as much as possible. The various buildings comprise a drying kiln 40 x 100 ft., wood machine and cabinet shop with a floor area of 10,600 sq. ft., four erecting and finishing

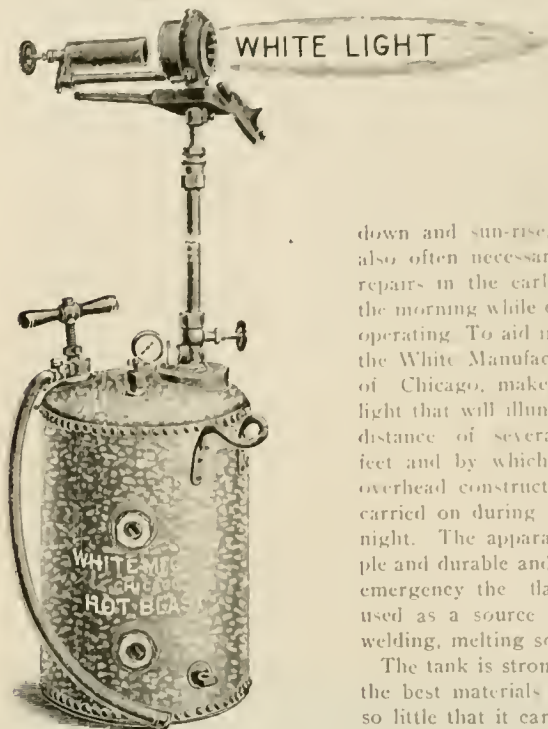


shops having an aggregate area of 58,600 sq. ft., blacksmith shop 60 x 80 ft., machine shop, storeroom, office building, and lumber sheds. All the shops are equipped with the most improved types of machinery, arranged for economy of time and labor. The shops are lighted throughout with electricity, and the works have a complete water and sewer system.

The Jewett Car Co. has a most enviable reputation for turning out the best-built cars to be found on the market and has grown

FOR NIGHT CONSTRUCTION WORK.

In these days of injunctions and sharp legal maneuvers the success or failure of a promising street railway enterprise sometimes depends on the ability of a company to get ahead of the other fellow by building stretches of track during the hours between sun



down and sun-rise, and it is also often necessary to make repairs in the early hours of the morning while cars are not operating. To aid in this work the White Manufacturing Co. of Chicago, makes a blast light that will illuminate for a distance of several hundred feet and by which track and overhead construction can be carried on during the darkest night. The apparatus is simple and durable and in cases of emergency the flame can be used as a source of heat for welding, melting solder, etc.

The tank is strongly built of the best materials but weighs so little that it can be carried without difficulty by two men and its capacity is large enough to keep the flame going for several hours without recharging. A portable blast light would seem to be an indispensable part of the equipment of an up-to-date road.



A POPULAR TYPE OF CAR BUILT BY THE JEWETT CAR CO.

to be one of the largest concerns in the country. Among recent orders are 30 cars for the South Side Elevated, Chicago, and cars for the Steubenville, Mingo & Ohio Valley Traction Co.; the Cincinnati, Lawrenceburg & Aurora Ry.; the Detroit, Monroe & Toledo Ry.; the Buffalo & Hamburg Ry. The illustrations herewith show exterior and interior views of a very popular style of double truck car for city service.

The officers of the company are: President, W. S. Wright, Wheeling, W. Va.; secretary, H. S. Sands, Wheeling, W. Va.; manager and treasurer, A. H. Sisson; superintendent, Neil Paulson.

FENDER FACTS.

It is interesting to note the steady change in sentiment during the past few years as regards the question of fenders; many managers who were once opposed to their adoption are now equipped with safety devices. There has been however a good reason for this, for not a little of the opposition to the fender was founded not on the theory but the practice. In other words, when the fenders available were unmechanical, there was good reason to believe they were able to do as much harm as good.

The fact that there are on the market only two or three fenders where formerly there were nearly a score bears out the principle of the survival of the fittest. Some of them certainly had no claim to warrant their existence.

Col. A. P. Woodworth, president of the Consolidated Car Fender Co., Providence, has given more practical study to the fender problem than any other person, and has brought to that study of conditions and requirements a mechanical experience which has earned for the Providence fender the indorsement of the best managers. That this fender is in daily use on 7,000 cars on 91 roads in this country is the strongest indorsement of their merit. Further investigation will show these roads to include the largest in mileage and carrying capacity, and operating under all the varying conditions from a small hamlet on an inter-urban line to the great Metropolitan system in New York City.

Manager Lardner, of the Davenport-Rock Island lines, said yesterday as he discussed fenders with an interested group: "We are using the Providence fenders, and while we have had them only a few months they have already saved us more than the entire cost of equipment. We consider them one of the best investments we ever made." The same testimony is furnished by a dozen of managers.

P. & B. PRODUCTS.

The Standard Paint Co., of New York and Chicago, has at spaces No. 77 and 78, a full line of its materials including "electrical compound," paints for the preservation of iron and wood, water-proof insulating tape, P. & B. armature and field coil varnish,

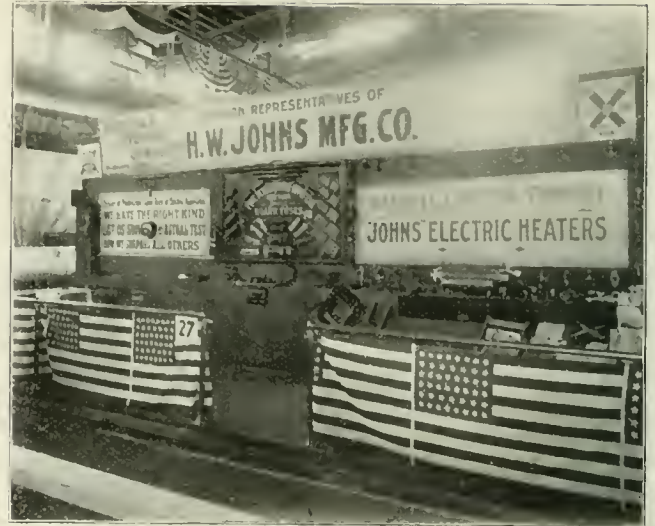


"Giant" insulating papers and "Ruberoïd" motor cloth. It also has samples of P. & B. "Ruebroid" roofing which has been very extensively used for covering street railway and electric light plants, as it is not affected by the fumes of gas, noxious vapors or steam.

One feature of the exhibit is a fine oak counter with trimmings, which the company will use as a permanent stand in the future whenever it makes exhibits at conventions or expositions. Messrs. J. C. Shainwald and J. F. Hicks are extending a cordial welcome to all visitors.

MANVILLE COVERING CO.

The Manville Covering Co., of Chicago, western representative of the H. W. Johns Manufacturing Co., is displaying the following goods in a tastefully arranged booth at space No. 27: Moulded mica line insulators, clips, ears, and other overhead materials; "Noark" fuses and cut-outs; "Vulcaheston" insulating sheets and insulating pieces for motors and controllers; and "Johns" electric car-heaters. Practical demonstrations of the noiseless and safe operation of the Sach's "Noark" fuses are made and all visitors to the convention are cordially invited to make themselves at home at the company's booth. Those in attendance are Messrs.



A. Hall Berry and Joseph Sachs, of New York, D. T. Dickson and J. W. Perry, of Philadelphia, H. D. Bayne, of Pittsburg, all representing the H. W. Johns Manufacturing Co.; E. B. Hatch, of the Johns-Pratt Co., Hartford, Conn., and S. H. Finney, manager electric department, Manville Covering Co., Chicago.

CONCERNING TRUCK PATENTS.

Kansas City, Mo., Oct. 18, 1900.

Editor Review: I have seen in your paper of to-day, page 49 a letter written by Mr. Peckham in connection with a patent suit which is now in the courts between the Peckham Truck and Motor Co. and ourselves. I do not want to take up the time of your readers in a long discussion on a subject of this kind. The question of the validity of our patents is one the courts will properly decide, as they have just done in sustaining our patent for the combination of spiral and plate springs for single trucks.

There are, however, one or two items in Mr. Peckham's letter in which he is evidently not fully conversant with the situation. In the latter part of his letter he cites the fact that his company was the pioneer on short wheel base trucks. The facts of the case are these, we sold the first of these short wheel base trucks to Mr. David Young, of the North Jersey Street Railway Co., in whose employ Mr. Febelacker had been. Mr. Febelacker on hearing of this called upon Mr. Young and stated to him that he had made a mistake in purchasing a truck of this kind, and that he would in a very short time have to put them in the scrap heap. It was the successful operation of these trucks, sold Mr. Young by the Brill company, that caused Mr. Febelacker to go into the matter and design a truck on the same principles, using the cast steel sides and other things and naming it the Jersey Street Railway's special. These facts are all matters of record and are easily substantiated.

We do not intend to make an endless discussion upon matters of this kind which are properly between the Peckham Truck Co. and ourselves, but simply make this statement of facts, as we think it is just that our purchasers should know the exact status of the case.

G. MARTIN BRILL,
Pres. J. G. Brill Co.

General Otto H. Falk, vice-president of the Falk Co., is in attendance. The General seemed to be having a splendid time on the trip to Fort Leavenworth yesterday renewing many acquaintances.

Mr. William Silver, of New York, is also here. He began going to conventions 17 years ago, but doesn't look it. The boys were wondering if his side partner, Ed. Lawless, had quit them, but Silver says Ed. was too busy taking orders to come.

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VOL. X. SATURDAY, OCTOBER 20, 1900. No. 4.

LIVING PICTURES.

In the October souvenir edition of the "Review," among our collection of good-looking men appeared the portraits of Superintendent Satterlee and Electrician Grover, of the Metropolitan, this city. We expected an immediate and large increase in the subscription list and were not disappointed. But some unmitigated Chicago scoundrel—probably some supply man—plotted to bring about an estrangement between our above named good friends and ourselves. What did he do but cut out the portraits, and send them to the Chicago Chief of Police with a statement that these were two dangerous characters who were planning to attend the street car convention in Kansas City, and were liable to get away with the whole shooting match.

The aforesaid chief promptly forwarded the pictures and advices to the Kansas City chief, who detailed a new man to lay for them. This sleuth polished up his eagle eye, and taking his life in one hand and the pictures in the other, concealed himself behind a trolley pole. Presently he spied a strong resemblance to the portrait, but the suspected one looked so much like Mr. Satterlee he paused to hesitate. Inquiry confirmed his guess so he let his victim escape. Soon after he caught a glimpse of Grover, whom he did not know, and anxious to bag somebody to take home to the chief he sailed in. Grover claimed exemption on account of having served on a petit jury some years ago, likewise that one of the motors on 6th Street was sparking badly and needed immediate attention. He finally bought the cop off and since he induced John O'Keefe not to let any more minions through the door, is breathing freely again.

Now Grover says it is up to us and we therefore hereby offer a year's subscription for information which will lead to the apprehension of the guilty party.

VAUDEVILLE AT CONVENTION HALL.

The vaudeville show was a hummer and witnessed by 3,000 persons. The whole convention was present in nice front seats and the others were residents of the city. The entertainment began at 2 o'clock and was continuous until 4:30. Like the supply men, it didn't stop until the performers were through. The program included singing, dancing, tumbling, trick dogs, etc. At the close Secretary Penington proposed three cheers for the supply men, which were given with a will, also a tiger.

The ladies turned out in full force and occupied the boxes and reserved seats. The orchestral music was excellent.

As a leader to the show a brass band of 20 pieces marched through the Coates and Midland, and several business streets. G. E. Pratt acted as drum major. In the procession were a group of negroes wearing heads of elephants and monkeys. Then a lot of signs, one of which was 30 ft. long telling all about the show. This colored contingent was headed by Elmer Morris. The chief of police in a fierce uniform was John Granger.

Bleacher Barnard, 78 inches high, rode the donk, 36 inches high. It was fun for Barnard, but tough on the donk. On reaching the hall a band concert was given.

The menu card for the banquet was very handsome; the front cover symbolized the start and was engraved in gold and several colors. The back cover showed the finish in plain black and white; aside from the menu proper, the intervening pages contained the list of officers and committees.

SHALL SUPPLY MEN ORGANIZE?

The Time Considered Ripe for Such an Association—Benefits to be Derived—Exhibitors Can Handle the Problem More Easily Than Street Railway Officials—Interviews With Leading Supply Men Show Great Interest in the Scheme.

"The time has come when we need an organization of the supply men to take the burden of the exhibit hall and its contents off the shoulders of the local officials. The display has now reached mammoth proportions and is constantly growing. We know what we want and how to handle the innumerable details connected with the show much better than any one who has not been through the mill."

It was Maj. Evans, of the Lorain Steel Co., one of the most prominent of the supply men and who has had years of experience in exhibiting at our conventions who made the foregoing remark as the curtain rang down on the vaudeville show in Convention hall yesterday afternoon. Several exhibitors, who were present, instantly voiced their approval, and at their request the "Review" representative undertook to ascertain the views of as many others as could be reached in the limited time remaining before the banquet. The result of this canvass is given, and of all the persons interviewed only three—who requested not to be quoted—were very much pleased with the idea. These three took pains to state they were not opposed to the idea, but not prepared to endorse it until they had either taken more time to consider or know more of the details.

The situation is this: When exhibits were few and small 15 years ago a small room, usually one, commonly used by travelling men to show goods in the headquarters' hotel, was ample for the display. Then the builders began to bring a few cars which were set out on a piece of temporary track in the street in front of the hotel, gradually the idea was expanded and the display increased until a store room was needed. Usually one could be found near the hotel. At Pittsburg, no other space being available, a river barge was anchored three blocks from the hotel and the display made on board. When electricity became a practical motive power a big jump was made and it became necessary to use skating rinks and similar ground floor structures which afforded large space. From the drummer's room at the hotel which cost nothing to the present day requirements which are so great as to bar some cities out of being considered for convention, has been a long time. In the early days the local roads furnished the banquet free, but when it became necessary to pay from \$1,000 to \$2,000 for an exhibit building the burden was too heavy. Now the inviting company furnishes the hall, turns it over to the association to rent out, and entertains in other ways than the banquet which is managed by the association.

With the steadily increasing number of exhibits which at Chicago were valued at \$250,000 there came an immense amount of detail work for some one on the ground to do. Changes had to be made in the building; stronger floors built; wide doors cut; wires run for light and power; arrangements for teaming hundreds of tons of appliances and machinery; carpenter work which in the aggregate would build a house, provided. Sign painters, electricians, machinists, printers, decorators and painters, furniture men and florists, telegraph operators, messengers, and telephones. All these now have to be in readiness. Then the correspondence involved between the convention city and exhibitors, covering several weeks and involving the dictating of hundreds of letters, all these things have followed in the wake of the expansion of the exhibit idea, which, within the experience of the writer, was limited to a few rope harness, patent horse medicine and a few bell punches.

The burden of the work alluded to above naturally falls on some railway official, usually the manager of the inviting road. He is always a busy man and the additional burden which the convention imposes is little realized by any but those who have been through it. The supply men feel they should not ask it and are perfectly willing to relieve the manager of his work.

Another feature which handicaps the local committee on exhibits is that the meeting goes to a different place each year, and the committee there has it all to learn just as some one did in another city the year before. It is asking a good deal in spite of the willing spirit in which the work has always been done.

The plan now proposed is to organize the supply men next

year at New York and put things on a permanent and uniform basis. Elect a standing committee to take entire charge of the hall and everything in it except the meeting rooms of the two associations. The committee would engage some experienced, thoroughly competent man for several weeks in advance of the convention. He would take charge of affairs. Would make the contracts in the name of the supply men's Association for all teaming, labor, power, etc. Each exhibitor would feel perfectly free to use this man without feeling they were imposing on the good nature of a busy manager. If anything did go wrong they need not hesitate to enter a complaint to their own committee and get an adjustment. This article is not written in any spirit of criticism—far from that; nor have there been any shortcomings here at Kansas City to suggest it. In all our convention experience there has never been less friction and annoyance than here, but there has been in the past and is liable to be in the future. There are many things which bear down on the exhibitor which never come to the knowledge of the railway people. For instance: the local committee contract for carpenter work. They select the best they can. An exhibitor puts in a requisition for a platform and booth. The order is turned over to the contractor who then deals exclusively with the exhibitor. Through some carelessness in book-keeping we will say, and during past years many times with direct intention the contractor takes advantage of the emergencies and necessities of the exhibitor and tucks an extra \$10 or \$20 on his bill. The exhibitor feels a reluctance to complain to the local railway manager with whom he may have, or hopes to have dealings, so he says nothing pays his bill and sometimes contents himself with cuss words. The illustration is no fairy tale. It goes all along the line of teaming, wiring, sign painting, and down the whole list.

We do not mean to say that every exhibitor gets stuck on every one of the above items, though several times it has been nearly as bad as this. But the trouble lies in the lack of any authority to whom the exhibitor feels at liberty to appeal. With an association, its superintendent is the association's hired man, and bound to take up such matters and adjust them. It is no favor asked of him—he is paid to attend to just such things.

Another advantage would be the possibility of adopting and enforcing a standard set of rules as to the size, appearance and location of signs, which at present are very nondescript. Signs of all sizes and previous conditions of servitude touch ends with the one inlaid with gold letters and polished wood, canvas, tin, boards, "any old thing" goes. To bring these signs into some sort of uniformity would not cost anybody very much, and would improve the effect as a whole several hundred per cent. One exhibitor would not be allowed to build a canvas wall to shut out from view somebody else, sometimes a competitor. Signs are necessary and lots of them, but there are signs and bill boards.

In the question of freight to convention a marked saving can be made. As an association its committee is in position to deliver to the road offering the best rates and time shipment, practically the whole freight, and secure for its members concessions which their individual shipments would not warrant. For instance all the shipments from New York to Chicago last year could have been lumped and sent over one road with several routes to choose from.

The exhibitors complain bitterly at the lack of attention paid them by the railway delegates. Organize and send a committee upstairs and they will receive a ready bearing and this matter can be improved. Tell the railway body what it has cost to do all this; and that we are getting to a point where the game is hardly worth the candle. When they understand these things they will devote more time down stairs.

And while the committee is there maybe the railway people would like to arrange for a little less noise during the business sessions, so those sitting back of the front 3 rows of seats could hear the discussion instead of, as this week, getting it by the lip reading method. Now the exhibitors did not intentionally intrude on the deliberations, but if they had only gone up in the tent room a few minutes we believe they would have hurried back and turned on some quiet.

The foregoing touches only on the outer edges of many reforms, improvements and advances possible with organization. The single exhibitor has no voice at present in the present associations, nor does he ask it, and he could not go as such. But as an exhibitor his committee can go, leaving all individuality below, and protest, request and suggest with dignity and propriety.

In the steam road field such an organization has been in existence for years, and has contributed in a large measure to the success, strength, longevity and pleasure of the parent association. There is no reason why the same should not be repeated in our case.

The following interviews were all it was possible to secure in the limited time. Almost without exception the person interviewed insisted that it be distinctly understood what he said was in no spirit of criticism on the management of the local committees here in Kansas City. Chairman Satterlee was accorded high praise. There has never been less friction and annoyance than here. It is the future and the expansion of the exhibit feature that it is desired to provide for.

Maj. Evans: I am most heartily in favor of an organization of the supply men. There can be no possible objection and the advantages are numerous. They have been exhibiting for years, know what they want better than anyone else, and have abundant talent among their numbers to form an executive board which will be acceptable to all. There are scores of things which we can do as an organization which is impossible as individuals, and I have been in favor of one for years.

Elmer P. Morris: I do not think it fair to put the burden any longer on the local committee of exhibits. Since the display has grown to such proportions it really requires the entire time of one man on the ground for several weeks, and we ought not to ask the manager of a big railway system—always a busy man—to lay aside his work to attend to this. As an organization we can regulate the size of signs and many things we ought now to do. We should of course work in perfect harmony with the American Association—in fact in conjunction with it, but we can do many things for ourselves better than they can do it for us. We are not asking for the revenue the association receives for floor space but would like to have the handling of details, and in short the management of the exhibit hall.

W. R. Garton: I think we should by all means have a supply men's association.

W. S. Rugg, Westinghouse Co.: I think it would be a good move to make.

Geo. D. Casgrain, Griffin Wheel Co.: There ought to be a uniform system for many features of exhibiting which can only be secured through organization. I am in favor of it.

G. R. Scrugham, Creaghead Engineering Co.: I consider an organization of the supply men a practical necessity. It would be a great relief to the local committee and the obliging secretary of the American Association, and would result in good not only to the convention but to the supply men themselves.

J. V. Titus, Garton-Daniels Co.: I am heartily in favor of it.

John Taylor, Taylor Truck Co.: I am very much in favor of it if we could arrange so that day times the exhibits could be viewed. One day is not enough for everybody to see each exhibit. You have to interview a great many people individually. The exhibitors here have spent easily \$50,000 in making this display and it is a lot of money and deserves more attention. The time now allotted is too short. With an organization we could have our committee represent us before the Railway Association and present our claims, and I hope secure arrangements which would be better than ever before.

Arthur Davis: I want it. We need a committee to arrange freight matters, and other things of mutual interest.

Mr. Garl, Garl Electric Co.—I favor it with a standing committee to make arrangements and attend to details, such as signs of uniform size, which will prevent one exhibitor cutting off the view from another. I favor smaller signs than now used.

General Electric.—We heartily approve of the plan and will be glad to join in any arrangement satisfactory to all.

H. T. Bigelow, Hale & Kilborn.—Such an association will do much to facilitate the work of exhibitors, and relieve the local committee of a multitude of details.

John High, Pantasote Co.—Those are my sentiments.

H. J. Davies, National Carbon Co.—That is what we ought to have by all means. The right kind of an organization, rightly officered and conducted, would be a great thing, and we have plenty of good men from whom to choose.

E. Peckham, president Peckham Co.—I have always been in favor of just such an organization, and it is something which should have been done years ago. I am heartily in favor of it and hope

something will come of the agitation this time. The exhibitors certainly do not receive the consideration to which they are entitled. These exhibitors have gone to thousands of dollars to present something instructive and interesting and while we receive our share of attention I speak of the display as a whole and express the universal opinion that the program should be made to allow much more time in the hall. Many have told me they were tempted never to make another exhibit, and others are taking small spaces than formerly. I appreciate the fact that this is a condition which has been a matter of growth and is not the result of any one to intentionally slight the supply men. But that makes it none the less disappointing to those who have gone to much expense and trouble to provide something interesting. We need an organization which can be represented by a committee and secure the recognition which the exposition deserves. The present time allowed us is altogether too short.

Geo. C. Bailey, Roebbling Co.—Such an organization would be conducive of great good to the supply interests, and reduce expenses.

Victor Angerer, Wharton Co.—If properly organized and managed it would be a good thing. If the majority want it I am with them.

D. A. Johnson, Jos. Dixon Crucible Co.—The supply men's interests are now so large in these conventions they should get together and can save money and improve the display by so doing.

Max Berg, McGill, Pomeroy & Berg.—That's just what we need. Let us have it.

E. S. Nethercut, Paige Iron Works.—Yes, I favor such an organization. It would find plenty to do and everybody would be benefited.

Consolidated Rail Joint Co.—We heartily agree with the plan as proposed to us.

Consolidated Car Heating Co.—We are in favor of the plan to form such an organization.

Chas. W. Cobb, Chicago Mica Co.—An excellent idea. I would like to see a uniformity in signs which should also be placed in a line and at a uniform distance from the floor.

J. W. Perry, H. W. Johns Co.—It is well worth taking up. Would relieve the local committee and result in a more systematic arrangement all around, and facilitate matters for everybody.

T. C. White, Central Union Brass Co.—A good thing; push it along.

G. R. Pratt, Star Brass Works.—By all means. Have something along the line of the M. C. B. supply men's association. That has been a success for years. I will gladly bear my share of any work or expense.

J. R. Wiley, Standard Underground Cable Co.—I think this exhibit business should be governed by an organization of its own, and so done would result in benefit all around.

F. A. Estep, R. D. Nuttall Co.—I am in favor of the plan. Such an organization, with its executive board or restraining committee, would make another place of our annual display. Heretofore and now there is a heterogeneous mass of signs of all sizes and colors. Such a motley collection would be classed in New York as belonging to a county fair. I favor an association of supply men.

D. B. Dean: Yes, I favor an organization if everybody will go in and unite on a plan, and there is no reason why we should not do so. Others have with good results.

R. H. Ham, Ham Sand Box Co.—Am in favor of what is outlined and think it would be a good thing.

Scott H. Blewett, American Car & Foundry Co.—The booths should be more uniform, the signs of a uniform height, lettering of a uniform size and color. So far as possible exhibitors of the same class should be grouped together. These and many other desirable improvements can be brought about by a supply men's association and would greatly improve appearance and save money. It has been done for years in the steam road field and their display is not so large as this.

Harold P. Brown: The plan as stated to me is needed and should be carried out. There is a great deal to be gained in many ways, and as an association we are in a position to secure many concessions that comes to large propositions and are denied individuals. It need not be a cumbersome affair, and its annual meeting consume little time, but the possible results will be recognized by everyone who makes an exhibit. I hope to see the organization effected.

F. W. Edmunds, Q. & C. Co: I favor your plan. We have the

same thing in steam road supplies in the Trackmasters' Association, the Master Car Builders, and also Master Mechanics Associations and have had for years. It is simply indispensable in those lines. The exhibiting concerns are taxed pro rata on their space or booths and the fund collected the first day by the treasurer. The committee thus have a fund for use in case of emergency without going round with the hat. In these conventions there is no local entertainer as in the case of the street railways, and it devolves upon supply men to provide carriage drives, flowers and theatre parties for the ladies. I assume the entertaining street railway company would always want to entertain as heretofore, therefore the necessary expenses of a street railway supply men's association would be nominal, although I think the exhibitors have always stood ready to contribute to the American Association if their help had ever been needed. There is usually some surplus left which is paid back pro rata to the exhibitors. For example our tax this year was \$39, and we were rebated \$7 after the convention which lasted a full week, closed. The committee is elected each year, does its work without friction and everybody is satisfied. It contracts for all the usual hall expenses, teaming, carpenters, etc., and secures low rates for the whole job. Each exhibitor is charged for what he gets.

The supply men held an annual meeting for election and any other business and this takes place during one of the business sessions of the main association. The two organizations are entirely separate, but the committee from the supply men can always take up and arrange any desired features with the main association. The plan has worked like a charm for years, and there is no reason why our supply men should not work together on the same basis.

W. H. Gray.—It's a good thing if we can get the right kind of men in control. I should favor a membership vested in companies or concerns, so that the large concerns cannot come in and vote 10 or 15 representatives against an equal number of small firms with only one representative present. There should be a committee elected annually from the members, of say three or five to carry out the work of the association along the lines of a policy decided by the members. If the plan is carefully matured and can be presented for action at next year's convention there would be something tangible to act on, and an intelligent action taken on the advisability or otherwise of effecting the association. I hope to see it worked out.

J. T. McMichael, Atlas Rail Joint.—Yes, I am in favor of the organization.

W. J. Cook, McGuire Co.—Mr. Cook was not interviewed but has so often expressed himself to the writer that we take the liberty of committing him in good earnest. His long experience in the steam road supply associations has convinced him of the benefits to be derived.

Only five street railway men were interviewed but each one was pleased with the idea.

Walton H. Holmes said, speaking as a railway man and not as an officer of the American Association that he considered it a good thing and would enable the supply men undoubtedly to secure many improvements which the local street railway men would not be likely to think of. If the supply men took hold of the matter it would be ably conducted.

T. C. Penington, speaking for himself, expressed the same views.

F. G. Jones, vice-president of the Memphis street railway, and also a member of the executive committee for the past year, said: From now on the supply men and the street railway men will be more closely drawn together. I think it is an excellent idea and hope the boys will carry it out.

W. Worth Bean hoped the organization would be effected. He recalled the time when there was considerable discussion about the supply men coming in as associate members. This was at Montreal when the boys offered to raise the debt of the association in full, a matter of some \$4,000. He urged them at that time to organize one of their own, and has wondered why it was not done long ago.

The last interview was with W. W. Satterlee, chairman of the local committee of exhibits. He has worked night and day and Sundays for nearly a month past, and the result of this has been evident in the rapid and systematic installation of exhibits. He has good reason to be proud of his efforts, and every supply man is grateful and appreciates his work. Mr. Satterlee expressed himself as heartily in favor of the new plan. He was sure the local railway people wherever the convention met would feel the same

way, and be only too glad to be relieved of a most trying position, and one which really requires more of a manager's time if rightly done, than he can spare in justice to himself. He appreciated highly all the pleasant things which exhibitors had said expressive of satisfaction at his efforts, and desired to thank them one and all through the "Review."

Mr. F. W. Darlington had parlors at the Coates House and was kept busy answering questions about the electric fountains which he makes for street railway parks and pleasure resorts. Among the places where Darlington fountains are installed are Willow Park, Philadelphia. The Plaza, Brooklyn, Schenley Park, Pittsburgh and Crystal Palace, London.

TRIP TO THE HEIMS' PLANT.

One of the most enjoyable entertainments provided yesterday was the trip to the plant and park of the East Side Electric Railway Co., better known locally as the Heims' Line. Special cars were in waiting at 5th and Walnut Streets, the city terminus, at the appointed time and a large number of the railway men took advantage of the opportunity to inspect the road. After an enjoyable ride the visitors were welcomed by the superintendent, Mr. W. O. Hands, who first conducted them through the large brewery of the Heim Brothers. Later the guests were introduced to the Messrs. Heim and then visited Electric Park and the power house. The electric fountain at the park was very interesting because of its mechanical simplicity, notwithstanding that it is equipped for living picture work as well as the ordinary water and color effects of such fountains.

The power house and line were described in our monthly issue for October. Leather purses were the visible souvenirs brought away by the visitors.

HAM IS ALL RIGHT.

The cog slipped again yesterday and the type setting machine made us say of President Ham of the Accountants' Association that "a better selection could have been made." Hereafter in printing in a strange garret we shall NOT construct our sentences so as to give the machine operator or the cub-editor any such chance.

D. B. Dean has accepted charge of the western territory for the J. G. Brill Co.

The Accountants were greatly disappointed at the unavoidable absence of J. F. Calderwood, of Minneapolis.

A very practical and unusual souvenir is being given out by Hanna & Gray. It is a record book, good for 21 years, for managers private use, providing for comparative records of every department of the business. The compilation is dedicated to the Accountants' Association and built along standard lines. Copies are being sent to managers with their name in gold on the cover. It is the only work of the kind in print, and is edited by a prominent street railway accountant.

The Brill Co. distributed a neat and serviceable fountain pen, which is much prized by recipients.

We are pleased to recognize the excellent work rushed out for us by the Kansas City engraving firm of Teachener & Bartberger. Quick work did not seem to injure quality. The same should be said of our printers, the Hudson & Kimberly Publishing Co.

The Knell Air Brake Co. distributed flowers to the ladies who attended the Convention Hall vaudeville.

After New York got what she came after, she was obliged to take an early train and could not attend the banquet.

The Electrical Installation Co., of Chicago, did a great deal of the track and overhead work in Kansas City. The work is all labelled and will bear inspection. For further particulars apply to J. A. Brett or F. H. Fitch, who are in attendance.

THE BANQUET.

The Kansas City Convention Closes in a Big Blaze of Glory and a Gale of Eloquence—President Roach Being Called Home, on Business, Vice-President Rigg Presides—About Three Hundred Present.

The hall was a scene of beauty, decorated as it was with bunting, and the tables were covered with ferns and cut flowers.

There can be no doubt but that the banquet of last evening was the liveliest function of this nature in the history of the association. President-elect Holmes believes that there is nothing like music and song to put a company in good humor with themselves and the world and he provided for this accessory in abundance, and with the happiest results.

One of the most novel as well as enjoyable features of the entertainment was furnished by 25 members of Epperson's Megaphone Minstrels. This organization numbers about 125 members, all of the most prominent men in Kansas City; it takes its name from the father of the idea, Mr. U. S. Epperson. This organization can always be relied upon to help Kansas City out of any difficulties, thus when Convention Hall was burned in April last the Minstrels were among the first to step into the traces. It is proper to mention here that President Holmes was an active member of the building committee.

A number of selections were rendered by the Minstrels and also by a quartette of their number.

At 10 o'clock the Virginia quintette, consisting of President Holmes, H. Arnold, F. Fosha, Dr. Walter Jackson and J. M. Sessions sang "Old Fashioned Home."

The entire company was at all times ready to join in the chorus, and grasped the spirit of Mr. Holmes so that the waiters usually walked to ragtime.

At 11 o'clock Vice-President Rigg mounted the platform of the car behind his chair—"Kansas City, 1900"—and announced that President Roach had at 5 p. m. appointed him as conductor of the car and requested that he get a good motorman. He then introduced D. B. Holmes to act as toastmaster.

Mr. Holmes: Ladies and Gentlemen, you may well appreciate my embarrassment at being called upon to conduct these exercises to their conclusion, under the circumstances which have been mentioned by the gentleman who has just preceded me. I was about to say that no one could regret more than I the absence of the distinguished retiring president of this association this evening and upon reflection I am convinced that all of my auditors will regret it more than I do.

Before we proceed with the program of toasts, I desire to say in behalf of Kansas City, that all of its inhabitants feel highly honored by the distinguished association which has assembled in its midst, and which is this evening concluding its deliberations. While we feel honored in that respect we feel still more honored in the fact that one of our own fellow citizens has been selected to preside over your association during the ensuing year. (Great applause.) Surely no higher compliment could have been paid to our city and surely none could be more appreciated than it will by all of us. (Applause.)

You have heard the praises of Kansas City by our distinguished mayor in welcoming you in our midst, and I will not undertake to repeat any of the good things which he said. I think you are ready to hear the words of wisdom and of wit which are to be made before you at this time, and that you would prefer to listen to the speakers who are to respond to the toasts than to any extended remarks from me.

The first toast to be responded to this evening is that of "Looking Backward." It is not a very pleasant thing for most of us to look backward—many of us have regrets and reminiscences which are not altogether pleasant things under all circumstances; but I have to say, ladies and gentlemen, that we have with us this evening a man who, if anybody, can make it pleasant for us to look backward; and I have the pleasure of introducing Mr. W. S. Gilbert, who will now address you on the toast "Looking Backward."

Mr. Gilbert: Mr. Toastmaster, Ladies and Gentlemen: It would be intensely interesting to know many things about the daily life of our ancestors which the stately muse of history has failed to chronicle. You who are assembled here tonight would like to

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LIVING PICTURES.

In the October souvenir edition of the "Review," among our collection of good-looking men appeared the portraits of Superintendent Satterlee and Electrician Grover, of the Metropolitan, this city. We expected an immediate and large increase in the subscription list and were not disappointed. But some unmitigated Chicago scoundrel—probably some supply man—plotted to bring about an estrangement between our above named good friends and ourselves. What did he do but cut out the portraits, and send them to the Chicago Chief of Police with a statement that these were two dangerous characters who were planning to attend the street car convention in Kansas City, and were liable to get away with the whole shooting match.

The aforesaid chief promptly forwarded the pictures and advices to the Kansas City chief, who detailed a new man to lay for them. This sleuth polished up his eagle eye, and taking his life in one hand and the pictures in the other, concealed himself behind a trolley pole. Presently he spied a strong resemblance to the portrait, but the suspected one looked so much like Mr. Satterlee he paused to hesitate. Inquiry confirmed his guess so he let his victim escape. Soon after he caught a glimpse of Grover, whom he did not know, and anxious to bag somebody to take home to the chief he sailed in. Grover claimed exemption on account of having served on a petit jury some years ago, likewise that one of the motors on 6th Street was sparking badly and needed immediate attention. He finally bought the cop off and since he induced John O'Keefe not to let any more minions through the door, is breathing freely again.

Now Grover says it is up to us and we therefore hereby offer a year's subscription for information which will lead to the apprehension of the gully party.

VAUDEVILLE AT CONVENTION HALL.

The vaudeville show was a hummer and witnessed by 3,000 persons. The whole convention was present in nice front seats and the others were residents of the city. The entertainment began at 2 o'clock and was continuous until 4:30. Like the supply men, it didn't stop until the performers were through. The program included singing, dancing, tumbling, trick dogs, etc. At the close Secretary Penington proposed three cheers for the supply men, which were given with a will, also a tiger.

The ladies turned out in full force and occupied the boxes and reserved seats. The orchestral music was excellent.

As a leader to the show a brass band of 20 pieces marched through the Coates and Midland, and several business streets. G. E. Pratt acted as drum major. In the procession were a group of negroes wearing heads of elephants and monkeys. Then a lot of signs, one of which was 30 ft. long telling all about the show. This colored contingent was headed by Elmer Morris. The chief of police in a fierce uniform was John Granger.

Bleecher Barnard, 78 inches high, rode the donk. 36 inches high. It was fun for Barnard, but tough on the donk. On reaching the hall a band concert was given.

The menu card for the banquet was very handsome; the front cover symbolized the start and was engraved in gold and several colors. The back cover showed the finish in plain black and white; aside from the menu proper, the intervening pages contained the list of officers and committees.

SHALL SUPPLY MEN ORGANIZE?

The Time Considered ripe for Such an Association—Benefits to be Derived—Exhibitors Can Handle the Problem More Easily Than Street Railway Officials—Interviews With Leading Supply Men Show Great Interest in the Scheme.

"The time has come when we need an organization of the supply men to take the burden of the exhibit hall and its contents off the shoulders of the local officials. The display has now reached mammoth proportions and is constantly growing. We know what we want and how to handle the innumerable details connected with the show much better than any one who has not been through the mill."

It was Maj. Evans, of the Lorain Steel Co., one of the most prominent of the supply men and who has had years of experience in exhibiting at our conventions who made the foregoing remark as the curtain rang down on the vaudeville show in Convention hall yesterday afternoon. Several exhibitors, who were present, instantly voiced their approval, and at their request the "Review" representative undertook to ascertain the views of as many others as could be reached in the limited time remaining before the banquet. The result of this canvass is given, and of all the persons interviewed only three—who requested not to be quoted—were very much pleased with the idea. These three took pains to state they were not opposed to the idea, but not prepared to endorse it until they had either taken more time to consider or know more of the details.

The situation is this: When exhibits were few and small 15 years ago a small room, usually one, commonly used by traveling men to show goods in the headquarters' hotel, was ample for the display. Then the builders began to bring a few cars which were set out on a piece of temporary track in the street in front of the hotel, gradually the idea was expanded and the display increased until a store room was needed. Usually one could be found near the hotel. At Pittsburg, no other space being available, a river barge was anchored three blocks from the hotel and the display made on board. When electricity became a practical motive power a big jump was made and it became necessary to use skating rinks and similar ground floor structures which afforded large space. From the drummer's room at the hotel which cost nothing to the present day requirements which are so great as to bar some cities out of being considered for convention, has been a long time. In the early days the local roads furnished the banquet free, but when it became necessary to pay from \$1,000 to \$2,000 for an exhibit building the burden was too heavy. Now the inviting company furnishes the hall, turns it over to the association to rent out, and entertains in other ways than the banquet which is managed by the association.

With the steadily increasing number of exhibits which at Chicago were valued at \$250,000 there came an immense amount of detail work for some one on the ground to do. Changes had to be made in the building; stronger floors built; wide doors cut; wires run for light and power; arrangements for teaming hundreds of tons of appliances and machinery; carpenter work which in the aggregate would build a house, provided. Sign painters, electricians, machinists, printers, decorators and painters, furniture men and florists, telegraph operators, messengers, and telephones. All these now have to be in readiness. Then the correspondence involved between the convention city and exhibitors, covering several weeks and involving the dictating of hundreds of letters, all these things have followed in the wake of the expansion of the exhibit idea, which, within the experience of the writer, was limited to a few rope harness, patent horse medicine and a few bell punches.

The burden of the work alluded to above naturally falls on some railway official, usually the manager of the inviting road. He is always a busy man and the additional burden which the convention imposes is little realized by any but those who have been through it. The supply men feel they should not ask it and are perfectly willing to relieve the manager of his work.

Another feature which handicaps the local committee on exhibits is that the meeting goes to a different place each year, and the committee there has it all to learn just as some one did in another city the year before. It is asking a good deal in spite of the willing spirit in which the work has always been done.

The plan now proposed is to organize the supply men next

year at New York and put things on a permanent and uniform basis. Elect a standing committee to take entire charge of the hall and everything in it except the meeting rooms of the two associations. The committee would engage some experienced, thoroughly competent man for several weeks in advance of the convention. He would take charge of affairs. Would make the contracts in the name of the supply men's Association for all teaming, labor, power, etc. Each exhibitor would feel perfectly free to use this man without feeling they were imposing on the good nature of a busy manager. If anything did go wrong they need not hesitate to enter a complaint to their own committee and get an adjustment. This article is not written in any spirit of criticism—far from that; nor have there been any shortcomings here at Kansas City to suggest it. In all our convention experience there has never been less friction and annoyance than here, but there has been in the past and is liable to be in the future. There are many things which bear down on the exhibitor which never come to the knowledge of the railway people. For instance: the local committee contract for carpenter work. They select the best they can. An exhibitor puts in a requisition for a platform and booth. The order is turned over to the contractor who then deals exclusively with the exhibitor. Through some carelessness in book-keeping we will say, and during past years many times with direct intention the contractor takes advantage of the emergencies and necessities of the exhibitor and tucks an extra \$10 or \$20 on his bill. The exhibitor feels a reluctance to complain to the local railway manager with whom he may have, or hopes to have dealings, so he says nothing pays his bill and sometimes contents himself with cuss words. The illustration is no fairy tale. It goes all along the line of teaming, wiring, sign painting, and down the whole list.

We do not mean to say that every exhibitor gets stuck on every one of the above items, though several times it has been nearly as bad as this. But the trouble lies in the lack of any authority to whom the exhibitor feels at liberty to appeal. With an association, its superintendent is the association's hired man, and bound to take up such matters and adjust them. It is no favor asked of him—he is paid to attend to just such things.

Another advantage would be the possibility of adopting and enforcing a standard set of rules as to the size, appearance and location of signs, which at present are very nondescript. Signs of all sizes and previous conditions of servitude touch ends with the one inlaid with gold letters and polished wood, canvas, tin, boards, "any old thing" goes. To bring these signs into some sort of uniformity would not cost anybody very much, and would improve the effect as a whole several hundred per cent. One exhibitor would not be allowed to build a canvas wall to shut out from view somebody else, sometimes a competitor. Signs are necessary and lots of them, but there are signs and bill boards.

In the question of freight to convention a marked saving can be made. As an association its committee is in position to deliver to the road offering the best rates and time shipment, practically the whole freight, and secure for its members concessions which their individual shipments would not warrant. For instance all the shipments from New York to Chicago last year could have been lumped and sent over one road with several routes to choose from.

The exhibitors complain bitterly at the lack of attention paid them by the railway delegates. Organize and send a committee upstairs and they will receive a ready hearing and this matter can be improved. Tell the railway body what it has cost to do all this; and that we are getting to a point where the game is hardly worth the candle. When they understand these things they will devote more time down stairs.

And while the committee is there maybe the railway people would like to arrange for a little less noise during the business sessions, so those sitting back of the front 3 rows of seats could hear the discussion instead of, as this week, getting it by the lip reading method. Now the exhibitors did not intentionally intrude on the deliberations, but if they had only gone up in the tent room a few minutes we believe they would have hurried back and turned on some quiet.

The foregoing touches only on the outer edges of many reforms, improvements and advances possible with organization. The single exhibitor has no voice at present in the present associations, nor does he ask it, and he could not go as such. But as an exhibit body his committee can go, leaving all individuality below, and pretest, request and suggest with dignity and propriety.

In the steam road field such an organization has been in existence for years, and has contributed in a large measure to the success, strength, longevity and pleasure of the parent association. There is no reason why the same should not be repeated in our case.

The following interviews were all it was possible to secure in the limited time. Almost without exception the person interviewed insisted that it be distinctly understood what he said was in no spirit of criticism on the management of the local committees here in Kansas City. Chairman Satterlee was accorded high praise. There has never been less friction and annoyance than here. It is the future and the expansion of the exhibit feature that it is desired to provide for.

Maj. Evans: I am most heartily in favor of an organization of the supply men. There can be no possible objection and the advantages are numerous. They have been exhibiting for years, know what they want better than anyone else, and have abundant talent among their numbers to form an executive board which will be acceptable to all. There are scores of things which we can do as an organization which is impossible as individuals, and I have been in favor of one for years.

Elmer P. Morris: I do not think it fair to put the burden any longer on the local committee of exhibits. Since the display has grown to such proportions it really requires the entire time of one man on the ground for several weeks, and we ought not to ask the manager of a big railway system—always a busy man—to lay aside his work to attend to this. As an organization we can regulate the size of signs and many things we ought now to do. We should of course work in perfect harmony with the American Association—in fact in conjunction with it, but we can do many things for ourselves better than they can do it for us. We are not asking for the revenue the association receives for floor space but would like to have the handling of details, and in short the management of the exhibit hall.

W. R. Garton: I think we should by all means have a supply men's association.

W. S. Rugg, Westinghouse Co.: I think it would be a good move to make.

Geo. D. Casgrain, Griffin Wheel Co.: There ought to be a uniform system for many features of exhibiting which can only be secured through organization. I am in favor of it.

G. R. Scragham, Creaghead Engineering Co.: I consider an organization of the supply men a practical necessity. It would be a great relief to the local committee and the obliging secretary of the American Association, and would result in good not only to the convention but to the supply men themselves.

J. V. Titus, Garton-Daniels Co.: I am heartily in favor of it.

John Taylor, Taylor Truck Co.: I am very much in favor of it if we could arrange so that day times the exhibits could be viewed. One day is not enough for everybody to see each exhibit. You have to interview a great many people individually. The exhibitors here have spent easily \$50,000 in making this display and it is a lot of money and deserves more attention. The time now allotted is, too short. With an organization we could have our committee represent us before the Railway Association and present our claims, and I hope secure arrangements which would be better than ever before.

Arthur Davis: I want it. We need a committee to arrange freight matters, and other things of mutual interest.

Mr. Carl, Carl Electric Co.—I favor it with a standing committee to make arrangements and attend to details, such as signs of uniform size, which will prevent one exhibitor cutting off the view from another. I favor smaller signs than now used.

General Electric.—We heartily approve of the plan and will be glad to join in any arrangement satisfactory to all.

H. T. Bigelow, Hale & Kilborn.—Such an association will do much to facilitate the work of exhibitors, and relieve the local committee of a multitude of details.

John High, Pantasote Co.—Those are my sentiments.

H. J. Davies, National Carbon Co.—That is what we ought to have by all means. The right kind of an organization, rightly officered and conducted, would be a great thing, and we have plenty of good men from whom to choose.

E. Peckham, president Peckham Co.—I have always been in favor of just such an organization, and it is something which should have been done years ago. I am heartily in favor of it and hope

something will come of the agitation this time. The exhibitors certainly do not receive the consideration to which they are entitled. These exhibitors have gone to thousands of dollars to present something instructive and interesting and while we receive our share of attention I speak of the display as a whole and express the universal opinion that the program should be made to allow much more time in the hall. Many have told me they were tempted never to make another exhibit, and others are taking smaller spaces than formerly. I appreciate the fact that this is a condition which has been a matter of growth and is not the result of any one to intentionally slight the supply men. But that makes it none the less disappointing to those who have gone to much expense and trouble to provide something interesting. We need an organization which can be represented by a committee and secure the recognition which the exposition deserves. The present time allowed us is altogether too short.

Geo. C. Bailey, Roebling Co.—Such an organization would be conducive of great good to the supply interests, and reduce expenses.

Victor Angerer, Wharton Co.—If properly organized and managed it would be a good thing. If the majority want it I am with them.

D. A. Johnson, Jos. Dixon Crucible Co.—The supply men's interests are now so large in these conventions they should get together and can save money and improve the display by so doing.

Max Berg, McGill, Pomeroy & Berg.—That's just what we need. Let us have it.

E. S. Nethercut, Paige Iron Works.—Yes, I favor such an organization. It would find plenty to do and everybody would be benefited.

Consolidated Rail Joint Co.—We heartily agree with the plan as proposed to us.

Consolidated Car Heating Co.—We are in favor of the plan to form such an organization.

Chas. W. Cobb, Chicago Mica Co.—An excellent idea. I would like to see a uniformity in signs which should also be placed in a line and at a uniform distance from the floor.

J. W. Perry, H. W. Johns Co.—It is well worth taking up. Would relieve the local committee and result in a more systematic arrangement all around, and facilitate matters for everybody.

T. C. White, Central Union Brass Co.—A good thing; push it along.

G. R. Pratt, Star Brass Works.—By all means. Have something along the line of the M. C. B. supply men's association. That has been a success for years. I will gladly bear my share of any work or expense.

J. R. Wiley, Standard Underground Cable Co.—I think this exhibit business should be governed by an organization of its own, and so done would result in benefit all around.

F. A. Estep, R. D. Nuttall Co.—I am in favor of the plan. Such an organization, with its executive board or restraining committee, would make another place of our annual display. Heretofore and now there is a heterogeneous mass of signs of all sizes and colors. Such a motley collection would be classed in New York as belonging to a county fair. I favor an association of supply men.

D. B. Dean: Yes, I favor an organization if everybody will go in and unite on a plan, and there is no reason why we should not do so. Others have with good results.

R. H. Ham, Ham Sand Box Co.—Am in favor of what is outlined and think it would be a good thing.

Scott H. Blewett, American Car & Foundry Co.—The booths should be more uniform, the signs of a uniform height, lettering of a uniform size and color. So far as possible exhibitors of the same class should be grouped together. These and many other desirable improvements can be brought about by a supply men's association and would greatly improve appearance and save money. It has been done for years in the steam road field and their display is not so large as this.

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same thing in steam road supplies in the Trackmasters' Association, the Master Car Builders, and also Master Mechanics Associations and have had for years. It is simply indispensable in those lines. The exhibiting concerns are taxed pro rata on their space or booths and the fund collected the first day by the treasurer. The committee thus have a fund for use in case of emergency without going round with the hat. In these conventions there is no local entertainer as in the case of the street railways, and it devolves upon supply men to provide carriage drives, flowers and theatre parties for the ladies. I assume the entertaining street railway company would always want to entertain as heretofore, therefore the necessary expenses of a street railway supply men's association would be nominal, although I think the exhibitors have always stood ready to contribute to the American Association if their help had ever been needed. There is usually some surplus left which is paid back pro rata to the exhibitors. For example our tax this year was \$30, and we were rebated \$7 after the convention which lasted a full week, closed. The committee is elected each year, does its work without friction and everybody is satisfied. It contracts for all the usual hall expenses, teaming, carpenters, etc., and secures low rates for the whole job. Each exhibitor is charged for what he gets.

The supply men hold an annual meeting for election and any other business and this takes place during one of the business sessions of the main association. The two organizations are entirely separate, but the committee from the supply men can always take up and arrange any desired features with the main association. The plan has worked like a charm for years, and there is no reason why our supply men should not work together on the same basis.

W. H. Gray.—It's a good thing if we can get the right kind of men in control. I should favor a membership vested in companies or concerns, so that the large concerns cannot come in and vote 10 or 15 representatives against an equal number of small firms with only one representative present. There should be a committee elected annually from the members, of say three or five to carry out the work of the association along the lines of a policy decided by the members. If the plan is carefully matured and can be presented for action at next year's convention there would be something tangible to act on, and an intelligent action taken on the advisability or otherwise of effecting the association. I hope to see it worked out.

J. T. McMichael, Atlas Rail Joint.—Yes, I am in favor of the organization.

W. J. Cook, McGuire Co.—Mr. Cook was not interviewed but has so often expressed himself to the writer that we take the liberty of committing him in good earnest. His long experience in the steam road supply associations has convinced him of the benefits to be derived.

Only five street railway men were interviewed but each one was pleased with the idea.

Walton H. Holmes said, speaking as a railway man and not as an officer of the American Association that he considered it a good thing and would enable the supply men undoubtedly to secure many improvements which the local street railway men would not be likely to think of. If the supply men took hold of the matter it would be ably conducted.

T. C. Penington, speaking for himself, expressed the same views.

F. G. Jones, vice-president of the Memphis street railway, and also a member of the executive committee for the past year, said: From now on the supply men and the street railway men will be more closely drawn together. I think it is an excellent idea and hope the boys will carry it out.

W. Worth Bean hoped the organization would be effected. He recalled the time when there was considerable discussion about the supply men coming in as associate members. This was at Montreal when the boys offered to raise the debt of the association in full, a matter of some \$4,000. He urged them at that time to organize one of their own, and has wondered why it was not done long ago.

The last interview was with W. W. Satterlee, chairman of the local committee of exhibits. He has worked night and day and Sundays for nearly a month past, and the result of this has been evident in the rapid and systematic installation of exhibits. He has good reason to be proud of his efforts, and every supply man is grateful and appreciates his work. Mr. Satterlee expressed himself as heartily in favor of the new plan. He was sure the local railway people wherever the convention met would feel the same

way, and be only too glad to be relieved of a most trying position, and one which really requires more of a manager's time if rightly done, than he can spare in justice to himself. He appreciated highly all the pleasant things which exhibitors had said expressive of satisfaction at his efforts, and desired to thank them one and all through the "Review."

Mr. F. W. Darlington had parlors at the Coates House and was kept busy answering questions about the electric fountains which he makes for street railway parks and pleasure resorts. Among the places where Darlington fountains are installed are Willow Park, Philadelphia. The Plaza, Brooklyn, Schenley Park, Pittsburgh and Crystal Palace, London.

TRIP TO THE HELMS' PLANT.

One of the most enjoyable entertainments provided yesterday was the trip to the plant and park of the East Side Electric Railway Co., better known locally as the Helms' Line. Special cars were in waiting at 5th and Walnut Streets, the city terminus, at the appointed time and a large number of the railway men took advantage of the opportunity to inspect the road. After an enjoyable ride the visitors were welcomed by the superintendent, Mr. W. O. Hands, who first conducted them through the large brewery of the Heim Brothers. Later the guests were introduced to the Messrs. Heim and then visited Electric Park and the power house. The electric fountain at the park was very interesting because of its mechanical simplicity, notwithstanding that it is equipped for living picture work as well as the ordinary water and color effects of such fountains.

The power house and line were described in our monthly issue for October. Leather purses were the visible souvenirs brought away by the visitors.

HAM IS ALL RIGHT.

The cog slipped again yesterday and the type setting machine made us say of President Ham of the Accountants' Association that "a better selection could have been made." Hereafter in printing in a strange garret we shall NOT construct our sentences so as to give the machine operator or the cub-editor any such chance.

D. B. Dean has accepted charge of the western territory for the J. G. Brill Co.

The Accountants were greatly disappointed at the unavoidable absence of J. F. Calderwood, of Minneapolis.

A very practical and unusual souvenir is being given out by Hanna & Gray. It is a record book, good for 21 years, for managers private use, providing for comparative records of every department of the business. The compilation is dedicated to the Accountants' Association and built along standard lines. Copies are being sent to managers with their name in gold on the cover. It is the only work of the kind in print, and is edited by a prominent street railway accountant.

The Brill Co. distributed a neat and servicable fountain pen, which is much prized by recipients.

We are pleased to recognize the excellent work rushed out for us by the Kansas City engraving firm of Teacher & Bartberger. Quick work did not seem to injure quality. The same should be said of our printers, the Hudson & Kimberly Publishing Co.

The Knell Air Brake Co. distributed flowers to the ladies who attended the Convention Hall vaudeville.

After New York got what she came after, she was obliged to take an early train and could not attend the banquet.

The Electrical Installation Co., of Chicago, did a great deal of the track and overhead work in Kansas City. The work is all labelled and will bear inspection. For further particulars apply to J. A. Brett or F. H. Fitch, who are in attendance.

THE BANQUET.

The Kansas City Convention Closes in a Big Blaze of Glory and a Gale of Eloquence—President Roach Being Called Home, on Business, Vice-President Rigg Presides—About Three Hundred Present.

The hall was a scene of beauty, decorated as it was with bunting, and the tables were covered with ferns and cut flowers.

There can be no doubt but that the banquet of last evening was the liveliest function of this nature in the history of the association. President-elect Holmes believes that there is nothing like music and song to put a company in good humor with themselves and the world and he provided for this accessory in abundance, and with the happiest results.

One of the most novel as well as enjoyable features of the entertainment was furnished by 25 members of Epperson's Megaphone Minstrels. This organization numbers about 125 members, all of the most prominent men in Kansas City; it takes its name from the father of the idea, Mr. U. S. Epperson. This organization can always be relied upon to help Kansas City out of any difficulties, thus when Convention Hall was burned in April last the Minstrels were among the first to step into the traces. It is proper to mention here that President Holmes was an active member of the building committee.

A number of selections were rendered by the Minstrels and also by a quartette of their number.

At 10 o'clock the Virginia quintette, consisting of President Holmes, H. Arnold, F. Fosha, Dr. Walter Jackson and J. M. Sessions sang "Old Fashioned Home."

The entire company was at all times ready to join in the chorus, and grasped the spirit of Mr. Holmes so that the waiters usually walked to ragtime.

At 11 o'clock Vice-President Rigg mounted the platform of the car behind his chair—"Kansas City, 1900"—and announced that President Roach had at 5 p. m. appointed him as conductor of the car and requested that he get a good motorman. He then introduced D. B. Holmes to act as toastmaster.

Mr. Holmes: Ladies and Gentlemen, you may well appreciate my embarrassment at being called upon to conduct these exercises to their conclusion, under the circumstances which have been mentioned by the gentleman who has just preceded me. I was about to say that no one could regret more than I the absence of the distinguished retiring president of this association this evening and upon reflection I am convinced that all of my auditors will regret it more than I do.

Before we proceed with the program of toasts, I desire to say in behalf of Kansas City, that all of its inhabitants feel highly honored by the distinguished association which has assembled in its midst, and which is this evening concluding its deliberations. While we feel honored in that respect we feel still more honored in the fact that one of our own fellow citizens has been selected to preside over your association during the ensuing year. (Great applause.) Surely no higher compliment could have been paid to our city and surely none could be more appreciated than it will by all of us. (Applause.)

You have heard the praises of Kansas City by our distinguished mayor in welcoming you in our midst, and I will not undertake to repeat any of the good things which he said. I think you are ready to hear the words of wisdom and of wit which are to be made before you at this time, and that you would prefer to listen to the speakers who are to respond to the toasts than to any extended remarks from me.

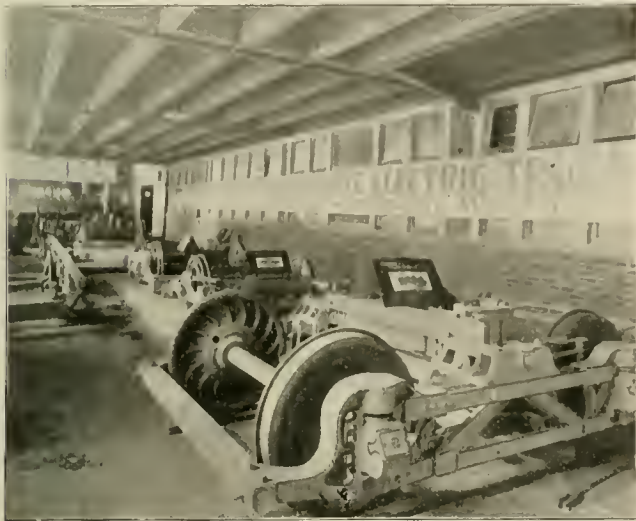
The first toast to be responded to this evening is that of "Looking Backward." It is not a very pleasant thing for most of us to look backward—many of us have regrets and reminiscences which are not altogether pleasant things under all circumstances; but I have to say, ladies and gentlemen, that we have with us this evening a man who, if anybody, can make it pleasant for us to look backward; and I have the pleasure of introducing Mr. W. S. Gilbert, who will now address you on the toast "Looking Backward."

Mr. Gilbert: Mr. Toastmaster, Ladies and Gentlemen: It would be intensely interesting to know many things about the daily life of our ancestors which the stately muse of history has failed to chronicle. You who are assembled here tonight would like to

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CONTINUOUS RAIL JOINT CO., NEWARK, N. J.

Samples of continuous rail joints for girder and T rails were exhibited at the north end of the hall by Messrs. L. F. Braine, H. M. Montgomery, F. C. Schmitz, W. E. Clark, J. G. Miller and C. E. Erwin, of the Continuous Rail Joint Co. All of these gentlemen were well pleased with the results of the convention.

CONANT TESTING APPARATUS.

One of the Conant testing boxes for determining the drop in rail joints was shown in the space of the Frank Riddon Co. The Mayer & England Co., of Philadelphia, has recently taken the general sales agency for these devices and is introducing them on a number of roads.

AMERICAN VITRIFIED CONDUIT CO.

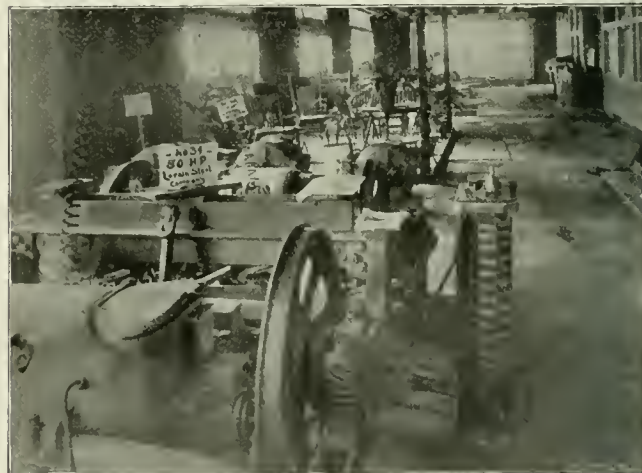
This company whose general office is at New York had a stand near the hall entrance where were shown the new standard round



hole single and multiple conduits, made by the American Vitrified Conduit Co., of New York. These embody the advantages of the single and multiple duct systems, and can be laid with dowel pin or mandrel. Mr. B. S. Barnard was in attendance.

LORAIN STEEL CO.

This company had prominent space at the entrance to Convention Hall, where it had the following: Two No. 34, 50-h. p. mo-



tors shown in operation on a type "F" du Pont double truck, with a No. 38-A improved controller; one No. 18, 25-h. p. motor; one No. 27, 37-h. p. motor; one No. 18, 25-h. p. motor; and an armature and field coil for the No. 34 motor.

The special work department exhibited two steam railroad crossings, girder crossing switches, etc., and the rail department showed samples of various sections of rails.

The Lorain Company has a large amount of its apparatus in use in Kansas City and vicinity, including du Pont single trucks which are standard on the Metropolitan Street Railway, rails, motors, etc.

Those representing the company were: Messrs. P. M. Boyd, secretary, R. T. Lane, sales agent, F. A. Merrick, manager of the motor department, H. C. Evans, of the New York sales office, A. S. Littlefield and D. J. Evans, of the Chicago office, S. R. S. Ellis, of Pittsburg, and W. W. Kingston, of Atlanta.

The United States Electric Signal Co., of Watertown, Mass., brought out a new signal system for electric railways. The good points were explained by Messrs. Frederick E. Withee and J. J. Ruddick.



ALBANY GREASE.

LEA HEADLIGHT.

The well-known Albany lubricants and grease cups were represented by Winne & Kellogg, the Chicago agents.

AMERICAN BRAKE SHOES.

The American Brake Shoe Co. is represented at the convention by Messrs. F. W. Sargent, E. L. Adreon and A. Gemunder, who are explaining at space No. 13, all about the "Diamond S" and "U" brake shoes.

PANTASOTE CO.

The car curtains and seat coverings made by this company were shown in connection with the display of the Curtain Supply Co. Pantasote has steadily gained in favor since last convention and is now in use on roads throughout the world, its pleasing appearance and cleanliness making it desirable from the standpoint of both company and patrons. Messrs. J. M. High and H. M. Grler represented the makers.

W. R. GARTON CO., CHICAGO.

Mr. Garton was in attendance and had with him a number of his specialties, including headlights with "multiplex" reflectors; general equipment circuit breakers; Fiest trolley head, etc. The reflector shown will be used to illuminate the Montgomery Ward tower in Chicago. The breakers are the type used at the Rock Island Arsenal.

An enclosed arc headlight exhibited by the Lea Electric Manufacturing Co., of Elwood, Ind., has a number of novel points. It is entirely self-contained, its feed mechanism is automatic and it burns directly across a 500 volt circuit with high efficiency and without extra resistance. The voltage at the arc is from 280 to 300 volts and the lamp only requires 1 ampere, although it may be adjusted to consume more, depending upon the light required by the railway. Although the arc is thin and long the lamp gives excellent light, being equipped with a parabolic reflector. A door in the upper portion allows easy access to the working parts and the carbons may be reached for trimming by opening a glass door in front of the reflector, and removing the inner globe. The manufacturers believe this lamp will be of especial interest to the trade because it does not require feeding by hand, does not need an auxiliary resistance on the platform of the car and on account of its very high efficiency, due to the utilization of the energy at the arc of the lamp where it will give light, instead of its consumption in useless resistance. Photographs and prices of the headlight will be furnished on application.

WALWORTH MANUFACTURING CO.

This concern is general contractor for furnishing and erecting power-house piping and showed a large number of tools for making boiler and pipe repairs of all kinds; blow off cock; and a new method of applying flanges to pipes. It also had a Smith track drill. Mr. H. L. Rideout was in attendance.



STANDARD UNDERGROUND CABLE CO.

The Standard Underground Cable Co. has on exhibition four large handsome cabinets of samples which attracted much attention at the National Exposition at Philadelphia, and for which that company received a Medal and Blue Ribbon as being the most complete exhibition of its kind ever seen. The company's space is No. 11, where Mr. J. R. Wiley, of Chicago, western manager, is in attendance.

KALAMAZOO TROLLEY WHEELS.

The Star Brass Works, of Kalamazoo, Mich., maker of the "Kalamazoo" trolley wheel, is represented by Mr. G. E. Pratt. At the company's booth, space No. 60, Mr. Pratt has arranged on a tastefully draped board, a number of wheels, forming a large star suggestive of the makers' name.



These wheels are made of pure copper treated by a secret process and they have made highly satisfactory records. A sign under the star states that a 6-in. wheel has run 25,000 miles and is still in service; a 4-in. wheel has run 23,000 miles with three bushings; and another 4-in. wheel ran 19,000 miles with one bushing. The Kalamazoo trolley harp is also shown.

WEBER RAIL JOINTS.

The Weber Railway Joint Manufacturing Co., of New York has space No. 14, where it is showing samples of Weber joints for T and girder rails; compromise or step joints for use where a rail is to butt up against a rail of larger cross section; and other models for special conditions.

The booth is in charge of Messrs. J. C. Barr, of New York, Fred. A. Poor, of Chicago, and E. W. Penfield, of New York, who are kept busy meeting the many customers and friends of the company.

NEW HAVEN REGISTERS.

One of the most complete and attractive displays at the convention was made by the New Haven Car Register Co., of New Haven, Conn. The company was represented by Willis M. Anthony, president, F. Coleman Boyd, vice-president and general manager, John S. Bradley, secretary and treasurer, and H. E. Beach. It displayed a full line of square, single, double and triple fare registers, and its new round single and double machines. It also showed a special double register for co-operative use by two companies operating the same car over two roads. Another feature was a register which had registered over 10,900,000 times on rapidly moving machinery. This record speaks volumes for the durability of New Haven goods. A full line of the special supplies handled by the company completed the exhibit.

AMERICAN STANDARD RAIL JOINTS.

The Chisholm & Moore Manufacturing Co., of Cleveland, maker of the American joints, was represented by Mr. W. E. Ludlow, who gave a handsome paper weight as a souvenir. Samples of joints were exhibited and also water color drawings of overhead hoists, pneumatic tools, etc.

CONSOLIDATED CAR HEATERS.

The Consolidated Car Heating Co., of Albany, N. Y., has an interesting exhibit at space No. 32, where it is showing some of the valuable features of its efficient electric heating apparatus. Two panels are displayed on which are mounted representative types of the company's heaters, from which an excellent idea of the general mechanical construction and design can be obtained. There are also exhibited standard types of "Consolidated" heaters for cars having longitudinal seats with risers, and temperature-regulating switches which are operated by a single handle, that may be turned in either direction, contacts being made and broken by a positive snap. As a practical example of its system a complete 12-heater equipment is shown in operation. Messrs. W. P. Casper and C. S. Hawley, general agents, and W. H. Fulton, mechanical inspector are in attendance.

GENERAL ELECTRIC CO.

The General Electric exhibit consisted of the following: One G. E. 54, 25-h. p. motor; one G. E. 67, 38-h. p. motor; one G. E. 57, 50-h. p. motor; one G. E. 73, 75-h. p. motor; one K-10 series parallel controller for two-motor equipments; one K-12 series parallel controller for four-motor equipments; one B-23 electric brake controller for two-motor equipments; one 600-kw., 500-volt rotary converter; three 250-kw. air blast step-down transformers; one A. C. and D. C. panel for 600-kw. rotary converter; full line of overhead material and supply parts for railway motors.

The following representatives were present: J. R. Lovejoy, A. H. Armstrong, W. G. Carey, J. G. Barry, S. W. Trawick, J. C. Calisch, Theo. P. Bailey, F. N. Boyer, R. A. Swain, C. C. Peirce, R. E. Moore, F. H. Strichy, H. E. Russell, Geo. D. Rosenthal, J. H. Shaefer, W. T. Osborn, C. R. Croninger.

THE FRANK RIDLON CO., BOSTON.

This company, which is represented by C. N. Wood, of Boston, calls attention to the Beverly vertical brake wheel for vestibuled cars; the Conant rail-joint testing instrument; the Electric Railway Equipment Co.'s slow feed controller handle, by which the handle can be turned but one point at a time; the Kilbourn sanding device, which works with any kind of sand, wet or dry, fine or coarse; and the Wilson trolley catcher, of which thousands are in use. Mr. Burt Horton, of the Electric Railway Equipment Co., of Cincinnati, is also in attendance.

WESTINGHOUSE CO.

Westinghouse headquarters are at space No. 7, where are shown the following: One 650-kw. direct current engine-type railway generator; one 200-kw. rotary converter, 7,200 alternations for street railway work; one 5-panel switchboard complete, with lightning arrester, switches, circuit-breaker and instruments; railway motors, types 49, 69, 50-c., 56 and 68; fuse blocks and diverters.

The company's staff in attendance includes Messrs. F. H. Taylor, N. W. Storer, G. Berentsen, W. H. Wells, W. M. Probasco, P. N. Jones, R. S. Brown, C. S. Powell, C. A. Bragg, J. R. Gordon, C. B. Humphrey, G. Tantaleoni, H. C. Ebert, F. C. Newell, W. S. Rugg and T. A. Hall.

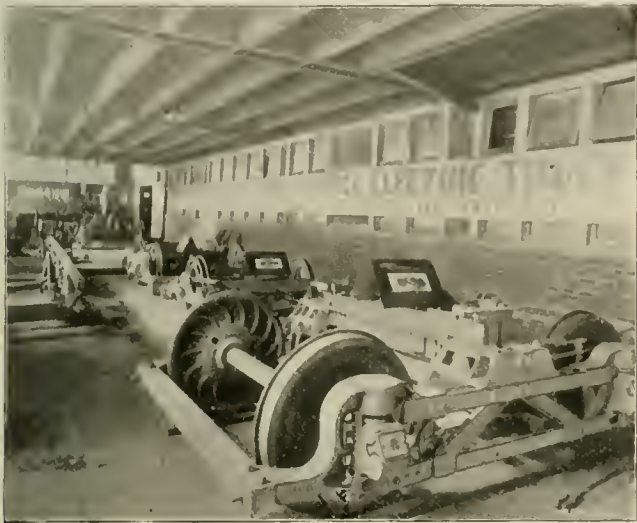
JOS. DIXON CRUCIBLE CO., JERSEY CITY.

This company has a small live stock exhibit in the shape of a large blind pig. Samples of the world famous Dixon products are displayed on tables, but these are merely tails as it were to the pig. Messrs. Mayer, Haasis, Johnson, St. John, Allen and Lewis, of the Dixon Company, are dispensing printed matter and hospitality to all visitors.

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also exhibited a new voltmeter that is even more sensitive than the one he had last year. This instrument will measure the drop in one-eighth of an inch of 90-lb. rail carrying 10 amperes of current.

CONTINUOUS RAIL JOINT CO., NEWARK, N. J.

Samples of continuous rail joints for girder and T rails were exhibited at the north end of the hall by Messrs. L. F. Braine, H. M. Montgomery, F. C. Schmitz, W. E. Clark, J. G. Miller and C. E. Erwin, of the Continuous Rail Joint Co. All of these gentlemen were well pleased with the results of the convention.

CONANT TESTING APPARATUS.

One of the Conant testing boxes for determining the drop in rail joints was shown in the space of the Frank Riddon Co. The Mayer & England Co., of Philadelphia, has recently taken the general sales agency for these devices and is introducing them on a number of roads.

AMERICAN VITRIFIED CONDUIT CO.

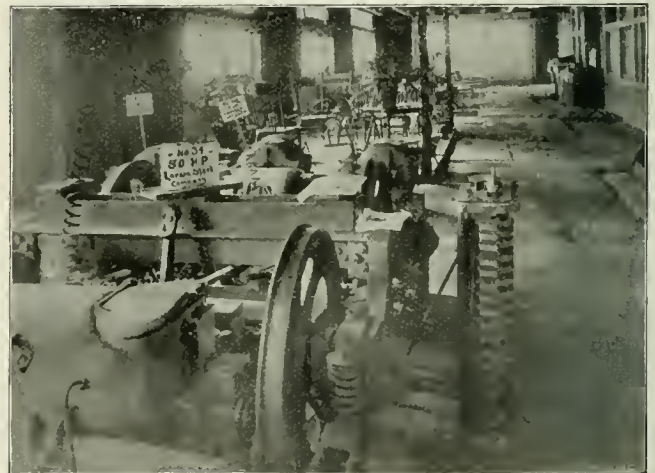
This company whose general office is at New York had a stand near the hall entrance where were shown the new standard round



hole single and multiple conduits, made by the American Vitrified Conduit Co., of New York. These embody the advantages of the single and multiple duct systems, and can be laid with dowel pin or mandrel. Mr. B. S. Barnard was in attendance.

LORAIN STEEL CO.

This company had prominent space at the entrance to Convention Hall, where it had the following: Two No. 34, 50-h. p. mo-



tors shown in operation on a type "F" du Pont double truck, with a No. 38-A improved controller; one No. 18, 25-h. p. motor; one No. 27, 37-h. p. motor; one No. 18, 25-h. p. motor; and an armature and field coil for the No. 34 motor.

The special work department exhibited two steam railroad crossings, girder crossing switches, etc., and the rail department showed samples of various sections of rails.

The Lorain Company has a large amount of its apparatus in use in Kansas City and vicinity, including du Pont single trucks which are standard on the Metropolitan Street Railway, rails, motors, etc.

Those representing the company were: Messrs. P. M. Boyd, secretary, R. T. Lane, sales agent, F. A. Merrick, manager of the motor department, H. C. Evans, of the New York sales office, A. S. Littlefield and D. J. Evans, of the Chicago office, S. R. S. Ellis, of Pittsburg, and W. W. Kingston, of Atlanta.

The United States Electric Signal Co., of Watertown, Mass., brought out a new signal system for electric railways. The good points were explained by Messrs. Frederick E. Withee and J. J. Ruddick.



ALBANY GREASE.

The well-known Albany Inbricants and grease cups were represented by Winne & Kellogg, the Chicago agents.

AMERICAN BRAKE SHOES.

The American Brake Shoe Co. is represented at the convention by Messrs. F. W. Sargent, E. L. Adreon and A. Gemunder, who are explaining at space No. 13, all about the "Diamond S" and "U" brake shoes.

PANTASOTE CO.

The car curtains and seat coverings made by this company were shown in connection with the display of the Curtain Supply Co. Pantasote has steadily gained in favor since last convention and is now in use on roads throughout the world, its pleasing appearance and cleanliness making it desirable from the standpoint of both company and patrons. Messrs. J. M. High and H. M. Grier represented the makers.

W. R. GARTON CO., CHICAGO.

Mr. Garton was in attendance and had with him a number of his specialties, including beadlights with "multiplex" reflectors; general equipment circuit breakers; Fiest trolley head, etc. The reflector shown will be used to illuminate the Montgomery Ward tower in Chicago. The breakers are the type used at the Rock Island Arsenal.

LEA HEADLIGHT.

An enclosed arc headlight exhibited by the Lea Electric Manufacturing Co., of Elwood, Ind., has a number of novel points. It is entirely self-contained, its feed mechanism is automatic and it burns directly across a 500 volt circuit with high efficiency and without extra resistance. The voitage at the arc is from 250 to 300 volts and the lamp only requires 1 ampere, although it may be adjusted to consume more, depending upon the light required by the railway. Although the arc is thin and long the lamp gives excellent light, being equipped with a parabolic reflector. A door in the upper portion allows easy access to the working parts and the carbons may be reached for trimming by opening a glass door in front of the reflector, and removing the inner globe. The manufacturers believe this lamp will be of especial interest to the trade because it does not require feeding by hand, does not need an auxiliary resistance on the platform of the car and on account of its very high efficiency, due to the utilization of the energy at the arc of the lamp where it will give light, instead of its consumption in useless resistance. Photographs and prices of the headlight will be furnished on application.

WALWORTH MANUFACTURING CO.

This concern is general contractor for furnishing and erecting power-house piping and showed a large number of tools for making boiler and pipe repairs of all kinds; blow off cock; and a new method of applying flanges to pipes. It also had a Smith track drill. Mr. H. L. Rideout was in attendance.



STANDARD UNDERGROUND CABLE CO.

The Standard Underground Cable Co. has on exhibition four large handsome cabinets of samples which attracted much attention at the National Exposition at Philadelphia, and for which that company received a Medal and Blue Ribbon as being the most complete exhibition of its kind ever seen. The company's space is No. 11, where Mr. J. R. Wiley, of Chicago, western manager, is in attendance.

KALAMAZOO TROLLEY WHEELS.

The Star Brass Works, of Kalamazoo, Mich., maker of the "Kalamazoo" trolley wheel, is represented by Mr. G. E. Pratt. At the company's booth, space No. 60, Mr. Pratt has arranged on a tastefully draped board, a number of wheels, forming a large star suggestive of the makers' name.



These wheels are made of pure copper treated by a secret process and they have made highly satisfactory records. A sign under the star states that a 6-in. wheel has run 35,000 miles and is still in service; a 4-in. wheel has run 23,000 miles with three bushings; and another 4-in. wheel ran 19,000 miles with one bushing. The Kalamazoo trolley harp is also shown.

WEBER RAIL JOINTS.

The Weber Railway Joint Manufacturing Co., of New York has space No. 14, where it is showing samples of Weber joints for T and girder rails; compromise or step joints for use where a rail is to butt up against a rail of larger cross section; and other models for special conditions.

The booth is in charge of Messrs. J. C. Barr, of New York, Fred. A. Poor, of Chicago, and E. W. Penfield, of New York, who are kept busy meeting the many customers and friends of the company.

NEW HAVEN REGISTERS.

One of the most complete and attractive displays at the convention was made by the New Haven Car Register Co., of New Haven, Conn. The company was represented by Willis M. Anthony, president, F. Coleman Boyd, vice-president and general manager, John S. Bradley, secretary and treasurer, and H. E. Beach. It displayed a full line of square, single, double and triple fare registers, and its new round single and double machines. It also showed a special double register for co-operative use by two companies operating the same car over two roads. Another feature was a register which had registered over 10,900,000 times on rapidly moving machinery. This record speaks volumes for the durability of New Haven goods. A full line of the special supplies handled by the company completed the exhibit.

AMERICAN STANDARD RAIL JOINTS.

The Chisholm & Moore Manufacturing Co., of Cleveland, maker of the American joints, was represented by Mr. W. E. Ludlow, who gave a handsome paper weight as a souvenir. Samples of joints were exhibited and also water color drawings of overhead hoists, pneumatic tools, etc.

CONSOLIDATED CAR HEATERS.

The Consolidated Car Heating Co., of Albany, N. Y., has an interesting exhibit at space No. 32, where it is showing some of the valuable features of its efficient electric heating apparatus. Two panels are displayed on which are mounted representative types of the company's heaters, from which an excellent idea of the general mechanical construction and design can be obtained. There are also exhibited standard types of "Consolidated" heaters for cars having longitudinal seats with risers, and temperature-regulating switches which are operated by a single handle, that may be turned in either direction, contacts being made and broken by a positive snap. As a practical example of its system a complete 12-heater equipment is shown in operation. Messrs. W. P. Casper and C. S. Hawley, general agents, and W. H. Fulton, mechanical inspector are in attendance.

GENERAL ELECTRIC CO.

The General Electric exhibit consisted of the following: One G. E. 54, 25-h. p. motor; one G. E. 67, 38-h. p. motor; one G. E. 57, 50-h. p. motor; one G. E. 73, 75-h. p. motor; one K-10 series parallel controller for two-motor equipments; one K-12 series parallel controller for four-motor equipments; one B-23 electric brake controller for two-motor equipments; one 600-kw., 500-volt rotary converter; three 250-kw. air blast step-down transformers; one A. C. and D. C. panel for 600-kw. rotary converter; full line of overhead material and supply parts for railway motors.

The following representatives were present: J. R. Lovejoy, A. H. Armstrong, W. G. Carey, J. G. Barry, S. W. Trawick, J. C. Caliseh, Theo. P. Bailey, F. N. Boyer, R. A. Swain, C. C. Peirce, R. E. Moore, F. H. Strieby, H. E. Russell, Geo. D. Rosenthal, J. H. Shaefer, W. T. Osborn, C. R. Croninger.

THE FRANK RIDLON CO., BOSTON.

This company, which is represented by C. N. Wood, of Boston, calls attention to the Beverly vertical brake wheel for vestibuled cars; the Conant rail-joint testing instrument; the Electric Railway Equipment Co.'s slow feed controller handle, by which the handle can be turned but one point at a time; the Kllbourn sanding device, which works with any kind of sand, wet or dry, fine or coarse; and the Wilson trolley catcher, of which thousands are in use. Mr. Burt Horton, of the Electric Railway Equipment Co., of Cincinnati, is also in attendance.

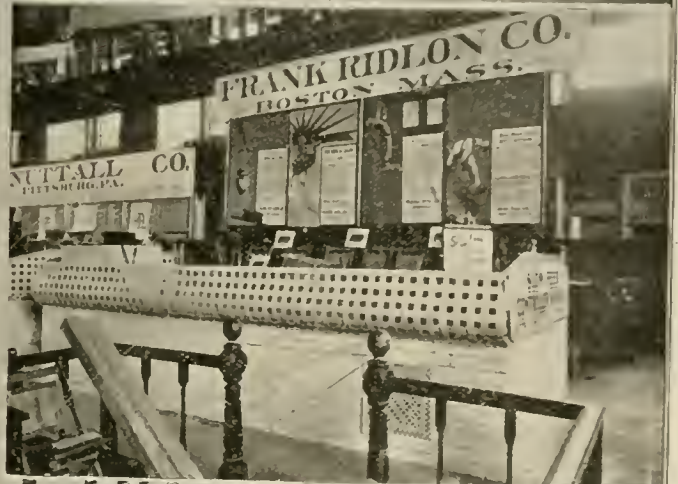
WESTINGHOUSE CO.

Westinghouse headquarters are at space No. 7, where are shown the following: One 650-kw. direct current engine-type railway generator; one 200-kw. rotary converter, 7,200 alternations for street railway work; one 5-panel switchboard complete, with lightning arrester, switches, circuit-breaker and instruments; railway motors, types 49, 69, 50-c., 56 and 68; fuse blocks and diverters.

The company's staff in attendance includes Messrs. F. H. Taylor, N. W. Storer, G. Berentsen, W. H. Wells, W. M. Probasco, P. N. Jones, R. S. Brown, C. S. Powell, C. A. Bragg, J. R. Gordon, C. B. Humphrey, G. Tantaleoni, H. C. Ebert, F. C. Newell, W. S. Rugg and T. A. Hall.

JOS. DIXON CRUCIBLE CO., JERSEY CITY.

This company has a small live stock exhibit in the shape of a large blind pig. Samples of the world famous Dixon products are displayed on tables, but these are merely tails as it were to the pig. Messrs. Mayer, Haasis, Johnson, St. John, Allen and Lewis, of the Dixon Company, are dispensing printed matter and hospitality to all visitors.





ST. LOUIS REGISTER.

Mr. Giles S. Allison, of New York, had charge of the exhibit of the St. Louis Register Co., of St. Louis, which comprised one No. 20 self-recording register and one No. 23 self-recording double register. These machines give a printed record of the number of fares at the end of the trip or day, and do away with the necessity of trip sheets and possible errors by conductors in transcribing.

McGILL, PORTER & BERG.

The display of McGill, Porter & Berg can be found at space No. 24, main aisle, where a very interesting and attractive exhibit of goods is made. This house caters to the street railway trade exclusively and delegates are invited to carefully inspect the supplies and specialties it carries, prominent among which are: 1-T-E circuit breakers, Ohio brass overhead material, Morris rail bonds, National car heaters, M. P. & B. trolley wheels, Speer carbon brushes, and Chicago Mica Co.'s products. Members of the association should secure a copy of the Convention Menu, which Messrs. McGill, Porter and Berg are distributing.

This concern has recently been appointed selling agents for their territory of the American Brake Shoe Co., which owns the "Diamond S" patents and the "Diamond S" brake shoes. The shoes are made under license by the Sargent Co., Chicago; the Ramapo Iron Works, Hilburn, N. Y., and Parker & Topping, St. Paul, Minn.

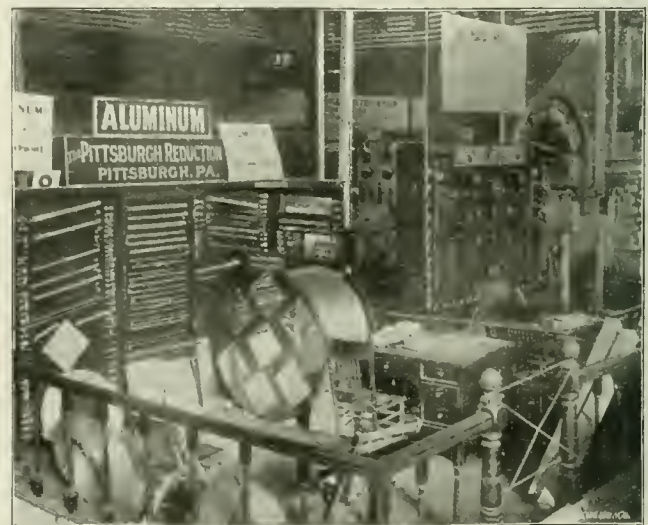
SERRATED WHEELS.

One of the street railway devices exhibited this year is the "serrated" car wheel shown at space No. 45, by the Burnham & Duggan Railway Appliance Co., of 60 State Street, Boston. The serrations are in the flange and adapt the wheel for digging ice, snow or dirt from the groove of the rail, and thus secure good traction and electrical contact. The evident advantages of the better traction are longer life for wheels and motors and a saving of time and electric current. The Burnham & Duggan Company has supplied these wheels to the Boston Elevated, the Quincy & Boston, the Portland (Me.) Railway, the Massachusetts Electrical Companies, the Metropolitan Street Railway, of New York, and other companies. The wheels are for use under both cars and snow plows. The company has received a number of strong testimonial letters among which is one from Mr. G. S. Waterhouse, acting superintendent of the Quincy & Boston Street Railway Co., which reads: "The snow plow equipped with 'serrated' wheels was the only one we could operate in the big storm of February 1st. The plow made the run from East Milton to Neponset and returned running at the ordinary rate of speed, when the other plows were all stuck fast."

ALUMINUM WIRE.

The Pittsburg Reduction Co., of Pittsburg, had a very complete exhibit of the different styles of aluminum electric conductors. It called especial attention to different sizes of aluminum street railway feeders, but also showed aluminum for power transmission, telephone and telegraph lines. Street railway feeders can be furnished by the company either bare or insulated, and samples of both styles were in the exhibit.

Particular attention also is paid to the question of jointing street railway feeders and the joints that are displayed prove conclusively that this question as raised by certain engineers has been completely solved by the Pittsburg Reduction Co. Soldered



joints, mechanical joints and compression joints are all to be seen, any one of which will meet the complete requirements of joints for street railroad feeder purposes.

The following officials of the company are in attendance at the convention: Arthur V. Davis, general manager; Alvah K. Lawrie, general sales agent; and James A. Rutherford, of the Cleveland office.

HALE & KILBURN.

A number of seats made by the Hale & Kilburn Manufacturing Co., of Philadelphia, were shown in the booth of the Curtain Supply Co. These seats are so well known as to require no description and Mr. H. T. Bigelow, of Chicago, who represented the company, stated that its factory is working overtime to keep up with orders.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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NOVEMBER 15, 1900.

NO. 11

The "Daily Street Railway Review" was certainly one of the distinct features of the convention. Each morning at daylight it appeared with 24 pages of reading matter, including a full verbatim report of everything said in both conventions the previous day. In addition all the happenings of interest up to midnight were chronicled. Since the convention closed scores of letters have been received from officials in all parts of the country who were unable to attend and who all voice one sentiment that "to read the 'Daily' was the next best to being present in person."

Next year, in New York City, we shall issue the "Daily" again, and we hope with additional features and improvements not possible this year.

The decision of the Accountants' Association to make no change in its by-laws and, as heretofore, to hold the annual meeting at the same time and in the same city as the convention of the American Association is, we believe, a very wise one. The distractions at a separate meeting might be fewer, but there are compensating advantages in the opportunity given the delegates for getting acquainted with managers, in the lower railway rates than could be otherwise secured, and in the entertainments. As to the distractions we think the accountants do plenty of work as it is.

From the supply man's point of view the Kansas City convention was a record breaker. The exhibit was all that could be asked as regards quantity and quality, but above all the supply men closed some orders which is not the usual thing at conventions.

Next year the supply men are to have the second day instead of the last one devoted to them and the arrangement will doubtless prove most satisfactory to all parties.

The experience of street railway companies that have provided club rooms for the use of their employes shows that in every case the investment is a good one. The companies that have gone into this matter most extensively are the large ones, but the club room

will be found to be just as desirable on the small road. We recently received a letter from the manager of a company having 36 trainmen on its rolls, in which he related his experience with a reading room. In the room where his men reported for duty he placed a table and some chairs and copies of such scientific journals as he had subscribed for. The result was that from two to six of the men are now always to be found in this room when off duty; before, there was never an extra man about the premises except at reporting time. The next day one of the men reported that he had subscribed for a daily paper to be delivered at the reading room—others brought books and magazines and within a week a bookcase became a necessity.

The presidential election has been held with results which exceeded the largest hopes of those citizens who stand for good government and sound money. Business interests generally were less affected than usual by the inevitable feeling of uncertainty which we seem doomed to experience every four years. This was due to the confidence felt that the result would not change the conditions and national policy of the past four years. To this declaration of the largest majority ever expressed at the polls the great army of street railway employes contributed in no small degree. The continuation of conditions which insure activity along industrial and manufacturing lines means just as much to the men on the car platforms as it does to the holders of securities.

During the past four years most of the roads in receiver's hands have been placed on a self-sustaining or paying basis, and in a large number of instances wages have been materially advanced.

The amount of new construction work for 1900 is smaller than was anticipated. This was due to two conditions: capitalists hesitated on account of election year, and materials were very high. It is reasonable to expect that new roads aggregating several hundred miles of track will now be able to float their securities on favorable terms, while the indications are that the important items of rails and ties will be purchasable for delivery early in 1901 at prices much more favorable to buyers than a year ago. The price of rail is still unsettled, but probably will be not far either way from \$28 per ton for T sections.

As during the past two years the greater mileage of new track will be outside the cities, but there will also be much work done in enlarging power stations and rebuilding tracks for city lines. The outlook is equally bright for the operator and the material man in our field.

A remunerative class of business which most interurban roads can handle to advantage is the transportation of cut flowers from green houses to the city dealers. Investigation of this subject presents the following conditions.

The business of growing cut flowers for city markets has reached proportions little imagined by the average person. The hot houses are usually located some distance from the city to secure cheap land and favorable climatic conditions. Shipments are made to city dealers once or twice a day regularly. Special rush orders call for additional shipments almost every day. The grower places his flowers in boxes with little care to guard against damage to the delicate blossoms in shipment. When thus packed they are loaded into a wagon and hauled in to town, or as is more often the case sent by express. This involves one loading into wagon; one unloading at express office; loading into car; unloading to delivery wagon; unloading to sidewalk; a total of at the very least five handlings. This number is more often increased to eight or ten and each time there is the usual throwing of the box and jarring of the contents. The damage from each handling makes a distinct and computable loss. It is evident therefore that any reduction in the number of times the box must be handled is a positive saving in values for which the shipper and dealer are equally willing to pay. It would be supposed the grower would take the same care in preparing for shipment that the retailer does, but the fact is they universally do not and will not.

Now if the grower could deliver to a trolley express which runs not only into town but close to the consignee, the boxes will require but two handlings instead of five or ten, and the saving to even the ordinary dealer would amount to hundreds of dollars annually. Hence he is willing to pay a liberal rate for trolley express service. Another desirable feature is that the trolley express can

make special trips and much more frequent than the old line express companies which are limited to certain trains on the steam roads.

There are doubtless many of our readers who can work up a large and profitable business from this source. The matter is well worth investigating and taking up with local growers and dealers.

It must be admitted that the discussions before the American Association were disappointing. Of the four papers, only one elicited any interest, so far as a reader may judge from the verbatim reports. What is the reason for this? Were the subjects ill-chosen or were the men present ill-prepared to debate the questions?

Take Mr. Holmes' paper on "Consolidations," for instance. This is a subject of vital interest to street railway men and to the public—it may even be said that it is a part of the trust question, one of the "paramount" issues of our late political campaign. It was a question to which the men present surely must have given thought and the paper itself was suggestive, yet not a word was submitted in discussion.

The other three papers were all on technical subjects but only one was discussed to any extent. To have the results of one man's experience is good, but to have the results of 10 men's experience is very much better. The Kansas City report would have been greatly enhanced in value had every road with a paint shop or double truck cars submitted such data as did Mr. Harrington, of the Camden & Suburban.

We think that this result is largely due to the fact that the papers are not given to the members in advance of the meeting as is the case in most other scientific and technical societies. Where the members of an association are all actively engaged in the work with which the papers before it deal, it is very easy for them to enter into the discussion without previous special preparation, but with the American Association the case is different. The delegates to the convention are for the most part managers and other executive officers who cannot be expected to carry in their heads all of the details as to the practice on their respective roads in technical matters. But if given an opportunity to read the papers in advance of the meeting, they could inform themselves concerning details and be prepared to give other members the benefit of their companies' experience. With a little preparation most of the delegates could become specialists, for the time being, on any of the technical subjects brought before the association.

The Accountants' Association had the question of advance publication under consideration, but no decision was reached. Though there is less need for prior publication in the case of the Accountants' papers, we trust that this association or its executive committee will take favorable action in the matter.

The delegates at these meetings who really have something to say, and do not take advantage of the opportunity, not only prevent the association from attaining to its full power for the good of the industry, but, in a negative way, do themselves injury. To print a list of the changes in executive officers and heads of departments of street railways, that have taken place within the past year would require perhaps 15 pages of the "Review." Other changes will be made as time goes on. The conventions offer a great opportunity for the young man in the business to become known to the men (perhaps we ought to say the other young men) who have positions to fill, and the opportunity ought not to be wasted.

In our eastern contemporary Mr. A. O. Kittredge comments on the doings of the Accountants' Association and criticizes it for devoting so much time to what he terms "mere account classification" and "details of bookkeeping" instead of discussing "real accounting." We have read those comments and are somewhat mystified, being in the dark as to just what "real accounting" may be.

We do not distinguish between bookkeeping and accounting. The object of keeping books of account should be to correctly show the state of the business and property. Popularly, any clerk in the bookkeeping department is a "bookkeeper," so that is just as well perhaps to call the man in charge an "accountant," but he is none the less a bookkeeper.

Mr. Kittredge censures the Accountants' Association for not discussing principles entirely divorced from blanks and forms, books and reports. Whether this attitude is justified will appear from a glance at the state of street railway bookkeeping four years ago and what has been accomplished by the Accountants' Association.

There are principles of accounting and there are details. At the outset the Accountants were confronted with a chaotic condition as to both principles and details. In the rapid transition from animal to electric power, practically no provision was made for a suitable accounting department, and none whatever for a uniform system. Indeed it is doubtful if any uniform system of accounts could have been secured during the period of evolution in which the engineering and operating departments were experimenting, constantly changing, and trying to determine to what accounts scores of expense items really did belong. We all know the bookkeeping which was ample for a road operating with horses, was as inadequate for the same road electrically operated, as the horse car barn was unsuited for the power house, or the horse hospital for a repair shop. The evolution had scarcely ceased when the Accountants organized and undertook the discouraging task of trying to straighten out the universal tangle. Their success in doing this has been astonishing and the rapidity of movement no less so. The American Association made several attempts and abandoned the undertaking in despair. It remained for the young men who had been called into the auditing departments to work out the problem.

The principles which should govern the separation of expense from capital accounts, probably more important than any other one thing in street railway accounting, are determined for the accountant by the policy of his company, and hence in the Accountants' Association are purely academic questions. With the details of keeping the accounts it is different, however, and these subjects should be authoritatively handled by the Association. The Accountants had the option of spending their time in telling what they thought or in doing what they could, and very wisely chose the latter. Even now comparatively few in the other departments realize the amount of thought and work involved. A leading manager remarked at Kansas City that he doubted if \$15,000 would have paid the bill had the work done by the Accountants in standardizing been ordered from some expert; and, he quickly added, it would have been impossible for any one or two men to have achieved the broad results already obtained where so many contributed.

We hope the time may soon come when the practical details of street railway bookkeeping will be so far perfected that the Accountants will have time for discussing the ethics of the subject, and are satisfied that when that time does come the members of this association will not be backward in dealing with the theory.

Mr. Kittredge thinks that someone should have taken the idea from Mr. Beggs' address on "What Does the General Manager Want to Know from the Accounting Department?" Mr. Beggs said some excellent things—things that should have the hearty approval of every street railway man—and one of them was "be honest with yourself and with the public and your troubles will grow less," or words to that effect. Yet, nevertheless, Mr. Beggs' summary of what the manager wants from the accounting department leaves very little freedom of action to his accountant; he wants three things, (1) to know that the accountant is in sympathy with the manager and believes in his policy, (2) speed, and (3) accuracy. With the first of these requirements in mind ethical discussion of accounting becomes a bit hampered.

SHALL SUPPLY MEN ORGANIZE?

The Time Considered Ripe for Such an Association—Benefits to be Derived—Exhibitors Can Handle the Problem More Easily Than Street Railway Officials—Interviews With Leading Supply Men Show Great Interest in the Scheme.

"The time has come when we need an organization of the supply men to take the burden of the exhibit hall and its contents off the shoulders of the local officials. The display has now reached mammoth proportions and is constantly growing. We know what we want and how to handle the innumerable details connected with the show much better than any one who has not been through the mill."

It was Major Evans, of the Lorain Steel Co., one of the most prominent of the supply men and who has had years of experience in exhibiting at our conventions who made the foregoing remark as the curtain rang down on the vaudeville show in Convention Hall Friday afternoon. Several exhibitors, who were present, in-

stantly voiced their approval, and at their request the "Review" representative undertook to ascertain the views of as many others as could be reached in the limited time remaining before the banquet. The result of this canvass is given, and of all the persons interviewed all but three—who requested not to be quoted—were very much pleased with the idea. These three took pains to state they were not opposed to the idea, but were not prepared to endorse it until they had either taken more time to consider or know more of the details.

The situation is this: When exhibits were few and small, 15 years ago, a small room, usually one commonly used by traveling men to show goods in the headquarters hotel, was ample for the display. Then the builders began to bring a few cars which were set out on a piece of temporary track in the street in front of the hotel, gradually the idea was expanded and the display increased until a store room was needed. Usually one could be found near the hotel. At Pittsburg, no other space being available, a river barge was anchored three blocks from the hotel and the display made on board. When electricity became a practical motive power a big jump was made and it became necessary to use skating rinks and similar ground floor structures which afforded large space. From the drummer's room at the hotel which cost nothing, to the present day requirements which are so great as to bar some cities from being considered for the convention, the advance has been great. In the early days the local roads furnished the banquet free, but when it became necessary to pay from \$1,000 to \$2,000 for an exhibit building the burden was too heavy. Now the inviting company furnishes the hall, turns it over to the association to rent out, and entertains in other ways than the banquet which is managed by the association.

With the steadily increasing number of exhibits, which at Chicago were valued at \$250,000, there came an immense amount of detail work for some one on the ground to do. Changes had to be made in the building; stronger floors built; wide doors cut; wires run for light and power; arrangements made for teaming hundreds of tons of appliances and machinery; carpenter work which in the aggregate would build a house, provided. Sign painters, electricians, machinists, printers, decorators and painters, furniture men and florists, telegraph operators, messengers, and telephones, all these now have to be in readiness. The correspondence involved between the convention city and exhibitors, covers several weeks and involves the dictating of hundreds of letters. Such is the present result of the expansion of the exhibit feature, which, within the experience of the writer, was limited to a few rope harness, patent horse medicine and bell punches.

The burden of the work alluded to naturally falls on some railway official, usually the manager of the inviting road. He is always a busy man and the additional burden which the convention imposes is little realized by any but those who have been through it. The supply men feel they should not ask it and are perfectly willing to relieve the manager of this work.

Another feature which handicaps the local committee on exhibits is that the meeting goes to a different place each year, and the committee there has it all to learn just as some one did in another city the year before. It is asking a good deal in spite of the willing spirit in which the work has always been done.

The plan now proposed is to organize the supply men next year at New York and put things on a permanent and uniform basis. Elect a standing committee to take entire charge of the hall and everything in it except the meeting rooms of the two associations. The committee would engage some experienced, thoroughly competent man for several weeks in advance of the convention. He would take charge of affairs and make the contracts in the name of the Supply Men's Association for all teaming, labor, power, etc. All exhibitors would be perfectly free to use this man without feeling they were imposing on the good nature of a busy manager. If anything did go wrong they need not hesitate to enter a complaint to their own committee and get an adjustment. This article is not written in any spirit of criticism—far from that; nor have there been any shortcomings here at Kansas City to suggest it. In all our conventions there has never been less friction and annoyance than here, but there has been trouble in the past and is liable to be in the future. There are many things which bear hard on the exhibitor which never come to the knowledge of the railway people. For instance, the local committee contracts for carpenter work; it does the best it can. An exhibitor puts in a requisition for a

platform and booth. The order is turned over to the contractor who then deals exclusively with the exhibitor. Through some carelessness in bookkeeping we will say, and during past years many times with direct intention, the contractor takes advantage of the emergencies and necessities of the exhibitor and tacks an extra \$10 or \$20 on his bill. The exhibitor feels a reluctance to complain to the local railway manager with whom he may have, or hopes to have dealings, so he says nothing, pays his bill and sometimes contents himself with cuss words. The illustration is no fairy tale. It goes all along the line of teaming, wiring, sign painting, and down the whole list.

We do not mean to say that every exhibitor gets stuck on every one of these items, but several times it has been nearly as bad as this. But the trouble lies in the lack of any authority to whom the exhibitor feels at liberty to appeal. With an association, its superintendent is the association's hired man, and bound to take up such matters and adjust them. It is no favor asked of him—he is paid to attend to just such things.

Another advantage would be the possibility of adopting and enforcing a standard set of rules as to the size, appearance and location of signs, which at present are very nondescript. Signs of all sizes and previous conditions of servitude touch ends; one is inlaid with gold letters and polished wood, another is of canvas, tin or boards—"any old thing" goes. To bring these signs into some sort of uniformity would not cost anybody very much, and would improve the effect as a whole several hundred per cent. One exhibitor would not be allowed to build a canvas wall to shut out from view somebody else, sometimes a competitor. Signs and lots of them are necessary, but there are signs and bill boards.

In the matter of freight to the convention a marked saving can be made. With an association its committee is in position to deliver to the road offering the best rates and time of shipment practically the whole freight, and secure for its members concessions which their individual shipments would not warrant. For instance all the shipments from New York to Chicago last year could have been lumped and sent over one road with several routes to choose from.

The exhibitors complain bitterly at the lack of attention paid them by the railway delegates. Organize and send a committee upstairs and it will receive a ready hearing and this matter can be improved. Tell the railway body what it has cost to do all this; and that we are getting to a point where the game is hardly worth the candle. When they understand these things they will devote more time down stairs.

And while the committee is there maybe the railway people would like to arrange for a little less noise during the business sessions, so those sitting back of the front three rows of seats could hear the discussion instead of, as this week, getting it by the lip reading method. Now the exhibitors did not intentionally intrude on the deliberations, but if they had only gone up in the tent room a few minutes we believe they would have hurried back and turned on some quiet.

The foregoing touches only on the outer edges of many reforms, improvements and advances possible with organization. The single exhibitor has no voice at present in the present association, nor does he ask it, and he could not go as such. But as an exhibit body his committee can go, leaving all individuality below, and protest, request and suggest with dignity and propriety.

In the steam road field such an organization has been in existence for years, and has contributed in a large measure to the success, strength and pleasure of the parent association. There is no reason why the same should not be repeated in our case.

The following interviews were all it was possible to secure in the limited time. Almost without exception the person interviewed insisted that it be distinctly understood what he said was in no spirit of criticism on the management of the local committees here in Kansas City. Chairman Satterlee was accorded high praise. There has never been less friction and annoyance than here. It is the future and the expansion of the exhibit feature that it is desired to provide for.

Major Evans: I am most heartily in favor of an organization of the supply men. There can be no possible objection and the advantages are numerous. They have been exhibiting for years, know what they want better than anyone else, and have abundant talent among their numbers to form an executive board which will be acceptable to all. There are scores of things which we

can do as an organization which is impossible as individuals, and I have been in favor of one for years.

Elmer P. Morris: I do not think it fair to put the burden any longer on the local committee of exhibits. Since the display has grown to such proportions it really requires the entire time of one man on the ground for several weeks, and we ought not to ask the manager of a big railway system—always a busy man—to lay aside his work to attend to this. As an organization we can regulate the size of signs and many things we ought now to do. We should of course work in perfect harmony with the American Association—in fact in conjunction with it, but we can do many things for ourselves better than they can do it for us. We are not asking for the revenue the association receives for floor space but would like to have the handling of details, and in short the management of the exhibit hall.

W. R. Garton: I think we should by all means have a supply men's association.

W. S. Rugg, Westinghouse Co.: I think it would be a good move to make.

Geo. D. Casgrain, Griffin Wheel Co.: There ought to be a uniform system for many features of exhibiting which can only be secured through organization. I am in favor of it.

G. R. Scragham, Craghead Engineering Co.: I consider an organization of the supply men a practical necessity. It would be a great relief to the local committee and the obliging secretary of the American Association, and would result in good not only to the convention but to the supply men themselves.

J. V. E. Titus, Garton-Daniels Co.: I am heartily in favor of it.

John Taylor, Taylor Truck Co.: I am very much in favor of it if we could arrange so that day times the exhibits could be viewed. One day it not enough for everybody to see each exhibit. You have to interview a great many people individually. The exhibitors here have spent easily \$50,000 in making this display and it is a lot of money and deserves more attention. The time now allotted is too short. With an organization we could have our committee represent us before the American Association and present our claims, and I hope secure arrangements which would be better than ever before.

Arthur Davis: I want it. We need a committee to arrange freight matters, and other things of mutual interest.

M. Garl, Garl Electric Co.: I favor it with a standing committee to make arrangements and attend to details, such as signs of uniform size, which will prevent one exhibit cutting off the view from another. I favor smaller signs than now used.

General Electric Co.: We heartily approve of the plan and will be glad to join in any arrangement satisfactory to all.

H. T. Bigelow, Hale & Kilburn: Such an association will do much to facilitate the work of exhibitors, and relieve the local committee of a multitude of details.

John High, Pantasote Co.: Those are my sentiments.

H. J. Davies, National Carbon Co.: That is what we ought to have by all means. The right kind of an organization, rightly officered and conducted, would be a great thing, and we have plenty of good men from whom to choose. This from a supply man's point of view. I can also speak from the other side. As a member and secretary of the local committee of arrangements for the Cleveland Convention, in 1892, I had charge of the renting and assigning of space for exhibits, the correspondence, the arranging of exhibits on arrival, etc., and know something of the amount of work involved in preparations for these annual exhibitions. It is too much to ask or expect, gratuitously or otherwise, from any local committee. Street railway men are too busy. And each local committee has to learn the business—usually without a teacher or a text book. Perhaps the work could not be done better by a committee of supply men, but it could be more easily done after a year or two of experience, if not at once.

E. Peckham, president Peckham Mfg. Co.: I have always believed in having just such an organization, and it is something which should have been done years ago. I am heartily in favor of it and hope something will come of the agitation this time. The exhibitors certainly do not receive the consideration to which they are entitled. These exhibitors have expended thousands of dollars to present something instructive and interesting and while we receive our share of attention I speak of the display as a whole and voice the universal opinion that the program should be made to allow much more time in the hall. Many have told me they were

tempted never to make another exhibit, and others are taking smaller spaces than formerly. I appreciate the fact that this is a condition which has been a matter of growth and is not the result of an intention to slight the supply men. But that makes it none the less disappointing to those who have gone to much expense and trouble to provide something interesting. We need an organization which can be represented by a committee and secure the recognition which the exposition deserves. The present time allowed us is altogether too short.

Geo. C. Bailey, Roebing Co.—Such an organization would be productive of great good to the supply interests, and reduce expenses.

Victor Angerer, Wharton Co.: If properly organized and managed it would be a good thing. If the majority want it I am with them. As the next convention is to be held at New York it might be well to consult the street railway men in that city.

D. A. Johnson, Jos. Dixon Crucible Co.: The supply men's interests are now so large in these conventions they should get together and can save money and improve the display by so doing.

Max Berg, McGill, Porter & Berg.: That's just what we need. Let us have it.

E. S. Nethercut, Paige Iron Works: Yes, I favor such an organization. It would find plenty to do and everybody would be benefitted.

Continuous Rail Joint Co.: We heartily agree with the plan as proposed to us.

Consolidated Car Heating Co.: We are in favor of the plan to form such an organization.

Chas. W. Cobb, Chicago Mica Co.: An excellent idea. I would like to see a uniformity in signs, which should also be placed in a line and think it would be a good thing.

J. W. Perry, H. W. Johns Co.: It is well worth taking up. It would relieve the local committee and result in a more systematic arrangement all around, and facilitate matters for everybody.

T. C. White, Central Union Brass Co.—A good thing; push it along.

G. R. Pratt, Star Brass Works: By all means. Have something along the line of the M. C. B. supply men's association. That has been a success for years. I will gladly bear my share of any work or expense.

J. R. Wiley, Standard Underground Cable Co.: I think this exhibit business should be governed by an organization of its own, and so done would result in benefit all around.

F. A. Estep, R. D. Nuttall Co.: I am in favor of the plan. Such an organization, with its executive board or restraining committee, would make another place of our annual display. Heretofore and now there is a heterogeneous mass of signs of all sizes and colors. Such a motley collection would be classed in New York as belonging to a county fair. I favor an association of supply men.

D. B. Dean: Yes, I favor an organization if everybody will go in and unite on a plan, and there is no reason why we should not do so. Others have with good results.

R. H. Ham, Ham Sand Box Co.: Am in favor of what is outlined and think it would be a good thing.

Scott H. Blewett, American Car & Foundry Co.: The booths should be more uniform, the signs of a uniform height, lettering of a uniform size and color. So far as possible exhibitors of the same class should be grouped together. These and many other desirable improvements can be brought about by a supply men's association and would greatly improve appearances and save money. It has been done for years in the steam road field and their display is not so large as this.

Harold P. Brown: The plan as stated to me is needed and should be carried out. There is a great deal to be gained in many ways, and as an association we are in a position to secure many concessions that comes to large propositions and are denied individuals. It need not be a cumbersome affair, and its annual meeting consume little time, but the possible results will be recognized by everyone who makes an exhibit. I hope to see the organization effected.

F. W. Edmunds, Q & C Co.: I favor your plan. We have the same thing in steam road supplies in the Trackmasters' Association, the Master Car Builders, and also Master Mechanics Associations and have had for years. It is simply indispensable in those lines. The exhibiting concerns are taxed pro rata on their space or booths and the fund collected the first day by the treasurer. The

committee thus has a fund for use in case of emergency without going round with the hat. In these conventions there is no local entertainer as in the case of the street railways, and it devolves upon supply men to provide carriage drives, flowers and theater parties for the ladies. I assume the entertaining street railway company would always wish to entertain as heretofore, therefore the necessary expenses of a street railway supply men's association would be nominal, although I think the exhibitors have always stood ready to contribute to the American Association if their help had ever been needed. There is usually some surplus left which is paid back pro rata to the exhibitors. For example our tax this year was \$30, and we were rebated \$7 after the convention which lasted a full week, closed. The committee is elected each year, does its work without friction, and everybody is satisfied. It contracts for all the usual hall expenses, teaming, carpenters, etc., and secures low rates for the whole job. Each exhibitor is charged for what he gets. The supply men hold an annual meeting for election and any other business and this takes place during one of the business sessions of the main association. The two organizations are entirely separate, but the committee from the supply men can always take up and arrange any desired features with the main association. The plan has worked like a charm for years, and there is no reason why our supply men should not work together on the same basis.

W. H. Gray: It's a good thing if we can get the right kind of men to control. I should favor a membership vested in companies or concerns, so that the large concerns cannot come in and vote 10 or 15 representatives against an equal number of small firms with only one representative present. There should be a committee elected annually from the members, of say three or five to carry out the work of the association along the lines of a policy decided by the members. If the plan is carefully matured and can be presented for action at next year's convention there would be something tangible to act on, and an intelligent action taken on the advisability or otherwise of affecting the association. I hope to see it worked out.

J. G. McMichael, president Atlas Railway Supply Co.: I am, and always have been in favor of such an organization. I believe that it would greatly relieve the American Street Railway Association as well as benefit the supply men. I heartily agree with the remarks of Mr. Taylor, of the Taylor Truck Co., concerning the limited time allowed for inspection of the exhibits, and with Major Evans' statement. There are scores of things connected with the exhibition which should be done by the exhibitors and relieve the Street Railway Association.

Only five street railway men were interviewed but each one was pleased with the idea.

Walton H. Holmes said, speaking as a railway man and not as an officer of the American Association that he considered it a good thing and would enable the supply men undoubtedly to secure many improvements which the local street railway men would not be likely to think of. If the supply men took hold of the matter it would be ably conducted.

T. C. Pennington, speaking for himself, expressed the same views.

F. G. Jones, vice-president of the Memphis street railway, and also an officer of the association for the past year, said: From now on the supply men and the street railway men will be more closely drawn together. I think it is an excellent idea and hope the boys will carry it out.

W. Worth Bean hoped the organization would be effected. He recalled the time when there was considerable discussion about the supply men coming in as associate members. This was at Montreal when the boys offered to raise the debt of the association in full, a matter of some \$4,000. He urged them at that time to organize one of their own, and has wondered why it was not done long ago.

The last interview was with W. A. Satterlee, chairman of the local committee of exhibits. He has worked night and day and Sundays for nearly a month past, and the result of this has been evident in the rapid and systematic installation of exhibits. He has good reason to be proud of his efforts, and every supply man is grateful and appreciates his work. Mr. Satterlee expressed himself as heartily in favor of the new plan. He was sure the local railway people wherever the convention met would feel the same way, and be only too glad to be relieved of a most trying position, and one which really requires more of a manager's time if rightly

done, than he can spare in justice to himself. He appreciated highly all the pleasant things which exhibitors had said expressive of satisfaction at his efforts, and desired to thank them one and all through the "Review"

Since the convention we have heard from the following:

Van Dorn & Dutton Co.: We believe that such an organization would relieve the Street Railway Association of much detail work that must be a great annoyance, and that it would be a good thing for the supply men. We would willingly do our share towards making it a success.

Triumph Electric Co.: We think the scheme a very good one and believe that such an association would facilitate matters and make it easier for exhibitors. The idea has our hearty approval.

N. H. Colwell, general manager R. Bliss Manufacturing Co.: It has been my opinion for several years that the supply men should have an organization, and in the past I have spoken to a number of gentlemen advocating this subject, but did not find many who thought the time opportune to effect an organization. We shall be pleased to co-operate and to assist in such an organization, and the sooner it is done, we believe, the better.

W. J. Cooke, McGuire Manufacturing Co.: I am heartily in favor of such an association. The exhibits at the street railway conventions have attained such magnitude that it would be a very great advantage to all parties concerned to have our own man or men on the ground to superintend the placing of exhibits and look after the details. This is to my mind a necessity, and our company will be glad to do everything in its power to forward the movement.

Michigan Electric Co.: While we are not exhibitors at the railway conventions, yet as the writer attends most of them, and is much interested in the exhibits made, I would state as my opinion that a supply men's organization would be a good thing if it is governed by a board which properly represents a sufficient number of prominent exhibitors to make it truly representative of all exhibitors' interests and prevents showing undue favoritism to any firm or individual, and further bears such relation to the American Street Railway Association as will provide for working thoroughly in harmony with that Association. This last could possibly be accomplished by having one or two members of the Street Railway Association elected each year to the controlling committee of the Supply Men's Association; such members to be selected preferably from those living at or near the city where that year's convention is to be held. Supply men certainly are best fitted for looking after all matters pertaining to exhibits and arranging the details of freight rates, cartage, etc., on a basis which will be most convenient and less expensive for the exhibitors, and if such arrangements are made for all exhibitors by a committee authorized to do so, they undoubtedly would get better terms than individual exhibitors could otherwise secure. I would be pleased to do anything I can to further the proposed supply men's organization.

George W. Lord: We have taken considerable interest in the numerous expressions of opinion in regard to effecting a permanent organization of supply dealers, who in the past have placed exhibits at the annual conventions of street railway men. We have not been represented at these conventions mainly because of the various objections mentioned by others, but all of which could, no doubt, be overcome. As it is necessary for someone to start the ball rolling in a matter of this kind, we take the liberty of making the following suggestion: It would seem to be entirely appropriate if you and the editor of the Street Railway Journal, of New York, should request, say, three prominent supply men, who have been exhibitors in the past, to act with you. This committee of five could place themselves in communication with the individual concerns composing the general supply trade and from the various suggestions which would, no doubt, be received, they might be able to formulate some definite plan, according to which a permanent organization might be effected to the advantage of all concerned. The expenses of this committee would be inconsiderable and we would be willing to contribute towards paying them.

November 1st the Springfield (Mass.) Street Ry. put in effect an order prohibiting smoking in its closed cars.

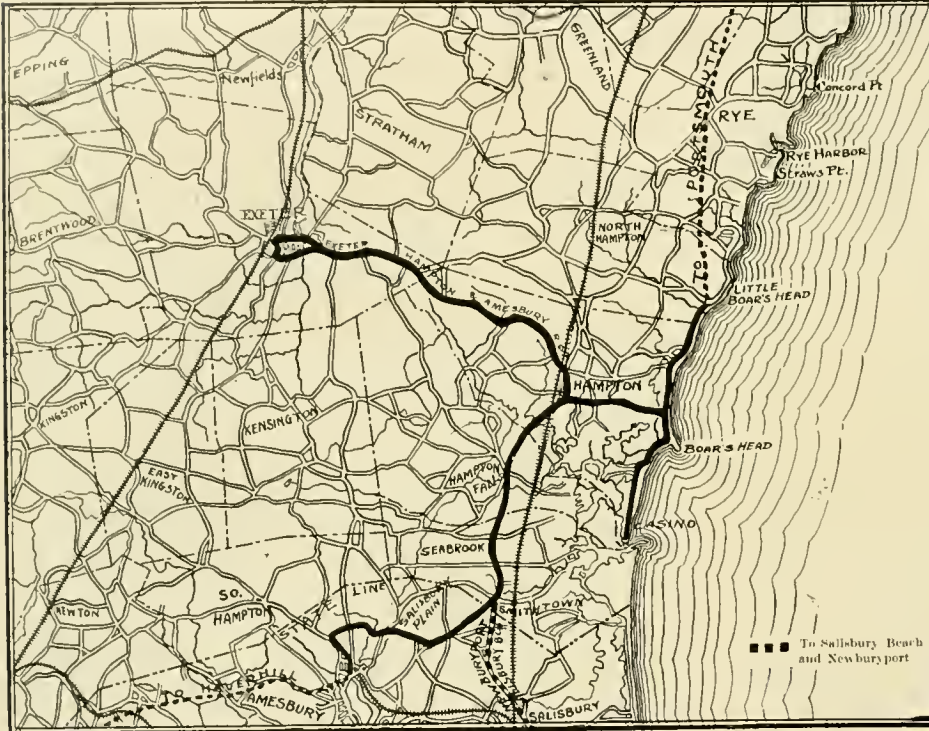
The Exeter, Hampton & Amesbury Street Railway.

BY C. B. FAIRCHILD.

One of the most interesting cross country railway systems to be found in New England, is that of the Exeter, Hampton & Amesbury Street Ry., the lines of which connect Exeter with Amesbury, Hampton and Hampton Beach. The track in Exeter makes a loop about the central portion of the village, passing the depot of the

two miles to Little Boar's Head, where connection is made with the lines of the Portsmouth Street Railway Co. This portion of the state embraces what is known as "Historical New Hampshire," and while a trip over the line presents many interesting and beautiful scenes, at the same time one is reminded of many stirring events connected with the early settlement of the region, which have been recorded in history, song and story. Exeter, a town of about 5,000 inhabitants, is some fifty miles from Boston and about the same distance from Portland. The first settlement of Exeter dates from 1637, when John Wheelwright, who had been banished from the Massachusetts Colony on account of his alleged heretical religious views, came to the vicinity of Exeter and in 1638 selected as the site of the new town the falls in the Squamscott River, now the head of the tide water navigation. From this section went the ancestors of Daniel Webster; here Lewis Cass was born; here lived many families that have sent out men to make American history; here was the birthplace and home of Whittier, who afterward lived at Amesbury where he is buried. At Exeter is located the celebrated Phillips Exeter Academy, which was founded and formally opened by John Phillips in May, 1783, and which has always maintained a high standing as a preparatory school for college. The Academy buildings are delightfully located in the center of the village and the ample grounds are well kept and shaded by stately elms. The campus is bounded on one side by a beautiful

new public library, built of cream-colored brick and on the opposite side by a large stone church and in front by colonial houses with acres of lawns and a forest of shade trees. Nearby on the same street, is a church bearing a tablet, which reads, "The First Church in Exeter. Founded in 1638. Reorganized in 1698. This house erected in 1798." Hampton the other town from which the line



MAP OF THE SYSTEM.

Boston & Maine R. R., returning and completing the loop in front of the office of the operating company, where is also a waiting room. The line then crosses a bridge in an easterly direction and runs through a prosperous farming country about eight miles to Whittier's, a notable wayside inn. Here the line branches, one track going to Amesbury, nine miles distant, along the old



CASINO AND HOTEL, HAMPTON BEACH.

post road from Portsmouth to Boston. The other continues three miles to Hampton Beach, where on reaching the shore the tracks again branch, one section running south along the shore line about two miles in front of cottages and hotels to the terminal in front of the Casino, and the other north along the shore about

takes its name, has a population of about 2,000, while Amesbury is a prosperous manufacturing city of about 12,000 population, which is located on the Merrimac River a few miles above its mouth.

While both of the branches, as well as the main line, are through a well settled part of the country, and a number of villages besides

those noted above, the road does not depend entirely upon local traffic for its income, but it draws a pleasure traffic from the whole Merrimac Valley, and also enjoys a very liberal patronage from the summer tourists and seashore cottagers from Hampton, Rye and Salisbury Beaches, who find it a pleasant pastime to make daily trips inland on the "electrics," as the cars are called in all this region. Until recently, comparatively few people realized how many attractions this region possessed, but thanks to the "electrics," it is now brought within easy reach of a great multitude. In order to fully describe it, however, one must necessarily employ a vocabulary equal to that overheard at times on the cars from the groups of feminine tourists. It is not enough to say that everywhere along the line is the most beautiful farm scenery in all New England, with old colonial farm houses and stone walls on every hand, but one must say lovely, grand, delicious, entrancing, beautiful, fascinating, as at different turns in the road one



THE OLD WAY.

has an extended view over a neighboring valley, or sees some mountain peaks in the distance, or as the cars whirl through a group of native pines or passes through long rows of well laden apple trees (the principal border trees along the route) or some spreading or historical elm comes into view. It is safe to say that when city people come to know of the almost ideal beauty and interest which this region possesses and its accessibility, greatly larger numbers of tourists will favor the line with their patronage. The road approaches the coast over an extensive salt marsh, then proceeds to the south for a considerable distance paralleling the shore behind a ridge of gravel, sand or rocks, that have been thrown up by the sea, then behind the Great Boars Head, then along the beach proper as it makes a long bend inland and in front of a long row of hotels, cottages and stores, to the casino and hotel, already mentioned, which are owned and run by the street railway company. These buildings are near the middle of a curved sandy beach, which extends a mile or two farther south to Hampton River, and which is controlled by the railway company. The entire coast line of New Hampshire is only about 18 miles. In front of the casino, and for a mile or two in each direction, the beach slopes so gently, that it seems almost level, making it one of the finest and safest beaches for bathing to be found on the whole coast. There is no undertow, and no life lines or safety lines are required; bathing is safe at any stage of the tide. From the board-walk in front of the casino there is a stretch of fine, white, soft sand, extending about 130 ft. to the ordinary tide line; then there is a stretch of firm sand, about 500 ft. wide at low tide, without a shell or a pebble, and so firm and solid as to form a perfect carriage drive and a most delightful bicycle path. Here horse races are held and on some sections may be seen games of croquet, hall games by the lads, and the ordinary seashore amusements.

The buildings were erected by the street railway company about two years ago. First there is a large casino about 400 ft. in length, with a double row of piazzas all around. Adjoining this to the right is a fine hotel, with 50 rooms, which is run on the European plan, the guests taking their meals in the dining room at the casino. The casino is divided on the first floor into offices, and concessions for fruit venders, and there is a small dining room and kitchen. The main dining room is on the second floor, and adjoining it is an enclosed theater, with stage and modern fixtures,

for plays and vaudeville entertainments. At the south end on the ground floor is a large billiard room and bowling alley, while above these is a very pleasant large hall designed for concerts, political meetings, dancing parties and other entertainments. Vaudeville shows are given every afternoon and evening in the theater.



SPREADING ELM AND TYPICAL FARM HOUSE.

the troupes being furnished by the Gorman Amusement Agency, of Boston. A charge of 10 cents is made for the vaudeville entertainments and for dancing parties a charge of 35 cents is made for tickets, which admit a gentleman and lady. Adjoining the casino is a large pavilion divided into dressing rooms for bathers. Behind the casino and on the edge of the extensive salt marsh, is a fine base ball ground, and when match games are being played a charge of 5 cents is made for those who wish to watch the game from the piazza of the casino. On Sundays grand concerts are given. On pleasant days the cars carry about 10,000 people to the beach, and on special occasions, as many as 15,000 people have been counted on the beach at one time. Special rates of fare are offered by the railway company to excursion parties from neighboring cities and parties frequently come in on the steam



SUMMER CAR

cars to Exeter or Amesbury and then go by the electrics to the beach.

It is quite the fashion for some of the large stores and factories at Amesbury to close for a day and give the employes a free excursion to the beach. Merchants associations and other organized bodies frequently make excursions to the beach and are entertained at the casino. During one week in August, the Rockingham County Musical Association gave public concerts at the hall, the singers being entertained at the hotel. From this it will be seen that the street railway lines caters to a very large patronage, and that its officers are fully awake to the future possibilities of Hampton Beach.

One of the most conspicuous objects of Hampton Beach is

Great Boar's Head. It is a moraine or mound of glacial drift 1,300 ft. long and about 50 ft. high, thrust out into the ocean from the coast line. All about the base of the Head and for quite a distance on each side the shore line is strewn with boulders of all sizes, supposed to have been washed in from the undermining of the Head, as it was at one time probably of very much

sections are on a private right-of-way. On both the Exeter and Amesbury branches the tracks cross a steam railway line by means of wooden bridges, with earth approaches. These bridges were put in last year. The region is gently rolling, but none of the grades are very long or steep. The turnouts and each of the stations are provided with telephones, which are housed in



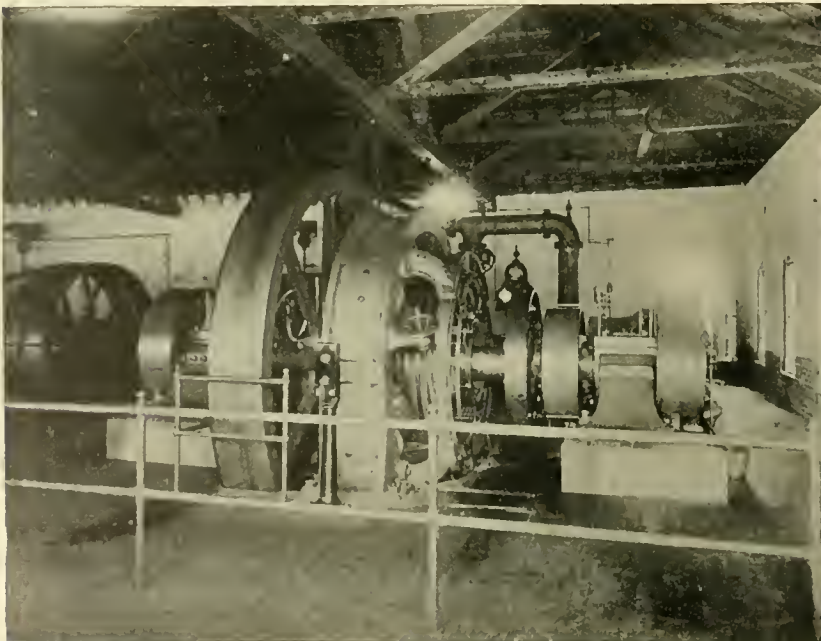
POWER HOUSE AND CAR BARN.

greater area. The Head divides the beach into two parts. The north beach extends about two miles to little Boar's Head and the south beach to Hampton River. From the point of the Head the shore swings back on both sides in a sharp curve, as shown in the illustration. There are several hotels located on and near the Head.

iron boxes on the posts and are of the type made by Couch & Seely, of Boston. The overhead hangers and attachments are for the most part from the Ohio Brass Co. At the turnouts, Johnson switches are provided, and when cars are run in groups, each conductor is obliged to tell the waiting conductor on the siding how many, if any, cars are following. In this matter the rules

are very strict, the men not being allowed to signal the number to the waiting conductors, but are required to call out and wait for the number to be repeated by the other conductor. In case any conductor is not sure that the line is clear, he is required to stay on the siding and telephone for instructions and always wait for instructions. When cars are running in groups, no car is allowed to approach the leading car nearer than five poles.

The power for operating the system is principally generated at a single station, which is located in Hampton Township, about eight miles from Exeter. In busy hours extra current is rented from a station in Amesbury for operating the Amesbury division, as the distance from the power house to the terminal in Amesbury is about 14 miles. The power house is a one story, brick structure and adjoining it is the principal car house. The ground dimensions of the power house are 100 x 80 ft., and it is divided by fireproof walls into engine room, boiler room, pump and condenser room. It is located in an isolated region, near a small pond, from which feed and condensing water is obtained. In front of the station is a wide, well kept lawn, with a fountain and numerous flower beds. The brick chimney is 150 ft. high, with a 5-ft. flue, giving excellent draft. Power is generated not only for operating the railway station, but for street and commercial lighting in Exeter, Hampton and Hampton Beach. The engine equipment consists of four machines, three single and one compound. The latter was recently added to the station. All the engines are from the works of the Buckeye Engine Co., of Salem, O. The



250-KW. UNIT—BUCKEYE ENGINE—GENERAL ELECTRIC GENERATOR.

PHYSICAL FEATURES.

The line is single track with turnouts for cars running at intervals of 15 minutes. The rails are 60-lb., in 60-ft. lengths. The track is, for most of the distance, on the public highway, but some

new engine is a horizontal cross compound machine with cylinders $16\frac{1}{2}$ and $30\frac{1}{2}$ x 30 in., and is rated at 400 h. p. when running at 120 revolutions, with a steam pressure of 120 lb. This machine is direct coupled to a General Electric multipolar generator of 250 kw. capacity. The voltage is 550. Two single engines of 185 h. p. each, with cylinders $15\frac{1}{4}$ x 24, and running at 160 revolutions drive by means of belts, two Keystone generators of 125 kw. capacity. A third engine of the same capacity drives by belts the lighting generator, which is a new machine, and one of the latest put on the market by the General Electric Co. In this machine the fields revolve and the speed is 600 r. p. m. and from it by means of a tank converter, currents for both the arc and incandescent lamps are obtained. The tank converter contains 280 gallons of oil and is of 100 light capacity. The lighting current is transmitted about six miles from Exeter and about the same distance in the opposite direction to Hampton Beach.

The boiler equipment comprises three Ames horizontal tubular boilers, 72 in. by 18 ft., and one Dickenson, each of 150 h. p. capacity. There is a combined condenser and feed water heater, designed by L. C. Lamphear, of Boston, Mass. In the primary division of this heater the engine exhaust is used and in the secondary, the exhaust steam from the pumps so that a temperature of 220° F. is obtained for the feed water. There are two M. T. Davidson feed pumps, one of which is a deep-well pump, for use in case the pond supply should fail; the well is 150 ft. deep. There are also a Knowles feed pump and a Davidson high pressure pump, with a capacity of 1,000 gallons a minute. This is used for fire protection. The water is lifted into a 10,000-gallon tank, mounted on a steel tower 80 ft. high. One-half of this supply is available for daily station purposes, for wetting down the coal, washing floors, etc., while the other 5,000 gallons is in reserve for fire purposes and for operating the Grinnell dry air fire sprinkler system, with which the neighboring car house and repair shop are equipped.

thus drawn off; every two weeks the boilers are cleaned and examined.

Coal is delivered by rail at Hampton depot, three miles away, and is hauled by wagon to the car station. Hard coal screenings, mixed with Georges Creek soft coal, is used as fuel. In ordinary traffic the mixture is half and half by weight. On occasions of



HAMPTON BEACH—BOATS HEAD IN THE DISTANCE.

extra heavy traffic, only one-third of screenings is used to two-thirds of soft coal. An oil house is constructed in the base of the water tower, and is provided with a concrete floor. Here the oil barrels are placed on an elevated stand and by means of a pipe the oil tank in the engine room is filled by gravity.

CAR HOUSES.

Two houses are provided for storing cars. The principal one is adjacent to the power house in Hampton. This is of wood, with



GENERAL VIEW OF POWER HOUSE, HAMPTON.

There is a duplicate system of feed water pipes, and in case all the feed pumps should be disabled the engineer has resort to a fire hose from the elevated tank to feed the boilers. The feed water is reasonably pure, but the engineer uses a little soda ash, which is introduced into the boiler once a week, through the heater. All tubes are blown out every morning, two gages of water being

metal shingles, and has ground dimensions of 50 x 215 ft., and is provided with four tracks. The second house is of brick and is located in the suburbs of Amesbury, and is of about the same size as the first. The repair pits of the former are constructed with brick walls and cement bottom, while 48 ft., of the floor space in front, on one side, is of concrete where the cars are washed.

The repair shop and stockroom are at the rear end of the building, separated by a fireproof wall and automatic sliding doors, and as before noted, both houses are equipped with an automatic fire sprinkler system. The superintendent's office is in front of the building, where is also a waiting room for car men. The tools in the repair shop are driven by a small electric motor, which also drives an air pump for charging the sprinkler pipes. All motor repairs are made in the shop. For winding the field coils on the metal shields which are used with the Steel motors, the foreman has devised an arrangement shown in one of our illustrations. It consists of an ordinary cone lathe head, which is driven by a belt from an overhead shaft and provided with an auxiliary adjustable

as they get their mail several hours in advance of the former service, by the old method. Three Taunton snow plows and a plow made by Smith & Wallace, with several flat cars, complete the equipment.

During the hours of heavy traffic 20 cars are frequently operated at one time. The winter cars have H. W. John's electric heaters, and all are provided with New Haven registers.

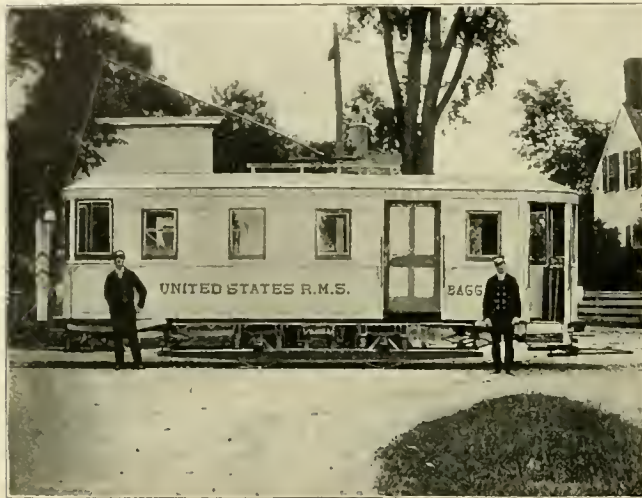
The through fare from Exeter to the Beach or from Amesbury to the Beach is 15 cents, but is collected in 5-cent payments at different stages. It requires one hour to make the trip in either direction between Exeter and the Beach; one hour between Amesbury and the Beach, and one and one-half hours between Exeter and Amesbury.

An interesting feature of this road is the care taken in the selection and management of all employes. The company's officials and the men are on excellent terms, and the company does everything possible to continue and increase this good feeling. One of the iron-clad rules of the road that is appreciated by the public is the one requiring every employe to show constant and unflinching courtesy to every man, woman and child that may use the service in any way.

At present the company employs 19 motormen and 19 conductors, who are paid 17½ cents an hour, and work 10 hours a day.

The officers of the Exeter, Hampton & Amesbury Street Railway Co. are: President, Warren Brown; treasurer, E. L. Pride; general manager, A. E. McReel; chief engineer, H. C. Mason; electrical engineer, J. C. Herlick. The company has an authorized capital of \$250,000 and \$203,000 in first mortgage bonds.

The general offices are in Folsom's block, Water St., Exeter.



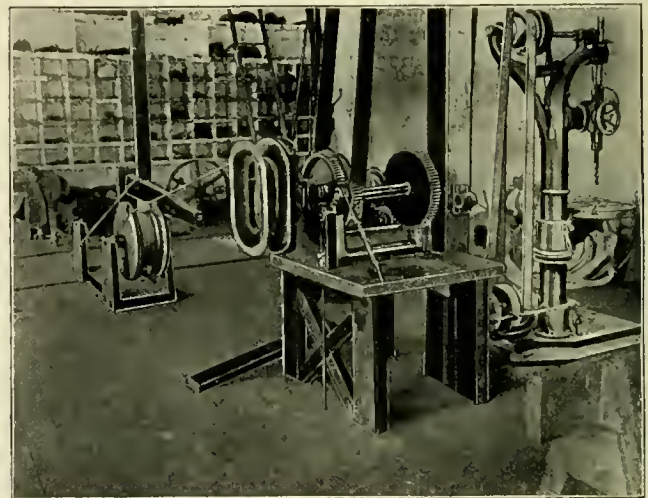
MAIL CAR—EXETER, HAMPTON AND AMESBURY.

shaft, with reducing gears on each end. This shaft is so mounted in rocker bearings, that it can be thrown into mesh by means of a foot lever. In normal position it is held out of mesh by means of a spring, as shown. One or two reels of wire are placed in position, as shown, and a braking or tension device is provided to give the necessary stress on the wire. By this means the field coils are readily formed.

ROLLING STOCK.

The summer equipment comprises 8 double truck, 45-ft. 14-bench open cars, with double steps and 13 single truck open cars. All the large cars have Standard air brakes, with geared axle-driven compressors; these have been running for nearly two years, and are said to be giving excellent satisfaction. For winter use there are 9 single truck box cars; some are vestibuled and 4 have cross seats with center aisles. There is also one Duplex type of car, which is used chiefly as a parlor car and for clubs and for private parties. It is decorated with a number of red incandescent lamps, and when trimmed up with flags, presents a brilliant appearance. The brakes on this Duplex car and some of the vestibuled cars are operated by means of a vertical hand wheel, connected to the spindle by beveled gears. This is known as the Beverly brake, and is made by the Beverly Engine & Machine Co., Beverly, Mass.

The long cars have two trolley poles; a hook is placed at each end above the hood of the car to hold down the idle pole. The Wilson trolley catchers furnished by the Frank Ridlon Co., of Boston, are employed on all cars, and are in great favor with the car men and the manager, who all say, "It is a great thing." All the cars were built by the Briggs Carriage Co., of Amesbury, Mass., and the double, as well as single cars, are mounted on Du Pont trucks, furnished by the Lorain Steel Co., of Johnstown, Pa.; all are equipped with Steel motors furnished by the same company. The motors are No. 22, No. 34 and No. C. The car equipment also includes a fine mail car, which was designed by the manager. This is divided into two compartments, and is provided with racks for holding the mail bags and all the usual appliances for assorting the mail. This car has the right of way over all other cars and makes three trips each way, every day, connecting with the mail trains on the steam roads. This mail service is in high favor with the people in all the small villages,



DEVICE FOR WINDING FIELD COILS.

Here are finely arranged offices for the superintendent and the bookkeepers, and also a large private office for the use of the directors, and a commodious waiting-room for passengers. Here also is kept a large and complete stock of electrical supplies of all kinds for sale, as well as for the company's use. The Western Union Telegraph Co. has an office in one corner of the waiting-room. There is also an office and large waiting-room on Market Sq. in Amesbury. At the town of Seabrook, on the Amesbury branch, arrangements have been made with the proprietor of an old curiosity shop to use his store as a waiting-room. This is mutually satisfactory, as it saves the company the expense of renting or erecting a building and at the same time brings possible customers into the shop. The storekeeper does a large business selling relics and souvenirs of the region and its many famous characters.

The street railway system, as well as the Hampton Beach buildings and attractions, are under the direct supervision of Mr. McReel, the general manager, with headquarters at Exeter. Mr. McReel goes over the line every day and spends a good deal of time overseeing the crowds and terminal arrangements at the Beach. No pains are spared by the manager to keep the discipline up to a high standard, and to favor the patrons in every way, so that every one in all this region, and especially the summer tourist, has a good word for the management.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

CONDUCTOR'S PLACE IS ON PLATFORM WHEN CAR STOPS.

Nash v. Canal & Claiborne Railroad Co. (La.), 27 So. Rep. 661 Apr. 2, 1900.

The supreme court of Louisiana says that it takes it that the place of the conductor is on the platform when the car stops, to enable passengers to alight. Or, as it otherwise puts it, when a stop is made to permit a passenger to alight, ordinarily the conductor should be on the platform of the car. And, if he is called at the time, he should be able, in case of an accident, to account for his absence.

ARREST PROCURED BY CONDUCTOR FOR KEEPING ANOTHER'S CHANGE NOT MALICIOUS PROSECUTION.

Barry v. Third Avenue Railroad Co. (N. Y.), 64 N. Y. Supp. 615, May 11, 1900.

A passenger gave a conductor a quarter of a dollar, and received two ten-cent pieces in change. Another passenger got on the car, as the first one sat there, and also gave to the conductor a 25-cent piece to pay his fare. After a short time this second passenger asked the conductor for his change, but the conductor claimed that he had given the change to the first-mentioned passenger, and insisted on that passenger paying it to the second one. Thereupon there arose a dispute between the parties, which resulted in the conductor calling a policeman, and having the first passenger arrested. The policeman, accompanied by the conductor, took the man to the station house, where, after some delay, he was brought before a police justice, but no complaint was made and he was discharged. Following this, he sued the railroad company for malicious prosecution and false imprisonment, but at the trial elected to proceed for malicious prosecution, and not for false imprisonment. His complaint was then dismissed, and the appellate division, first department, of the supreme court of New York holds properly so. It does not think that upon the evidence above recited an action for malicious prosecution could be maintained. It says that there was no doubt but that the arrest, made by the policeman at the request of the conductor, was utterly illegal, and that such an arrest would undoubtedly afford a good ground for an action for false imprisonment against the officer who procured the arrest to be made. But, it adds, the mere fact of an illegal arrest and detention is not sufficient to sustain an action for malicious prosecution. Unless the arrest is followed by some sort of a judicial proceeding, which it was not in this case, there can be, it says, no malicious prosecution, and the plaintiff must seek his remedy in an action for false imprisonment. Again, it says that the charge against the plaintiff, if it were a crime at all, was only a misdemeanor, and hence no justification for an arrest, without a warrant, by an officer who was not present when the offense was committed or attempted.

LIABILITY UNDER ORDINANCE AND EVIDENCE FOR NOT RUNNING CARS AS REQUIRED AFTER MIDNIGHT.

City of New York v. Union Railway Co. (N. Y.), 64 N. Y. Supp. 483, May 1, 1900.

Sections 595 and 596 of the Revised Ordinances of the City of New York, approved March 30, 1897, the appellate term of the supreme court of New York says, clearly evince the purpose to compel all street surface railroads then operating within the municipality, under a penalty of \$100 for each neglect or refusal, to run cars, at intervals of not less than 20 minutes, over the entire road, between 12 o'clock midnight and 6 o'clock in the morning, and it holds that these sections must be treated as the declaration of the local legislative authority with respect to the subjects which they embrace at the time of their approval, viz., March 30, 1897, and not 1890, when the original ordinance in the identical language of

these sections was adopted, referring to companies "now" running cars, as do these sections.

Then, it appeared from a certain agreement, bearing date the 2d day of July, 1892, that certain street surface railroads, including "the road, tracks," etc., were consolidated, and became known as the "Union Railway Company of the City of New York," and among the thoroughfares affected thereby was Westchester avenue. The evidence showed, furthermore, that this avenue began at Third avenue, and continued to the Southern boulevard; that, during the daytime of the period in suit, cars bearing the name "Union Railway Company" were run along this avenue; and that no cars except those bearing such name were operated thereon. It also appeared from the testimony of a police officer that on a certain date he covered his post from Prospect avenue to Third avenue, which extended over and along Westchester avenue; that he was not off post from past 1 until half past 5 o'clock in the morning; and that during this time no cars passed him. Under these circumstances, it must be held, the court declares, that the Union Railway Company of the City of New York did not, during the time in question, run any car whatever, and hence incurred the penalty. It was during that part of the night bound to run cars over its entire tracks at intervals of 20 minutes each, and it could not, the court holds, escape liability upon the plea that the proof showed a failure or neglect to operate only a portion of its line.

CONCERNING ALLEGED RIGHT TO GO ON FROM SHORT TRIP CAR WITHOUT TRANSFER TICKET.

Little Rock Traction & Electric Railway Co. v. Trainer (Ark.), 56 S. W. Rep. 789, Apr. 21, 1900.

A woman boarded a car on Main street, intending to go on that and another street called West Markham. She testified that she asked the conductor if that car went to West Markham, or was for West Markham, and, being answered in the affirmative by him, she paid her fare. When, however, the car reached Markham street, he informed her that his car would go no further, but that an approaching car indicated to her by him would take her on West Markham street. She then alighted from the first car and when the second one moved up and took its place, boarded it. But the conductor on the second car demanded fare, which she refused to pay, informing him that she had paid her fare on the car from which she had alighted. The conductor insisted that she must pay, or get off, and, she still refusing, he ran the car back to police headquarters, where he called to his assistance a policeman, but the chief of police appearing on the scene disposed of the case at that point by paying the fare. An action for damages, laid at \$5,000, followed, resulting in a verdict and judgment for \$200 against the company, which the latter, on appeal, has got reversed by the supreme court of Arkansas.

At the plaintiff's request, the judge instructed the jury: "If you believe from the evidence that it was the rule or custom of the company to require a transfer ticket at the point at which plaintiff made the change, but you should further find that her entering the car without procuring a transfer ticket was the result of the negligent conduct of the conductor of the first car, and that the plaintiff, as a reasonably prudent person, had a right, under the circumstances, to assume from the conduct and statements of the first conductor that she would be carried on West Markham without such transfer ticket or further payment of fare, then she was entitled to be carried by the second car without further payment of fare." This is not discussed in the case.

The company asked to have this instruction given: "The regulation of the defendant company that persons transferred from one car to another can ride upon the second car without paying fare only upon the production of a transfer check from the conductor of the first car is a reasonable, valid, and binding regulation; and if the plaintiff knew of it, and transferred from one car to another without asking the conductor for a transfer check, and without his telling her none was necessary, she cannot recover." There was ample evidence, the supreme court says, to sustain the

instruction, and it holds that the company was entitled to it, without modification, as presenting its case, or its side of the case, and that it was error for the judge when he gave it to modify it by adding the words, "unless she was induced to do so by the conduct and statements of the conductor of the first car."

The evidence which the court refers to as ample to sustain the instruction as asked was that of the manager of the company, which was substantially uncontradicted, that, under the rules and regulations of the company, a conductor was not authorized to pass a passenger from another car without the production of a transfer ticket except in case of emergency, such as a breakdown or something of that kind. If a car was running extra on Main street to Markham, as was the case in this instance, the conductor on the latter car had no authority to pass him except on a transfer ticket. If any person, having paid on one car, wished to ride on another without paying a second fare, he must ask and get a transfer ticket. He also stated that these rules and regulations were kept posted in all the cars for a long time, and they were so posted at a certain point on Main up to the time of the trial. Besides, the woman herself testified that she was well acquainted with the rules as to transfers; that she knew that when she went from one car to another she had to pay, or have a transfer; that there was a notice in the cars stating that persons wanting to transfer must ask the conductor for a transfer check.

The supreme court also holds that, at the company's request, the judge should have instructed the jury, without the words he added, which are here indicated by being inclosed in a parenthesis, that "if, by the custom or regulation of the defendant company, passengers paying on one car could ride on another one by presenting upon the second car a transfer check procured from the first, and the plaintiff failed to procure such transfer check and present it on the car to which she transferred, then she was not entitled to ride on the car to which she transferred, without the payment of fare. The conductor was not authorized to allow her to ride on his car without the payment of fare or the presentation of such transfer check, (and the company would not be liable unless the jury should find that her entering the car was the result of the conduct of the conductor on the Main street car, and further find that she, as a usually prudent and business person, had a right to suppose from the conduct and statement of the first car conductor that she would be carried on West Markham street without such transfer ticket or further payment of fare)."

The modification, the court says, changed the issue from that made in the complaint and answer, from mistreatment on the part of the conductor on the second car, to a charge against the conductor of the first car. Nor does it consider that there was any evidence to support the theory that the conductor on the first car had produced or been the cause of the alleged injury on the second car. Which of the two, the conductor or the woman, should have taken the initiative in regard to the transfer ticket was a matter of dispute between the latter and the company, and, the court holds, could only be settled by the evidence and instructions thereon.

Furthermore, the court holds that, if it was sought to make the statements of the first car conductor to serve the place of representations which would justify the woman in refusing to present a transfer ticket or pay fare on the second car, as seemed to be the effort in this connection, it could not be permitted, for she ought not to rely on representations of the servant which she knew were in contravention of the rules and regulations of the company on the subject.

RELATIVE RIGHTS UNDER EXCLUSIVE FRANCHISE AND "RESERVED POWER OF REVOCATION."

Wilmington City Railway Co. v. Wilmington & Brandywine Springs Railway Co. (Del.), 46 Atl. Rep. 12. Apr. 11, 1900.

For many years the question has been discussed by lawyers in Delaware as to the precise meaning and effect of the latter portion of the provision in the constitution of that state of 1831 that no act of incorporation except for the renewal of existing corporations should be enacted without the concurrence by two thirds of each branch of the legislature; "and with a reserved power of revocation by the legislature." A long review of the authorities that might be expected to shed light on it, is made by the court of chancery of Delaware, which says that it shows that there is no decision of any

sort in opposition to the plain, logical interpretation of the phrase, "reserved power of revocation by the legislature," as meaning the power to revoke, at the pleasure of the legislature, any or all of the franchises granted to a corporation, the power to recall all the rights, privileges, or franchises granted to a corporation, or any number less than all, or any single right, privilege, or franchise; that it cannot mean less than this, and that it cannot mean more; and that it differs from the commonly reserved power "to alter, amend, or repeal the charter" in not including the power to regulate or control corporations in the manner held in certain cases to appertain to the latter power. It further holds that the revocation can be either direct, or, by necessary implication, by the passage of an act necessarily inconsistent with some right or privilege possessed by some existing corporation. For example, it holds that a grant to another company of authority to construct and operate a street railway in certain streets of a city would, under such reserved power, revoke proportionately any exclusive right which a company claiming the exclusive right to locate, construct and maintain a street railway in the city may have had.

But such an exclusive right, the court holds, is a property right, entitled to the same protection as any other property right, giving the company to which it was granted a standing in a court of equity to raise, by an application for an injunction, the question say of the forfeiture of the charter of a new company granted antagonistic rights in certain streets, as above suggested.

Now, on the question of forfeiture, the court holds that where a company was required by its charter to build within a certain time its railway, from without a city, to the boundary line of the city on a certain street, and was authorized, when that was done, to build and extend its railway from the point at which it so intersected the boundary line of the city to, through, and along a certain other named street, etc., the company forfeited its franchise by not building to the boundary line on the first-named street, but building, instead, to the boundary line on the second-named street. Nor does the court consider that it made any difference in this respect that to have built the road as prescribed would have made an acute angle in it.

The grant to a corporation of the exclusive right and privilege of locating, constructing, operating and maintaining a city railway within the city limits, the court holds gave it a monopoly to build within the city, notwithstanding a certain route was prescribed, it being granted the further privilege to build anywhere within the city, on condition of its first obtaining the consent of the council of the city. And while the court considers the policy of the law to be strongly against grants of exclusive rights or monopolies, it remarks that the most serious objections to them disappear when they are accompanied by a reservation of power of revocation, such as first above discussed.

Nor does the court agree with the contention that such an exclusive grant as the one just described could not operate to exclude another city railway from operating an electric railway within the city limits, because electricity was not used as a motive power at the time the grant was made.

It would seem, the court says, that when the broad term "city railway" is used in such a grant the term must be taken to mean only what is essential to the definition of the term, and obviously no particular motive power is essential. Whenever a statute specifies the motive power to be used, the expression of that power may be construed to exclude any other. Indeed, the general rule of construction seems to require this. But, when an exclusive right is given in general terms to a city railway, the effort to confine it to the particular motive powers in use at the time, the court declares, would seem to be as artificial and unauthorized as to confine it to the kind of rails then in use, excluding the idea of modern rails of steel and of great weight, or to limit the size and shape and quality of cars to those known at the time. All these things, including the motive power, are subordinate,—mere means to make the franchise effective; and yet the expression of any of them might be so made as to so limit the grant. Wherefore, the court holds, when no kind of motive power is mentioned, it should be taken to indicate that the legislature means what it says, "a city railway," however propelled, whether by powers then familiar, or those they know not of; in fact, any kind of power which the ingenuity of man may contrive that does not constitute an additional burden upon the highway, or an injury and annoyance to the public.

But it was argued here that it was shown that the motive power was intended to be limited to steam or horses by a provision "that steam power shall not be used to propel the cars of said company unless with the consent of city council, and that, in order to prevent accidents, suitable bells shall be attached to the horses drawing the cars." Not so, however, thinks the court. Taking this proviso in connection with the general terms of the grant, it holds that it would rather indicate that, omitting mention of motive power in the grant, and afterwards regulating the use of the two powers with the use of which they were practically familiar, the legislature left all other possible powers to be treated as experience might prove to be desirable.

A court of equity, the court here further holds, will not enforce by injunction such a contract between two companies as one whereby one of them agrees not to extend its tracks into or within the city in which the other is located say for a period of 25 years. Nor does it consider that it should make any difference that the company making such agreement had express legislative sanction to its making a traffic agreement with the other company, especially when the legislature later granted it a franchise to extend its line within the city.

MILWAUKEE FRANCHISE HELD VALID.

The Supreme Court of Wisconsin has passed on the so-called Trentlage injunction issued in January last to prevent the acceptance by the Milwaukee Electric Railway & Light Co. of the franchise ordinance passed Dec. 18, 1899, by the Milwaukee council. The court finds that discretionary power resides in the council to grant the use of streets and bridges to street railway corporations, and to determine what terms shall be attached to the grant, and that the exercise of this discretionary power can not be controlled by a taxpayer or any body of taxpayers. It finds therefore that as taxpayers the plaintiffs in this case had no cause of action stated in their complaint. It finds also that the prevention of the railway company from accepting the franchise, thereby annulling the whole grant, was in no way necessary to protect whatever right the plaintiffs might have as abutting property owners, and that in this aspect of the case the injunction was "an exercise of arbitrary power which cannot be defended for a moment." With regard to the claims of irregularity in the council's proceedings during the passage of the ordinance, the court finds that these questions can not be raised at the suit of private parties and adds that "upon the facts presented it is not at all certain that the present franchise would be set aside at the suit of the state."

As the result of the decision the company, being secure in its rights till 1934, will at once proceed to make extensive improvements.

PROPOSED EXTENSION IN MONTREAL.

In order to give the public easy access to the dock the Montreal Street Ry. proposes building an extension which will be a novelty in the way of electric railway construction in Canada. The intention is to extend the tracks on trestle work from the permanent roadway at the edge of the guard pier, out as far as the water front, where a platform will be built with wide stairways leading down to the docks. This will fill a long felt want in Montreal, where the ascent from the docks is very steep, and if carried into effect will overcome difficulties with which the street railway company has been struggling for a number of years past.

FIRE ON MT. TOM.

On the night of October 8th, the Mt. Tom Pavilion on the summit of Mt. Tom, near Holyoke, Mass., was completely destroyed by fire. This was a most popular summer resort. It was built by the Mt. Tom Railroad Co. at a cost of \$20,000, and \$5,000 more was spent in furnishing it. The pavilion was operated under lease by the Holyoke Street Ry.

The building was completed in June, 1897, and was illustrated in our issue for July, 1897, page 426.

The Cleveland (O.) City Ry. has ordered 65 new double truck cars.

FIRE AT THE PAIGE IRON WORKS.

The plant of the Paige Iron Works, Chicago, was partially destroyed by fire, October 27th, the loss amounting to \$75,000, fully covered by insurance. The origin of the fire, which was discovered shortly after six o'clock Saturday evening, is not certainly known though it is believed to have been set by a lighted cigar stump carelessly thrown among inflammable stuff on the premises. So soon as the insurance shall be adjusted contracts will be awarded for the building of the works, a fine and fireproof plant being projected to replace the burned building. The new Paige Iron Works will be completed, it is estimated, in four or six weeks. No delay in the filling of orders on hand is anticipated.

FLOWERS BY TROLLEY.

In a recent issue the Florists' Review comments on the advantages of using interurban electric lines for shipping flowers, as follows:

"Quicker and more frequent express service from suburban points into the large cities is of very great importance to growers of cut flowers and the electric roads who put on express cars will no doubt find liberal patrons in the growers their lines reach, provided, of course, that charges are not excessive.

"And what a saving and advantage it would be if electric express cars would deliver the grower's product direct to the doors of the wholesalers in 28th St., New York, or at Wabash Ave. and Randolph St., Chicago. It would certainly be a vast improvement over having the boxes tumbled from the express car to an express wagon and then shaken up by a trip over the stone pavements."

COMPRESSED AIR CARS.

It was very manifest during convention week at Kansas City, that compressed air for street railway service was attracting wide and intelligent interest and investigation. There are so many problems which the successful introduction of this power will solve, both in the street and general railway service, that no railway man should fail to appreciate its significance. Suburban lines of limited mileage are now being operated by steam at great expense, a great portion of which can be saved if the air motor can be substituted for the present locomotive. It is not necessary to amplify this statement; it will naturally commend itself to any experienced railroad man. Without considering the question whether or not it is likely to supersede the overhead or underground electric system, it must be conceded that it is capable of performing good auxiliary service on established electrical lines, during the rush hours, or late at night; this work is now done at an unnecessary cost. That this system has survived the experimental period and has come to stay, is made apparent by its operation on 28th and 29th Sts. in New York, which is perhaps the most difficult stretch of surface railway to handle in the United States, by reason of the fact that the streets being well paved with asphalt are very popular for vehicular traffic although they are narrow, and because the cars are required to stop whenever signalled by a passenger instead of halting at the street corners as customary on other routes.

Twenty air motors of the Hardie type have been running on these streets for the past two months having replaced other motors which failed to perform the service with satisfaction. Each car has averaged 97.6 miles per day and carried 1,100 passengers. This very extraordinary showing is a surprise even to those who had most faith; moreover it is stated that the cars make less noise than any others in service, start without the slightest jerk or inconvenience to the passengers, and the air brake is so marked a feature of the motor that it is likely to be introduced upon lines now operated by electricity.

CROWDED CARS IN TORONTO.

Last year the Board of Control of Toronto began a suit against the Toronto Railway Co. to prevent the overcrowding of the street cars; October 26th the City Council directed that the suit be dropped. It was considered that the only effect of a judgment against the company would be to transform the strap-holders into curb holders.

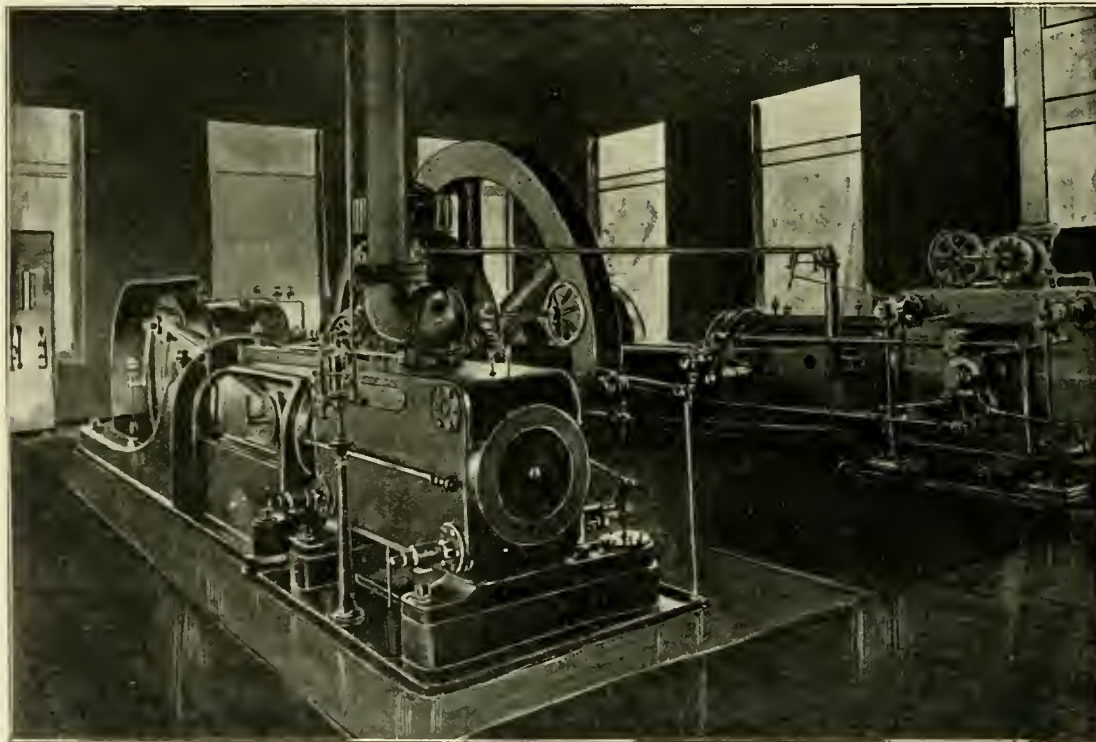
MILFORD, ATTLEBORO & WOONSOCKET STREET RAILWAY.

The region in which the different branches of this system are located embraces the southern part of Massachusetts just above the northeast corner of Rhode Island and terminates at Woonsocket in the state of Rhode Island. This territory owing to the numerous manufacturing villages and the topography of the country is regarded by experts as a most favorable one for a profitable electric railway enterprise and the receipts for the first year of the operation of this road are very gratifying to its promoters. The length of the line, thus far constructed, is 32½ miles and the different branches serve a population of over 77,000 people. The two principal lines run nearly at right angles to each other. The most northern point is Hopkinton near Echo Lake; from here the line extends in a southeasterly direction through the towns of Milford, Bellingham and Franklin to Wrentham, where it branches, one section running to the town line of Attleboro farther south, and the other to the town line of Foxboro three miles directly east from Wrentham. The second branch starts at Caryville and runs in a southwesterly direction through North Bellingham, Bellingham

or past attractive farms, then through a series of low hills, giving charming views, especially along the Charles River with its numerous cotton and woollen factories. Included in the scenic features are extensive marshes, groves of willows and small lakes. On one of these, Hoag Lake, the street railway company owns and operates a beautiful park which is situated on an island of about eight acres and at which are the usual park attractions, including a rustic theater with a seating capacity of over 1,200, a dance hall, boating facilities and merry-go-rounds.

The scenic features of the system naturally draw a large pleasure and tourist patronage, which, with the advantages stated, make the system a very promising one. The line is single track with turnouts, and is one of the best constructed lines of its character to be found in New England. The rails are 60-lb. T and are laid on ties spaced 2 ft. c. to c. The trestles and bridges are all of substantial construction. The power house and principal car house are located at Unionville near Franklin, and near by these are the Worcester textile mills. The buildings are both of brick with steel truss roofs and are practically fireproof.

The basement of the power house has its floor on a level with the grade line and is provided with large windows so that the pumps,



POWER HOUSE OF MILFORD, ATTLEBORO & WOONSOCKET STREET RAILWAY—FILER & STOWELL ENGINES.

and Blackstone to the city line of Woonsocket. At all the terminal towns and at Franklin connections are made with other street railway systems, some of which connect with towns farther north in Massachusetts and with points in Rhode Island so that certain parts of the system form links in the trolley ride that may be made from Providence to Boston.

Milford is a manufacturing town of about 11,000 inhabitants, the principal products being shoes, straw goods and the famous Milford pink granite products. It has a theater, good hotels and attractive shops. At Hopedale is the manufacturing establishment of the Draper Co. which employs about 3,000 operators and makes cotton mill machinery. Bellingham and Medway are known as farming towns, but also have several woollen mills. The population of Franklin is about 5,000 and the numerous factories turn out rubber, cotton, woollen and straw goods; here is located the celebrated Dean Academy, popular in New England. At Wrentham are manufactories of jewelry and straw goods, and near this town the tracks run by Lake Pearl, an attractive pleasure resort. Woonsocket has a population of about 31,000 and here and at Blackstone are cotton and woollen goods factories.

The line is built principally on the public highways, but in some sections is on private right of way, running through wild woods

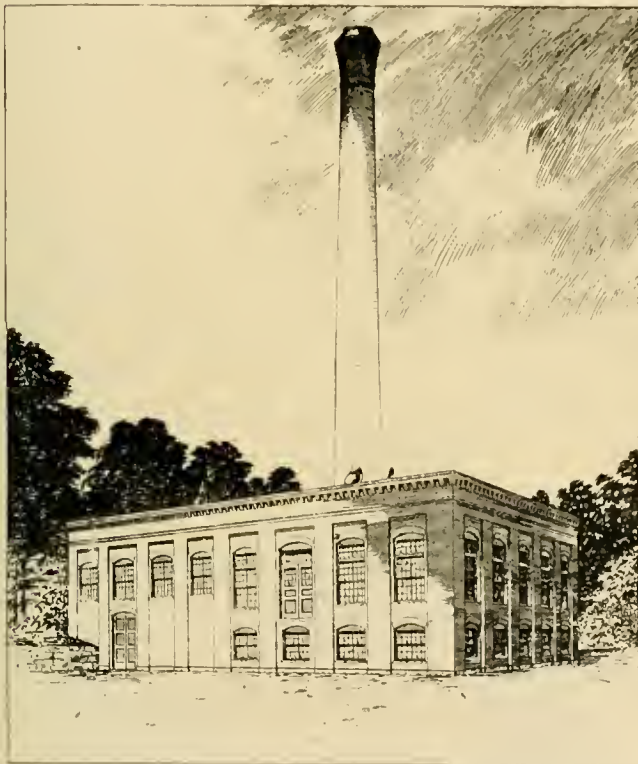
and condensors and piping which are placed there are lighted on all sides; this with the ample head room, makes it convenient for operation and repairs. The chimney is of brick 120 ft. high and 12 ft. in diameter at the base; the core is 5 ft. 6 in. in diameter inside.

The power equipment for this station, consisting of engines, boilers, electrical apparatus, together with their appurtenances, is all of the latest and most approved type and designs. The contract for the engines was awarded the Filer & Stowell Co., of Milwaukee, Wis., through T. W. Phillips, manager of the eastern department, with offices at No. 4 Market Sq., Providence, R. I.

The engines are two in number. One is of the simple condensing type with cylinder 18 in. in diameter and 42-in. stroke, and has a balance wheel 14 ft. in diameter, weighing 30,000 lb.; it operates at a speed of 120 r. p. m. The other engine is of the cross-compound condensing type with high-pressure cylinder 16 in. in diameter, low pressure cylinder 30 in. in diameter, and both of 48-in. stroke; this engine has a balance wheel 16 ft. in diameter, weighing 40,000 lb., and operates at a speed of 100 r. p. m.

The single cylinder engine is direct connected to a 250-kw. generator, and the compound engine to a 325-kw. generator. The engines are of the Filer & Stowell Co.'s heavy duty type, with a design of valve gear at variance with that of other Corliss engines,

provision being made to operate it at much higher speed if so desired without impairing the integrity of the mechanism, and of special construction throughout to meet the exacting requirements of railroad work. The cylinders of the engines present a pleasing appearance, being completely covered with planished sheet steel with finished corner strips, and polished false heads are provided for covering the back cylinder heads. The frames are of the full tangye type with bored guides and of massive construction throughout. The frame, pillow block and guides are cast in one piece, giving a foundation contact the entire length and making but one joint (where attached to the cylinder) and insuring absolute rigidity and perfect alignment under all conditions. The main bearings are lined with genuine babbitt metal, provision being made for taking up wear on the quarter boxes; there is an oil reservoir with chain oilers to give continuous lubrication of these parts and the bottom shells are furnished with water circulating pipes to prevent heating. Nugent pendulum center oilers are used for lubricating the crankpins. The pistons are made of cast iron with self-acting packing rings and adjustable junk ring, and the piston rod is provided with Tripp's metallic packing. The crossheads are made of special semi-steel, of the box pattern and fitted with ad-



EXTERIOR VIEW OF POWER HOUSE.

justable babbitted shoes. The crosshead shoes are turned and accurately fitted to the guides, and these being cylindrical it allows an adjustment around the center line of the engine. The connecting rods are of the solid end type, adjustable at both ends, and with solid phosphor bronze boxes at the crosshead and phosphor bronze boxes babbitted at the crank pin end. The cranks are of the disk form, counterbalanced on the back side, and turned and polished. The valve gear is of the liberating type, and so designed that the governor controls the point of cut-off from zero to three-quarters stroke. Large wearing surfaces are provided, and the patented drop lever which constitutes a part of the valve mechanism is keyed to the valve stem and supported in the bonnet, thus relieving the steam valve stem from all transverse strain. The latch dies are of hardened steel with eight wearing surfaces, and provided with a patented adjustment, whereby the amount of lap of the dies can be reduced or increased while the engine is in operation. Multi-ported valves are used, and separate steam and exhaust eccentrics are provided for actuating the steam and exhaust valves of each cylinder. The wrist plates of each cylinder are provided with unhooking device, which admits of all the valves being worked by hand, a feature which is thoroughly appreciated by engineers. The fly-wheel of each engine is of the square-rim

type, made in halves and held together with bolts at the hub, and at each rim joint by wrought iron rings shrunk on.

Considerable care was taken in the design of the piping and arrangement of pumps and condensers, etc., that the highest efficiency might be realized in the operation of the station and the cost of maintenance reduced to a minimum. All the main steam piping is of extra heavy wrought iron with very heavy cast iron flanged fittings and wrought iron long turn bends. Mosher separators are used and all valves in this system of piping are extra heavy gates with outside screw and yoke. The auxiliary steam piping is of standard weight iron and fitted with globe valves, and all feed piping used for hot water is of brass. A Hartford feed water heater is placed in the exhaust of each engine and a Gleaner auxiliary heater takes the exhaust from the pumps and condensers. A Dean Brothers' independent condensing apparatus is provided for the simple as well as the compound engine. In the rear of the station is the boiler house containing three Babcock & Wilcox boilers. The station is so situated that coal may be delivered on a side track from the adjacent steam road, and deposited in front of the boilers.

Richard P. Jenks, designing and constructing engineer, with office at 930 Banigan building, Providence, furnished the plans and specifications for the power house, and the construction as well as the entire installation of the station was under his direct supervision. The plant is considered a model one in point of design and equipment. The motors as well as the generators and all electric equipment are of the Westinghouse make. The cars were all built by the Wason Manufacturing Co., of Springfield, Mass. W. H. Tylee & Co., of Worcester, were the general contractors, and Hodges & Harrington, of Boston, were the engineers for the road construction.

The officers of the company are G. W. Higgins, president; E. K. Ray, treasurer and general manager; William H. Tylee, secretary.

GOLDSCHMIDT WELDING PROCESS.

In our September issue was a brief description of the Goldschmidt process of obtaining high temperatures by the combustion of aluminum. Mr. Ernest F. Lange in a paper before the Iron and Steel Institute (England) describes the various applications of the process, some of which are quite novel. Thus defective castings can be repaired, broken teeth of gear wheels replaced, etc. In the new works of the Chemische Thermo-Industrie in Essen, the steam service pipes are welded on this system.

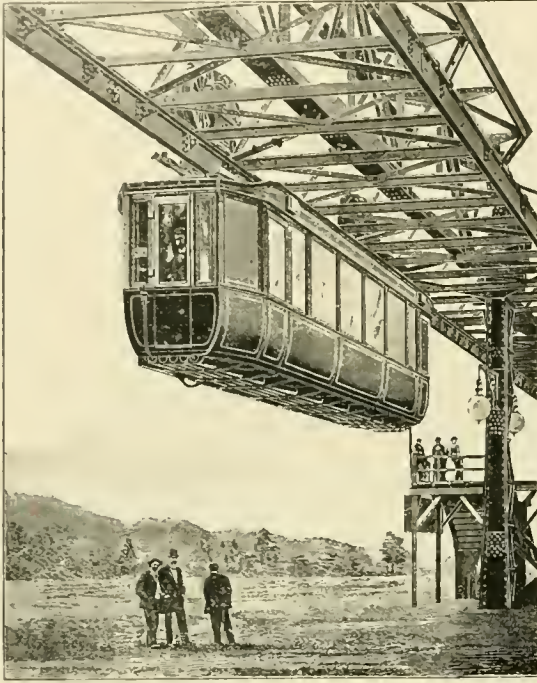
Details as to welding 7-in. girder rails are given as follows: A good joint having been made between the two ends, strong clamps were then secured to the rails, some 9 in. or 10 in. from the joint, and connected with each other by means of a strong bolt on each side of the rail. The sheet-iron form was then brought round the part to be welded, and backed round with fireclay. The reaction was then started in a crucible capable of taking 15 kg. (33 lb.) of the aluminium-iron-oxide mixture (known as thermit P), and at the end of the reaction, which lasted about a couple of minutes, the contents of the crucible were poured into the sheet-iron form surrounding the joint, care being taken that the slag made first contact with the cold surfaces. After waiting another couple of minutes, the rail ends were judged to be sufficiently heated, and a few turns of the nuts on the tension bolts were given equally and simultaneously, and the weld effected. An important feature about this welding process is that the layer of slag or corundum which first forms round the part to be welded also protects the joint from oxidation. After the welding, the solidified mass can be knocked away by a few light blows from a hammer; but, as a rule, it is better to allow it to remain on for some time, so as to allow of a more gradual cooling of the rail-joint. On knocking away the mass, it was seen that the sheet-iron form was so little damaged that it could be used over and over again.

With regard to the comparative cost of the joint as compared with a fishplate joint, Dr. Goldschmidt has got out some figures in which consideration is taken of the cost of maintenance of the fishplate joint, and makes out a favorable case for the welded joint.

The New Jersey & Hudson River Railway & Power Co., operating the "Hudson River Line," has issued a card containing a list of the autumn leaves, berries and flowers growing wild on the Palisades; both common and scientific names are given.

SUSPENDED RAILWAY AT PARIS.

The Continental Gesellschaft fuer Elektrische Unternehmungen, of Nuremberg, had on exhibition at the Vincennes Annex of the Paris Exposition a working length of a monorail suspended railway. The exhibit comprised two spans of 100 ft. each and a car of



SUSPENDED RAILWAY AT PARIS.

the type similar to those running on the Barmen-Elberfeld line illustrated in our issues for March and April last. The illustration is reproduced from *Engineering*, London, which paper states that this section will, after the Exposition, be utilized as a part of a line the company is constructing.

CHATTANOOGA RAPID TRANSIT CO.

Pres. S. W. Divine of the Chattanooga (Tenn.) Rapid Transit Co., while on a recent visit to Philadelphia, induced the stockholders of his company to purchase the electric railway on Lookout Mountain, the Lookout Mountain inclines, and the roadbed and other property of the Chattanooga & Lookout Mountain R. R. It is announced that the Chattanooga Rapid Transit lines will be extended to the top of Lookout Mountain, that a line will be built to Lulu Lake, on the mountain, and that an extension will be made from Sherman Heights to Boyce. All the Lookout Mountain property was purchased from Capt. J. T. Crass, and will be greatly improved, so that there will be a direct service over the lines of the Rapid Transit Co. to the center of Chattanooga. Mr. Divine has announced that the power plant which has been rebuilt on an extended scale since the company's fire of July 23d, will be equipped to have three times the capacity of the burned plant. These changes and improvements will place the Chattanooga Rapid Transit lines among the best of the many modern and progressive street railways in the South.

THE ENGINEER.

Under date of October 22d the Engineer Publishing Co., of Cleveland, announces that Mr. W. R. C. Smith and Mr. C. S. McMahan, for many years western managers of the *American Electrician* and *Street Railway Journal*, respectively, have severed their connections with these papers and associated themselves by purchase with the *Engineer*. Mr. Smith will be vice-president and general manager, and Mr. McMahan, secretary and business manager. The company will have offices in the Tribune Bldg., New York, and in the Monadnock Block, Chicago.

NEW CAR HOUSE IN CHICAGO.

The Chicago Union Traction Co. is now building on North Clark St., north of Devon Ave., Chicago, a car house covering almost three acres. The building is 127 ft. 3 in. wide, and about 1,000 ft. long, 1,006 ft. on one side and 981 ft. 9 in. on the other. The front end is two stories high, the second floor having an area of about 7,500 ft., and here will be offices for the superintendent and the receiver and locker and toilet rooms for the trainmen. The front wall is to be of pressed brick, terra cotta and ornamental iron work and will present a handsome appearance when completed. The side walls are of brick and the roof is covered with tar and gravel.

The roof is supported on four rows of posts spaced 18 ft. apart longitudinally and dividing the floor space into five bays each with two tracks. Over the middle is a monitor. All the foundations and side walls have been made heavy enough to permit a second story to be added and used for car storage. Where the building is more than one story high the posts have cast iron caps on which the second story posts rest, thus eliminating the effect that shrinkage of the floor timbers would otherwise have.

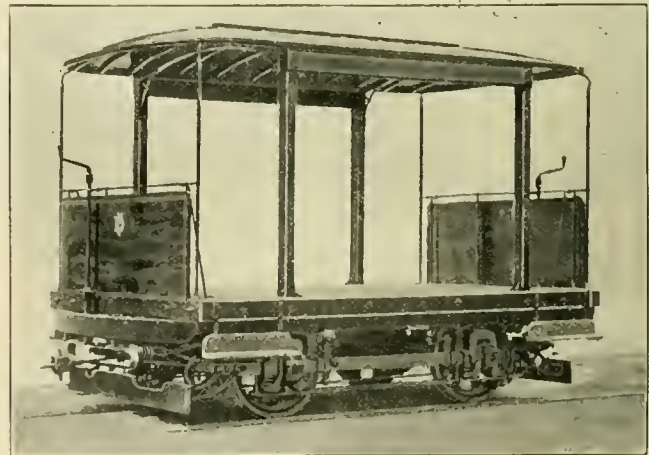
A second track 170 ft. long with its center line 10 in. from the center of the main track, has been laid in front of the building, and from this off-set track the barn tracks branch. The special work required was furnished by the Falk Co., of Milwaukee.

The five rolling doors, each 25 ft. wide, for the front will be furnished by the Kinnear Manufacturing Co., of Columbus, O.

SECOND CLASS FUNERAL CAR.

The popularity of funeral cars in Mexico and the attention which is being paid to funeral cars in this country show that the subject is one that deserves the attention of street railway managers. The car illustrated is one of 14 shipped within the present month to one of the Mexican railways from the works of the J. G. Brill Co.

It is 13 ft. long by 8 ft. 2 in. wide and is mounted on a No. 21 E truck with a 6 ft. 6 in. wheel base. The road is standard gage. The cars are fitted with two G. E. 1000 motors so that they could haul a considerable number of trailers if necessary. The weight



MEXICAN FUNERAL CAR—J. G. BRILL CO.

of the car without the motors is 7,860 lb. Radial draw bars are used with angle iron buffers. The step is placed at each corner of the car. The roof is supported by four stout corner posts which are strengthened by wrought iron corner braces. The decorations for the car consist of black curtains, draperies, etc., which are furnished and put on by the company. There are also crucifixes and other religious decorations. These cars take the place of the hearse in American cities and as the company furnishes transportation for the mourners as well as for the coffin, the revenue derived from this source is a large one.

Pickpockets are working the Chicago street cars and have had considerable success.

AMERICAN STREET RAILWAY ASSOCIATION.

The 19th Annual Convention Held at Kansas City
October 16-19, 1900—Nearly 800 Persons Registered the First Two Days—100 Ladies in Attendance—New York in 1900—W. H. Holmes Chosen President—Secretary Penington Re-elected—Successful Banquet Friday Night.

TUESDAY, OCTOBER 16th.

The 19th annual convention of the American Street Railway Association was called to order at half past eleven by President J. M. Roach. Notwithstanding the late arrival of a large number of the delegates, the large room in the roof garden of Convention Hall was well filled, and the attendance steadily increased until adjournment. The meeting room was on the west side of the building, and while the association as a body was never before so near the sky, the ascent was reached by a series of easy inclines not at all tiresome. The speaker's platform was tastefully ornamented with potted plants and cut flowers.

The delegates almost reluctantly gave up the social greetings of old friends to take up business at the sound of the gavel. The representation this year was excellent and came from almost every state. If anyone had doubted the wisdom of selecting so distant a point as Kansas City that doubt was wholly dissipated the first morning. There was the same earnest interest in the meeting which had been the case at former years, and the somewhat chilly temperature of the room was not reflected in the attention paid the speakers, some of whom were interrupted frequently by the "hum of industry" from the exhibit section.

After calling the meeting to order the president introduced Mayor Reed, of Kansas City.

ADDRESS OF MAYOR REED.

Mr. President and Gentlemen: I do not know whether I can make you hear me this morning or not. My voice, which usually is as soft and as musical as the notes of a flute wafted over moonlit waters, has been laid out on the altar of my country to such an extent in the last few days that I imagine it bears a distinct resemblance to the inharmonious blending of the sounds of a cracked fiddle and the roar of a buzz-saw. If I could make you hear, and say something to make you feel at home in this city, I shall be delighted.

I esteem it, Mr. President and gentlemen, a great honor to address this body of distinguished gentlemen, and I trust that your meeting here in this roof garden is not being held under that part of the scriptures which states that "The wicked dwell in high places." (Laughter.)

Of course, I do not know much about street car men, except our friends, Con and Walton Holmes; but I have heard it rumored on the street that that is not Mr. Con Holmes' proper name at all—that his first name has been acquired by virtue of his various and intricate business transactions in this city, and his ability to talk franchises out of the council, and when he gets them to immediately put them into execution. (Laughter.)

In the little I have to say to you, I shall not bore you with a speech, because I do not know what purpose a speech serves on an occasion of this kind. When the old Egyptians had a feast and everybody was feeling hilarious and good-natured, there was a pleasant custom of passing around a skull and saying to each of the guests, "Remember you are mortal; remember you are mortal." I apprehend I was brought here to represent the skull and cross-bones on this occasion. You are here to transact important business, having important objects in view, and it is not a time for

speech-making. It is a time when you desire to deliberate and get to business.

I wish to say on behalf of this city that Kansas City, as much as any other city in the world, welcomes to her midst the representative business men of all other cities. We in the West believe that it requires capital and brains and courage to build cities. We in the West know that if capital comes to us it must come because it expects a fair remuneration; and I wish to call your attention, gentlemen, to the fact that you are in Missouri; and, notwithstanding the fact that all of the states that surround us, in times past, in those troublous times when there were hard financial conditions existing, nearly all of the Western states placed upon their statute books laws aimed at the destruction of the wealth of financial institutions, there never has been a syllable, line, or sentence of what we commonly denominate crank legislation placed upon the statute books of Missouri. (Applause.)

We in this state believe that capital should receive its fair remuneration; but we believe, at the same time, of course, that



WALTON H. HOLMES,
President, 1900-1901.

these great institutions which you represent owe some duties to the citizens of the cities, and that it is their business and duty to serve the citizens and serve them well. We at the same time realize that great financial institutions must be secure in their profits, and that all the people have the right to ask of them is a policy of "Live and let live," a policy of serving the people and in turn of being benefitted by the people. That is Missouri doctrine, and it is Kansas City doctrine. We in Kansas City know what Eastern capital has done for us. We know that fifteen or sixteen years ago we scarcely had in Kansas City a mile of paved streets. We know that it took a great deal of money to pave our streets; of course that was paid for by our citizens, but it took money to create the great plants for the purpose of paving our streets. While we insist, and shall insist, that these institutions should treat our people fairly, at the same time the people of Kansas City are willing that they shall receive a fair remuneration upon their capital invested. Our people have done this and the result has been that for the size of the city, we have paved more streets than any other city in the world. (Applause.)

We believe in inviting the capital of the East here for the purpose of investing in great public buildings. I do not think a single

man lives who came to Kansas City and used ordinarily good business judgment in the matter of his investment in great public buildings, but to-day is receiving splendid dividends upon that investment. Of course, there were men who came here during the "boom" days when the whole town and the whole country had gone mad, who bought property without regard to business judgment, and paid fabulous prices and lost money; but the men who came with business judgment and with business care, and invested their money as men ought to invest it, have all received fair dividends.

We had a few years ago in this town two streaks of rust and five teams of mules, drawing horse cars, that meandered slowly and laboriously up and down the almost inaccessible cliffs of this town. This was called a railroad system, and it was said that the cars were run for many years for the purpose of holding the franchise. I do not know what the object or purpose of the railroad was, but I do know that everybody who was in a hurry was obliged to walk. (Laughter.)

About the period referred to, fifteen or sixteen years ago, there was begun the building of the present street car system of Kansas City—built first with a cable equipment, and Mr. Holmes will tell you here in your secret meetings, if you can have any with your walls of canvas, of the struggles, I presume, that his road underwent in overcoming the natural difficulties of this town; but to-day, in riding over this street car system, you, better than I, will judge whether any progress has been made in that respect. And as far as dividends are concerned, I apprehend that Mr. Holmes can tell you all about that, if he only will.

The point I wish to impress upon you, gentlemen, and I do it with a selfish purpose of convincing, as far as I can each man in this audience, that Kansas City is a good a place to invest money; that every legitimate enterprise where the men have come and used good business judgment, has been a success in this city. We have no warfare to make upon capital. Of course, as I said before, we do insist that capital shall treat us fairly, and as a general proposition, capital has treated us fairly. I would call your attention to the fact that Kansas City lies in the very center of the richest agricultural country that God ever spread out beneath the canopy of the skies. In whatever direction you go, for hundreds of miles, you pass through the finest arable land there is in the United States of America. I want to call your attention to the fact that there is scarcely a town or village for hundreds of miles in either direction from Kansas City but is, by force of our railroad system, compelled to pay its tribute to the center.

From this city down to the Southern coast and down to the Gulf we have various railroad lines. This city is the outlet for all of the grain, all of the cattle, and all of the farm products of every description of the entire West and Northwest and as soon as the Nicaragua Canal is built, if it is ever built, and I hope when it is built it will be built by the American Government (applause), and that crowning over all, at each end, and wherever is necessary between those ends, will be American forts and American cannons (applause)—and that great waterway is added to the lines of vessels that already ply from these Southern ports, this city must receive the greatest benefit that any city in the United States receives from the building of that canal. The reason for this is that the railroads are already built here, and they will not be torn up, and having already been built here, all of the grain and all of the farm products of the great West and Northwest, and much of the Southwest, will flow through the gateway of Kansas City to these direct lines leading down to the Gulf.

Another reason why we are going to succeed here is because of the qualities of our people. Each of you lives in a city and each one thinks his city is "it." Each of you gentlemen thinks your city is the best city, and I have nothing to say against your city; but I hold, with all due modesty, that it can be said that this is the most typically American city on the continent. Here in our state and city is the parent stock of the very best blood of the South, and grafted on to that we have the genius of the Yankee, the men from the Middle States and the men from the Eastern States, and from all parts of this country; and whenever you come to Kansas City, you will touch elbows as you pass upon the street, with men from every state in this nation. I might say we have a few Greeks and Turks whom we keep for exhibition purposes. What does this mean in the upbuilding of a city? We have always heard it said that the "horizon of civilization was covered

with the white caps of progress;" that it is the boy who has brains and genius and courage, who leaves his home in the East and comes to the West and develops into the great man representing the type which has made this country what it is. In the progress of the nation, every time that the milk of humanity has been skimmed, the West has been favored with the creamy side of the dish. The result is that there is such energy, such determination to succeed, such an indomitable will back of everything that our people undertake, that Kansas City has made a splendid success in the few years she has been a city. Let me give you one illustration, and with that I close. At a tremendous expense for a town of this size, with not very many extremely wealthy men in it, we built this Convention Hall. We built it as a public enterprise, and into it went the money of the capitalist, and the money of all our citizens, even down to the men who carry the dinner-pail, not always so full, either; into this Convention Hall went the dollars of the laboring men. (Applause.) It was destroyed by fire, we had invited the National Democratic Convention to meet here on the 4th of July. This hall was burned, if I recollect aright, exactly 90 days before that convention met. Before the building had been on fire an hour, thousands and thousands of dollars had been subscribed to rebuild it, and in the 90 days which intervened between the burning of the building and the 4th day of July the new hall was erected. We had to make our contracts as rush orders, and you street railway men will understand what a "rush" order means, and how much it costs, but when the 4th of July rolled around, this building had risen from the ashes of the former building and was completed as you see it here at this minute. (Applause.) A lot of "lobsters," gentlemen, do not do that kind of work, if you will pardon the use of a slang phrase. It is because we have that kind of people that we are succeeding here; we are glad to have you come here, and ask you to look this city over, and see whether it is not about the best place in the United States in which to make money. If you come here, you will be treated fairly by our citizens.

I need not extend to you the liberty of this city. That old phrase died years ago, and then I never saw a lot of street car magnates in my life that needed the liberties of a city—they generally know how to get them (laughter); but you are welcome among us, and I know you will be made to feel at home because I know the Messrs. Holmes and their associates in business will make you feel at home. You may have read something in the papers here of the police outrages, but if, perchance you lose your way, for that is all would ever happen to so distinguished a body of gentlemen as you are—if perchance you do lose your way, I guarantee you that some good police officer, like a good Samaritan, will conduct you to your hotel in peace and with due dignity and if necessary will take you up the back way.

President Roach: Mr. Mayor, on behalf of the association, I desire to thank you for your eloquent words of welcome spoken to us, and also to give you my personal thanks.

The first business at this meeting is the calling of the roll. If it is the pleasure of the meeting, instead of taking time to call the roll, the official registration of the secretary will be deemed the calling of the roll. That has been the custom in the past, and will be considered as applying at this time, if there is no objection. We now extend an invitation to those companies represented at this meeting which do not belong to our association, if there be any here of that class, to join us; or if the representatives of such companies have not time to do this at present, they can do so later by applying to Secretary Penington.

President Roach then delivered his annual address:

PRESIDENT'S ADDRESS.

Gentlemen: It gives me great pleasure to meet with you in this magnificent western city. I have every assurance that nothing will be left undone to make our visit most pleasant and profitable. There is a breadth of character and freedom of personality in this young metropolis of the plains, which is peculiarly appealing to the business man who has large interests entrusted to his care, and I believe the members of this association will show their appreciation of the many pleasant things provided for their entertainment while in this community. When this 19th annual convention of the American Street Railway Association shall have finished its labors, I am sure I may safely say to Mayor Reed that none of you will have regretted the accept-

ance of the hospitality of the people of Kansas City, so graciously extended by him.

I see before me representative men from all the leading cities of this country. To your hands are entrusted street railway investments aggregating hundreds of millions of dollars and the welfare of over a million persons. From the single-track one-horse car of forty years ago the business in which you are engaged has grown to a magnitude where nearly all fields of human endeavor are called upon to perfect its equipment or aid in its management. It has outgrown ridicule and financial instability and in the rapid whirl of events has built cities, enriched its promoters and made possible a freer, healthier and happier life for its patrons. Each day the street car is entering more and more into the business life and pleasures of the community, and each day its benefits are becoming more apparent to the general public.

The street railways of America now represent the enormous investment in bonds and stocks of \$1,800,000,000, upon which investors are receiving annually over \$70,000,000 in interest and dividends. Salaries and wages amounting to \$250,000,000 a year are distributed among the 300,000 employes necessary to equip, operate and manage this great industry, repair its 20,000 miles of track, handle its 60,000 cars and meet the ever-pressing demands for improvement. Directly and indirectly over 1,200,000 persons depend upon the traction interests of America for their livelihood.

An industry of such proportions penetrates and more or less affects all other enterprises in the country which sustains it. Nine-tenths of the business men and women of the United States look to the management of street railway companies to furnish them with swift, comfortable and safe transportation to and from business. Still a greater per cent of pleasure-seekers demand and receive from the same management service to and from the theater, casino, park and suburb and the transportation is of such elegance of equipment and so efficient as to satisfy the most exacting. It has required heroism and patience on the part of the street railway men to meet, with so little friction, the demands of a critical patronage in so excellent a manner as is being accomplished by them at the present time.

On all sides we hear the cry of improvement and in every direction we hear the sound of the busy car shop as it responds to the demand for more modern equipment. The public is becoming more exacting and there is need for the most perfect knowledge and the widest experience to successfully cope with the ever-changing situations which confront the street railway manager. Street railway companies have frequently, at great cost, increased their miles of tracks and added to an expensive equipment, primarily for the sole purpose of accommodating the public, by extensions into outlying districts, unwarranted by additional business to be acquired in such territory. This policy has proved wise in nearly every instance. It requires considerable pluck on the part of a company to back a temporary loss in order to please its patrons. Those companies which have pursued such a course have generally been rewarded by more liberality on the part of municipalities, more good nature and praise from patrons and an early increase in the new districts acquired, which soon brought those lines to a paying basis.

In thus catering to the wishes of the public the street railway industry of the United States has been brought to a high standard of excellence and has kept safely in advance of traffic. The aggregate of miles of track has grown from a few hundred miles of single track, confined mainly to business centers, to many thousands of miles of thoroughly equipped double tracks, which have brought the country districts within quick and active touch with the larger cities. Such energy and management must and will be appreciated and fairly treated by the communities benefitted.

It may be declared that corporations are without soul, but it cannot truthfully be said that managers of street railway corporations are lacking in good sense or business principles. False economic doctrines yield to and flee before rapid development and prosperity. A well equipped street railway with modern service, which seeks to oblige the people, operated in any community, will develop the best resources thereof and bring prosperity to its people with such rapidity as to utterly confuse and put to flight all false economic doctrines.

Newspapers, reviews, magazines, periodicals and journals of this country, indeed of many parts of the world, are entitled to

the thanks of this association for the fair and generous treatment accorded in their columns to the street railway men and their interests during the year. It is the province of these publications to exploit the great industries of the land. If upon one day we are able to congratulate ourselves upon their unstinted praise, we should patiently bear the publicity given to our faults, if any there be, in the next issue.

The last year has been a period of notable activity and healthy progress, with but few disturbances of a serious nature. The managers of large street railway properties should shape their policy toward their employes and the public so that disturbances between employer and employe will be entirely eliminated from their history. The management of the great corporations of the country can best retain the adherence and loyalty of employes by adopting toward them a policy at all times just, and at the same time courteous, kind and conciliatory. The good will of your employes and of your patrons will be found an asset of great value in the days of trouble and most desirable at all times.

A business so widespread in its usefulness, holding and judiciously employing as it does so great a portion of the capital of the country and so essential to the best interests and prosperity of the trade centers, should, and I believe in good time will, possess the very necessary good will and hearty support of the municipalities it so faithfully serves. Our interests and those of the public are inseparably interwoven and naturally harmonious. If the relations become strained and in conflict, such conditions are unnatural and illogical, therefore it should become one of the leading features of our association to suggest a uniform policy for street railway companies, and of so broad a gauge that the mutuality of the best interests of the public and of the company shall be as apparent to the people as to the street railway managers themselves.

I take pride in announcing that the condition of your association, both as to membership and finances, is improving each year. I wish to urge you to make this gathering of use to our association and of importance to the street railway industry. This may be accomplished by a full attendance upon and participation in the business meetings. The executive committee has selected members who have prepared papers on important subjects, and I urge upon you the advisability of entering into full discussion and analysis of these subjects, so that a clear understanding of all questions presented may be carried home with you. I also urge the association to show appreciation for our friends, the supply men, who have produced for this annual meeting their splendid exhibit. Allow me to request your hearty support in the work of the Accountants' Association, which meets in annual convention here at this time. Its work is of great importance and is worthy of your most serious consideration.

To the secretary and members of the executive committee our thanks are due for the satisfactory manner in which they have assisted in conducting the affairs of this association. Personally their efforts have been highly appreciated.

The honor of having acted as your president for the last year has been most gratifying to me and shall ever remain one of the pleasant recollections of my life as a street railway man. For my successor I bespeak the same courtesy and cordial cooperation which it has been my good fortune to enjoy.

The secretary then read the report of the Executive Committee. The committee recommended the following rules of procedure:

1. No member will be recognized by the president unless he shall announce distinctly his name and address.
2. Speeches will be limited to 10 minutes, unless the time shall be extended by the convention.
3. Members who desire to offer resolutions or other matters to be considered by the convention, are requested to submit them in writing over their signatures, to the secretary.

Regarding banquet tickets the committee endorsed the action of former years, to-wit: "There shall be two tickets issued to each member company of the association when there are two or more official representatives; when there is only one representative, only one ticket, and when a company is not officially represented, no ticket shall be issued on account of said company."

It was recommended that, because of the satisfactory condition of the finances of the association, the admission fee be waived in the case of any company joining the association at this meeting.

The president had appointed Messrs. John A. Rigg and C. W. Wason as a committee on Memorials of Deceased Members.

Mr. C. K. Durbin, having left the street railway business, resigned from the executive committee of the association, and was succeeded by Mr. W. H. Holmes.

On motion of Mr. Dyer, of Augusta, the report of the executive committee was adopted.

REPORT OF THE SECRETARY AND TREASURER.

The report of the secretary and treasurer, T. C. Penington, showed a balance Oct. 10, 1899, of \$5,658.87, receipts of \$6,564.55, expenses of \$5,222.67, and a balance Oct. 10, 1900, of \$7,000.75.

Oct. 11, 1899, the number of member companies was 165; since then 32 new companies have joined the association, 2 have been suspended and 31 have withdrawn.

The new members are:

Atchison, Kan.—Atchison Railway, Light & Power Co.
 Aurora, Ill.—Aurora Street Railway Co.
 Asbury Park, N. Y.—Atlantic Coast Railroad Co.
 Bridgeton, N. J.—Bridgeton & Millville Traction Co.
 Chicago, Ill.—Chicago Electric Traction Co.
 Columbia, Pa.—Conestoga Traction Co.
 Detroit, Mich.—Detroit & Pontiac Railway Co.
 Dayton, O.—Dayton & Western Traction Co.
 Elgin, Ill.—Elgin City, Carpenterville & Aurora Railway Co.
 Fond du Lac, Wis.—Fond du Lac Street Railway & Light Co.
 Ft. Wayne, Ind.—Ft. Wayne Traction Co.
 Galesburg, Ill.—Galesburg Electric Motor & Power Co.
 Hamilton, O.—Cincinnati & Hamilton Electric Street Railway Co.
 Highwood, Ill.—Chicago & Milwaukee Electric Railway Co.
 Joliet, Ill.—Joliet Railway Co.
 Kansas City, Mo.—East Side Electric Railway Co.
 Knoxville, Tenn.—Knoxville Traction Co.
 Montreal, Canada.—Montreal Street Railway Co.
 Oakland, Cal.—Oakland Transit Company.
 Pasadena, Cal.—Los Angeles & Pasadena Electric Railway Co.
 Pittsburg, Pa.—Consolidated Traction Co.
 Peoria, Ill.—Peoria & Pekin Terminal Railway Co.
 Pueblo, Col.—Pueblo Traction & Electric Co.
 Schenectady, N. Y.—Schenectady Railway Co.
 Sioux City, Ia.—Sioux City Traction Co.
 St. Louis, Mo.—St. Louis Transit Co.
 Seattle, Wash.—Seattle Electric Co.
 South Bend, Ind.—Indiana Railway Co.
 Vicksburg, Miss.—Vicksburg Railroad, Power & Light Co.
 Venice, Ill.—Venice, Madison & Granite City Railway Co.
 Willoughby, O.—Cleveland, Painesville & Eastern Railroad Co.
 Westwood, Mass.—Norfolk Western Street Railway Co.

After the report of the secretary and treasurer had been accepted and ordered filed the secretary announced that the Kansas City Club and the Elks Club had extended cordial invitations for all the delegates to visit their club rooms, the badges admitting members of the association.

The president then announced the first paper:

THE CONSOLIDATION OF STREET RAILWAYS AND ITS EFFECT UPON THE PUBLIC.

By Daniel B. Holmes, Counsel Metropolitan Street Railway Co., Kansas City, Mo.

It is no part of the purpose of this paper to enter into an extended discussion of street railway consolidations from a legal point of view. It is assumed that no considerable number of those present would be particularly interested in that branch of the subject. Suffice it to say that the laws of nearly if not quite all of the states of the Union are in such condition that practical street railway consolidation may be brought about and made effective by union of companies as a technical consolidation, or by purchase and sale of the corporate property or capital stock or by common ownership of the corporate shares of several companies, or in other ways which might be mentioned. Whenever consolidation is desired by the parties in interest it may be safely assumed that counsel learned in the law will find little or no difficulty in pointing out the way in which that end may be legally accomplished.

Street railway companies may be properly classified as public service corporations, and whenever a union takes place of several such companies, it at once becomes obvious that the interests of the capital invested and of the traveling public may and probably will be positively affected thereby. Therefore these two interests will form the chief basis of what I have thought proper to lay before this convention of practical street railway men, whose calling is such that they never feel at liberty to disregard either the best interests of their stockholders or the welfare of the public, whose constant servants they are. And I may be permitted to add, in the light of an experience and intimate association with street railway managers extending over a period of upwards of twenty years, that no class of men with whom I have come in contact in the active practice of a profession which brings about the most intimate relations with all sorts of men, are so constantly mindful of the best interests of the public they serve by night and by day, as are the street railway men. I am the more pleased to make this acknowledgment because the street railway man has so many impatient masters among the trav-



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eling public that he is much more often the subject of unjust criticism than of the well-deserved encomiums he would surely receive if the difficulties of his situation and his conscientious efforts to faithfully discharge his company's duty to the public were even half-way understood. Above all men it is his lot to bear the "whips and scorns of time," and if he will but pin his faith to the teachings of the Good Book, he may expect to receive hereafter that reward which in but few cases, I am sorry to say, comes in this life in the shape of an adequate salary for so hard and thankless a job.

That the consolidation of street railway interests affords opportunities for the introduction of many various economies is a truth which is almost axiomatic, and this may be fairly said to have been the controlling consideration which has inspired and accomplished the many consolidations which have taken place in various parts of the country. By this process the managerial force is greatly reduced and the salary list largely diminished. Where three or four presidents, managers or superintendents were required for the successful management of the separate properties, but one officer of each kind is needed in their united state, and while he receives more salary than any one of his predecessors, as of right he ought, because of enlarged duties and more weighty responsibilities, still there is substantial saving over what was previously paid.

But there is in this connection a still more important consideration. As is the case with any other calling in life, the supply of really first-class street railway managers is more or less limited, and the larger salary offered by the consolidated interests naturally commands, and in all probability secures, a higher order of talent than the separate properties could retain even where it had been fortunately possessed. In this way the consolidated properties in nearly every instance are managed with greater ability than was shown by the management of the disconnected parts, and this is a positive gain, the value and importance of which can scarcely be estimated. This successful manager, you may be sure, is truly a remarkable man. The relations existing between street car companies on the one hand and the municipality or its citizens on the other, are the fruitful source of jealousies

and complications constantly arising which can be successfully disposed of by nothing short of the possession of genius for diplomacy, and for affairs and finance all at the same time, in order to be able to satisfy the demands of the public without involving the company in irretrievable financial ruin.

In most instances, the consolidation of street railway properties creates opportunities for marked reduction in the cost of generating motive power. Location is a most important consideration as regards the power station. Unless the power station is so situated that both fuel and water can be delivered to it at minimum cost, the highest degree of economy in developing motive power is altogether impossible. This is greatly facilitated by the union of properties since the car lines are so situated in most cities that but few of them, if independent, could operate from power stations located near steam railroad switches and water courses. A greater or less number of high-priced employes are always necessary around every power station whether large or small, and this is an expense which is greatly curtailed by generating as much power as it is practicable to handle from one station. A company possessed of an extensive system with large mileage has thus presented to it the opportunity of producing power at the minimum cost, a thing altogether impossible on a short line railroad.

But perhaps the most important result from consolidating street railway lines is the great stimulus it affords to street railway traffic. Outside of a few of the very large cities where the problem is not how to get business, but how to successfully handle that business which of necessity must come to the car lines, the street railway companies are quite generally engaged in efforts of all kinds to create travel on the lines artificially by offering to the public attractions of various and sundry kinds. This is all well enough, but one of the most effective means to this end is the consolidation of the street car lines. I believe it is the uniform experience that the aggregate travel on the united lines exceeds by a large percentage the business formerly done by the separate properties. This is partially accounted for by the fact that short distances are now ridden that were formerly walked, because two fares were then necessary in order to ride, and this was considered too great an outlay for the accommodation afforded.

But how stands the case with the public? I am altogether sure it is no different. Indeed the immediate benefit to those who ride upon the cars far exceeds the increased returns to the consolidated company. Where before the union, two and even three fares in some instances had to be paid in order to convey the passenger to his destination, he may now make the same journey for a single fare by means of transfers and through cars, which were previously impossible. Taking Kansas City for an example, 50 per cent of all the passengers who ride on the cars make at least one transfer in every journey, so that it may be truly said 60,000 passengers save 5 cents each and every day in the year in Kansas City alone, and this saving is due solely and directly to the consolidation which took place only a few years ago. And who are the people thus benefited? It is chiefly the laboring classes who can least afford to spend their hard earned gains unnecessarily. The sons of toil who were formerly compelled to shelter their wives and rear their children in the polluted air and noise and smoke because unable to pay more than a single fare in going to and from their vocations, can, and do now, dwell in the neat little cottage in the suburbs where loved ones breathe the pure air of heaven and bask in the sunshine of life all the day long, and when evening comes smiles and mirth and joy are the companions who have taken the place of sickness, suffering and grief. Who can estimate the value of blessings like these? If the public welfare is the first and highest duty of the state who can gainsay the immense value to the public of street railway consolidations, and who can say that the state ought to throw any obstacles in their way?

But it is said that competition is the life of trade, and that monopolies are odious. Accepting these as general truths, let us see how it is with the street railroads. Except to a very limited and unimportant degree, there is no such thing as competition in street railroads, and their consolidation is entirely devoid of any objectionable feature of a monopoly. In the very nature of things, street railroads are seldom competitors in business. They were never known to compete in rates, and can only be laid on such highways as the authorities may determine. The necessity for keeping some streets open for ordinary vehicle traffic keeps the street railroads sufficiently apart as a rule to eliminate any matter

of choice on the part of the intending passenger. Each line supplies and accommodates its own peculiar territory, and there is no real choice, and hence no real competition. As to rates, these are universally fixed by the franchise ordinances. They are the same on all roads so that the intending passenger is moved solely by considerations of convenience to himself. In short, he simply takes the line which takes him to his destination with the least inconvenience. Monopolies are only odious when of a character that they do or have the power to fix their own price for what they alone can sell. Not so with the consolidated street railway. So far from having the power to increase the cost of travel, consolidation always results in a practical reduction of cost by giving to the passengers the right to ride for the same single fare the increased distance brought about by consolidation. No thoughtful man would condemn a street railway consolidation, because it neither stifles competition nor increases cost of travel, nor creates a monopoly as that term is generally understood.

There can be no doubt that consolidations of this character are greatly beneficial both to invested capital and the public at large. And happily this is so, because the public is never so likely to have its wants provided for as when it is to the interest of capital to do so. There is no tie so strong as common and mutual interest. This is a principle which would render many conflicts and controversies impossible, if kept always in mind and strictly adhered to in all dealings between public service corporations and the municipality in which they dwell. I commend it to the thoughtful consideration of all who are assembled in this convention, as the firm foundation on which aggregations of capital may safely rest, the Gibraltar of justice and right, garrisoned by an always sound and healthy public sentiment, against which the assaults of prejudice, passion and demagoguery would be hurled in vain.

The meeting then adjourned, the president announcing that the executive committee would then hold a meeting.

WEDNESDAY, OCTOBER 17TH.

The meeting was called to order at 10:50 o'clock by President Roach.

The President: For reasons unnecessary to explain at this time, we have changed the order of business somewhat. The names of the nominating committee have been selected, and the secretary will now read them. This committee will also recommend to the association a place for our next meeting.

The secretary read the names of the Committee on Nominations, as follows: Chairman, John A. Rigg, Reading, Penn.; E. C. Foster, Lynn, Mass.; E. G. Connette, Syracuse, N. Y.; D. B. Dyer, Augusta, Ga., and Robert McCulloch, Chicago, Ill.

The President: I would say to the gentlemen who have any idea of asking the association to hold its next meeting in their city, that they can see Mr. Rigg, the chairman of the Committee on Nominations, any time at their convenience. Mr. Rigg will appoint a time and place for the meeting of the committee.

Secretary Penington: Mr. President, I will state that I have received invitations from the mayor of Cincinnati, the president of the Cincinnati League, and from president Kilgour, of the Cincinnati Street Railway Co., asking us to hold the next convention in that city. I will turn these invitations over to Mr. Rigg.

The President: In the absence of Mr. Bancroft, the secretary will read the next paper.

COMPARISONS OF THE VARIOUS SYSTEMS OF ELECTRICAL DISTRIBUTION FOR STREET RAILWAYS.

By C. F. Bancroft, Electrical Engineer, Massachusetts Electric Companies, Boston.

In preparing a paper on "Comparisons of the Various Systems of Electrical Distribution for Street Railways," the subject selected by the executive committee, I find that the conditions to be met in the numerous localities where the various systems are in use are so widely different, and each system so generally satisfactory, under certain conditions, and so completely unsatisfactory for meeting other conditions, that comparisons are altogether impossible, except in a very general way.

There are six systems of electrical distribution for street railways at present in more or less general use.

First, what may be called the standard 500-volt continuous current system, where the current is generated at from 500 to 600 volts and delivered direct to the car motors, usually by means of a feed-wire and a trolley, third rail or underground conduit.

Second, what may be called the alternating direct current system, where the power is generated as alternating current, usually at high voltages or from 5,000 to 15,000 volts, and transmitted to sub-stations, where the voltage is usually reduced by means of static transformers, transformed into direct current by rotary converters, and delivered to the lines at about 500 volts continuous current.

Third, the "booster" system, where the current is generated usually at about 550 volts and where, by means of an auxiliary generator, usually series wound, called a "booster," additional voltage is generated and compensates for that lost on the line.

Fourth, the so-called three-wire system, where the current is generated at about 1,000 volts, usually by means of two 500-volt generators connected in series, and is delivered to two motors or two groups of motors in series.

Fifth, the alternating current system, where the power is generated as alternating current, usually at high voltage, and transformed down to about 500 volts at the trolley wires by means of static transformers, which may be located on the poles supporting the feed-wire and trolleys, the cars being equipped with alternating current motors.



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Sixth, the storage battery system, where the batteries are carried on the car and charged at the power house or at special points on the line. Storage batteries can also be used to advantage in connection with any of the other systems under certain conditions, and in fact combinations can be made of any or all of these systems.

For any given conditions as to speed, traffic and length of line, some one of the systems named is likely to be much better fitted and more efficient than any of the others; therefore, it seems to me that a comparison of the various systems can best be made by considering the particular conditions most favorable to each. In the distribution of power for street railways the result to be aimed at is usually the maintenance, at variable loads, of an approximately constant pressure of 500 volts on the trolley wire at a minimum total cost of power.

The cost of generating electric power under the same conditions, as regards fuel, depends to a great extent on the amount of power generated and the capacity of the generating apparatus with reference to the average output required. Under ordinary operative conditions, with the same power factor, that is, the same ratio of output to capacity, the cost of power per kilowatt-hour from stations of less than 500 kw. capacity increases very rapidly as the station decreases in size. With from 500 to 1,500 kw. capacity, the cost of power per kilowatt-hour decreases slowly as the size of the station increases. From 1,500 to 2,500 kw. capacity the cost per kilowatt-hour decreases very little as the output increases, and above 2,500 kw. station capacity the cost of power per kilowatt-hour becomes nearly uniform. This is due to the fact that in small plants the labor item is disproportionately large, and the general efficiency less than in larger ones, while in plants of 1,500 kw. output and larger the cost of labor remains proportionately nearly the same as the plant increases in size. It follows from this that there is often very little or nothing to be gained

from an economical standpoint by substituting one station of 5,000 kw. capacity for two of 2,500 kw. capacity each, provided the local conditions, as regards cost of coal, water, etc., are the same.

The system of distribution most suitable to a particular road depends to a great extent on the location of the power station or stations and the nature of the load. It is always expensive to transmit power, the expense being either in interest on copper investment or in fuel or both; and, therefore, other things being equal, the location of the power station or stations should be as near the load or center of distribution as possible. The location of the station is, however, usually governed to a considerable extent by local conditions as regards cost of fuel, water and real estate.

On a large system, requiring an average output of 12,000 kw., even though the load be distributed within a five-mile radius of a practical station location, it will usually be found economical to generate this power at several smaller stations, rather than at one large station, provided the conditions as regard cost of fuel, water and real estate are about the same, as the cost of power station buildings and machinery per kilowatt of capacity and the cost of generating power per kilowatt-hour, with a station of 5,000 kw. capacity, is about the same as at a station of 10,000 kw. capacity. The interest on the saving in cost of feed-wire by having several stations, each located near its load, would more than offset the slight saving in cost per kilowatt-hour, due to the generation of power at one large station, and it also has the advantage that in case of fire or accident to one station the other can usually be so interconnected as to temporarily carry the entire load, and thereby avoid much of the stoppage of traffic which would occur if the road was supplied entirely from one station.

For an example of what was called the first or standard 500-volt continuous current system of distribution, a city may be cited in which the street railway lines radiate west from the center of the city like the spokes of a half-wheel, with a radius of about five miles. Instead of having one large station at the hub of the wheel, the road is supplied with power from seven stations, distributed throughout the system, having an aggregate capacity of over 26,000 kw.

The generating and distributing system in use in one of our most densely populated cities may be taken as an example of the way in which the system of distribution adopted is governed by conditions outside of those indicated for the most economical generation and distribution of power to the car motors. Although this system is compact and will probably require an average station output of over 30,000 kw., which it would seem to the outside engineer could be more economically distributed and almost as economically generated at several stations, the street railway company is installing a high-tension alternating direct current system of distribution with a main station of 45,000 kw. ultimate capacity, and five rotary converter sub-stations of from 3,000 to 6,000 kw. capacity each. It is probable in this case that the location of the power station and the system of distribution was governed almost entirely by the great cost of real estate at points suitable for separate power stations.

It frequently happens that several miles distant from a street railway system much cheaper power is obtainable than at or near the center of the system. This may be due to an available water power, or to a difference in the cost of fuel, etc., at the two points. In cases of this kind the second, or what may be called the alternating direct current system, is usually the most applicable. To transmit power at 500 volts in any quantity from a distance of 10 miles, or even less, is very expensive, owing to the large amount of copper required and the great loss. For instance, to deliver 500 amperes at 10 miles distance will require about 150 tons of copper, allowing a loss of about 30 per cent in the line. This same amount of power could be transmitted at 5,000 volts by an alternating direct current system with about 5 tons of copper and with a loss of less than 10 per cent in the line.

The weight of copper required to transmit power a given distance, other things being equal, is inversely as the square of the voltage, that is to say, if it takes 100 lb. of copper to transmit a certain amount of power a given distance at 500 volts, it will only take 25 lb. of copper to transmit the same amount of power the same distance with the same loss at 1,000 volts. It is owing to this fact that the alternating direct current system is so applicable where power has to be transmitted for any considerable distance, as it allows of the use of very high voltages on the line, 10,000 volts or more being in general use, which by means of

transformers and rotary converters can be reduced to 500 volts direct current for the trolley wire at points where the power is required. For an example of this system of distribution, a street railway system may be cited which derives its power from a waterfall. Here the power is generated at a pressure of 2,200 volts and is stepped up to 11,000 volts for the line. About 6,000 h. p. is transmitted at this voltage for a distance of about 21 miles. The voltage is then reduced to 500 volts, direct current, by means of static transformers and rotary converters at five sub-stations, located at or near points where the power is required.

The third system mentioned, the "booster" system, is chiefly applicable on lines where there is a light average load, but where for short periods an extra heavy load has to be taken care of. It would seldom be economical to supply an entire road with power by means of booster system, as the greater part of the power generated by the booster represents wasted energy, which is usually generated in an extravagant way, as the power required to drive the booster varies as the square of the current in the feeder, that is to say, if it requires 50 h. p. to drive the booster with a load of 100 amperes, it will require 200 h. p. to drive it if the load is increased 200 amperes. Line losses which necessitate the continuous waste of more energy than could be compensated for by an ordinary compound wound railway generator are seldom economical, even on a portion of a system, but there are many cases where there is sufficient copper installed to take care of the average load economically, but where for a short time each day, or for a few weeks in the year, owing to local conditions, the traffic is very unusually heavy.

In cases such as these, where the heavy traffic is of short duration, a well designed booster system may save a large investment in copper at a total cost of much less than would be required to pay the interest on the copper investment. For an example of this method of distribution I might cite a street railway company which supplies power to its own lines by means of a standard 500-volt direct current system, and which also supplies power to a smaller road about 13 miles distant by means of a three-phase alternating current system, using 5,500 volts on the line. Here the booster system is used in connection with the high tension system. When it became necessary to repair the high tension line, it was found expensive and inconvenient to do the work between the hours of 12 midnight and 4 a. m., the only time when the power was off, and as it was not considered safe to work on the line when it was in operation, a booster system was arranged to supply power to the distant road for short periods at times of light load. A 200-kw. booster was installed at the generating station and was designed to raise the voltage one volt per ampere of current. Switches were installed at the sub-stations so that the high tension line could be connected directly with the 500 volt feeders, some eight miles from generating station, and the booster was arranged so that it could be readily connected to the high tension feeders.

When it was necessary to replace broken insulators or make other repairs on the line the attendants were notified at the generating station and at the sub-stations, and at a pre-arranged signal, made by varying the voltage on the line, the alternators were thrown out and the booster thrown on in such a way that the power was only off from the trolley wire for the fraction of a minute. It was thus found quite practicable to make repairs on the line while the booster was in operation, and the system proved very satisfactory for supplying power at times of light load, while repairs were being made; the load on the booster frequently running as high as 500 amperes, at which time the voltage generated by the booster was about 500, which in addition to the 575 volts of the direct current system gave 1,075 volts at the generating end of the line; the voltage at the sub-station averaging about 450. While it would have been very expensive to run this booster for any great length of time, for the short time it was used the total cost was much less than the interest on the copper investment required to build a duplicate line.

The fourth system mentioned, or three-wire system, is most applicable to double track lines, where one trolley is made positive and the other negative, there being about 1,000 volts potential difference between the two, the current flowing from the positive trolley wire through the car motors to the rail and from the rail through the car motors and the other track to the negative trolley. The track is usually cross-bonded and also connected to the conductor connecting the two generators which are operated in

series in the station. This connection with the track forms the third wire and tends to equalize the voltage should there be more cars on one side of the system than on the other. This method of distribution is usually capable of saving from 20 to 40 per cent in copper, according to the character of the track return. If well balanced, it also greatly reduces the electrolytic action on buried conductors, such as water pipes, etc., and is most applicable where there are excessive track losses with fair opportunities for a balanced load.

There are few roads in this country using the three-wire system of distribution, although it is used almost universally by lighting companies. This is probably due to the complications introduced in railway systems by the high voltage, usually about 1,000 volts, between the trolley wire and feeders on different sides of the system and the difficulty of balancing the load. The saving in copper, while not as great as in the three-wire lighting system, is still enough to warrant the extra complication, and under favorable conditions may prove very valuable.

I am only familiar with one example of this system of distribution. In this case there is very heavy traffic over a double track line to a park, about 16 miles from the power station. It was found impossible to handle the increased traffic on the ordinary 500 volt system with the existing feedwire. By reinsulating the line and operating it on the three-wire system, the efficiency of the distributing system was very much improved and they were enabled to easily handle the increased traffic with the existing feedwire.

The fifth system mentioned, or the alternating current system, is practically untried in this country. It seems peculiarly adapted to lines having long runs at uniform speed with few stops, such as lines connecting cities, rather than for ordinary street railway service. The alternating current motors at present in general use are of the polyphase type, and require at least three working conductors, which is a serious objection in many cases for railway work, as it necessitates the use of two trolley wires in addition to the track as conductors. The disadvantages of this system appear to be the necessity for at least two trolley wires and the probable difficulty in building alternating current motors suitable for railway work which will have a good power factor.

The main advantage of the alternating current system is the possibility of feeding lines with stationary transformers which need no supervision, but which can be considered simply as a part of the feeder, thereby multiplying many times the length of line which can economically be supplied with power from one station. The alternating current motor also has the advantage of running at fairly constant speed independent of the load. It will not race going down hill if the power is left on, but will return power to the line, nor will it slow down much in going up hill. There are four or five railway companies using this system, and judging from the reports that appear from time to time in the railway journals it is giving very satisfactory results.

The sixth system referred to, or storage battery system is decidedly more expensive than the usual methods of electrical distribution, owing to the great first cost and the short life of the batteries. Lead is at present the only metal capable of resisting the attacks of sulphuric acid, and modern batteries consist largely of lead, which is very undesirable from a mechanical point of view and is very heavy, so that unless the present type of storage battery is substantially improved, this system is only likely to be used where other systems are not practicable owing to peculiar local conditions or restrictions. The storage battery, however, has a large field in connection with the other systems of electrical distribution for street railways, and under favorable conditions may considerably increase the station capacity and reduce the fuel consumption; and when used on the line may greatly improve the regulation and increase the copper efficiency.

From this brief outline of the various systems it will be seen that each has its peculiar advantages and that no one is suitable under all conditions. It will generally be found that where the traffic is heavy and the distance short, the standard 500-volt system is most applicable. For suburban work, where the distances are greater and the traffic less congested, or where it is necessary to transmit the power for some distance, the polyphase alternating direct current system will usually be found more economical. In special cases, where for short periods of time an unusually large amount of power is required, the "booster" system will often prove very valuable, while for high-speed, long distance, interurban

work the three-phase alternating current system may be attractive. The cars on this system, however, would have the great disadvantage of not being able to run over the ordinary direct current street railway lines.

There can be no general rule given that will determine the most advantageous system of distribution to use under the varying conditions to be met in street railway work. Each case must be considered as a separate problem and that method selected which will best meet the peculiar conditions involved.

The President: Gentlemen, we have gathered here for the purpose of disseminating information. You have heard the paper just read. We would be pleased to hear from some of the gentlemen who are present in reference to the subject matter of this paper. I will call upon Mr. E. C. Foster, of Lynn, to open the discussion.

Mr. Foster: Mr. President and gentlemen: I thank you for calling upon me, but as I am not an expert electrician, it seems to me that I am hardly competent to discuss the merits of the paper which has been read. I think that Mr. Bancroft has treated the subject in a very broad way. He is a very competent man, and is employed by the same companies which employ me. We consider him one of the ablest electrical engineers in the Eastern country. I do not care to undertake to discuss this subject. There are many others here far more competent to do it than I. I thank you for calling me, Mr. President.

The President: I will call upon Mr. E. G. Connette, of Syracuse, N. Y., to give us his views upon the subject.

Mr. Connette: I thank you Mr. President, but I think, like Mr. Foster, that the paper is of such a technical nature, and the ground has been so fully covered, that there is nothing that can be said that would be interesting in addition to what the author has already stated.

The President: I can fully appreciate what the gentlemen have said. It certainly seems to cover the ground quite fully. We would like to hear from Colonel Dyer, of Augusta, Ga.

Mr. Dyer: Gentlemen of the Convention: I am not at all prepared to discuss a technical paper of this character. I think that the subject has been treated most exhaustively, and it is a valuable paper. This association certainly owes a debt of thanks to the gentleman who wrote it. I am wholly unable, however, to go into the details of the paper, and discuss the advantages of the different systems which have been referred to.

Mr. Wason: Mr. President and gentlemen: It seems to me that from the standpoint from which the author of the paper has taken up the subject, there is very little to discuss as to applying the theories of the paper to any particular road. The fact that the condition of each road as it is presented, determines in a great measure the character of the electrical application, there is hardly anything that we can discuss. If we had a road which we desired to equip, then the question would come up as to which one of the several systems presented would, in the minds of the gentlemen present, bring the best results. Under the circumstances, it does not seem to me that there is really anything to discuss.

The President: Gentlemen, you have heard the reading of the paper. What is your pleasure in the matter?

Mr. Connette, Syracuse: I move that the paper be received and the thanks of the convention tendered to the author. Motion carried.

The secretary then read the following paper:

PAINTING, REPAINTING AND MAINTENANCE OF STREET CAR BODIES.

By F. T. C. Brydges, Superintendent of Car Shop, Chicago Union Traction Co.

In giving my views as to the proper manner in which to paint, repaint and maintain street car bodies, I thoroughly realize that it is a subject of the greatest interest to street railway men; and as it is a part of my daily duty to supervise this class of work, the subject is of the greatest interest to me, and I will endeavor to give my views on the three topics separately.

PAINTING.

Our object in painting a street car is two-fold: maintenance and durability of structure, and appearance. It is needless for me to go

into the question of the increased life and durability of a street car, when properly painted, repainted or revarnished, as often as necessity may require to keep it up and maintain it in good condition, as it is an admitted fact that painting, repainting or revarnishing, as necessity may require, adds to the life and durability of street cars.

Our methods of painting new cars are simple and, we think, very efficient. We apply our first, or priming coat, on all wood work to be painted, then putty all nail holes and other imperfections, and then sandpaper the priming coat. In place of applying four or five coats of rough stuff to produce a surface, we apply one coat of glaze, or scrape-in coat, as I am of the opinion that the least number of coats of paint applied to produce a surface for painting the better. There is not so much danger then of the finished surface cracking and checking, as when there are four or five coats of Japan or quick drying material used to produce a surface with rough-stuff, which, as a rule, is dry, brittle and non-elastic, and owing to the thickness of the four or five coats, is almost sure to check more or less within a short time after the work is finished. After the glaze, or scrape-in coat, is thoroughly dry, it is sandpapered down close. The iron sill plates, in the case of open cars, are scraped in with the same quality of material and then sandpapered in the same manner as the wood work surface, the iron plates and all other iron work being thoroughly painted with best quality of Prince's mineral, mixed with raw oil, turpentine and Japan, as the first coat, to prevent rusting of the iron. After the glaze coat has been thoroughly sandpapered to a smooth surface, apply the first coat of body color, consisting of 10 lb. of bleached white lead, 5 lb. of Japan body color, 1 pint of raw oil and then apply the second coat of pure Japan body color and one coat of color varnish, sandpapering slightly with No. ½ or No. 0 sandpaper each coat of color before applying the next coat of color. Dashes and all iron work are painted with Prince's mineral, as above described, as the first coat, to prevent rust and then brought up in the same manner as the wood work, except the glaze or scrape-in coat, which is omitted on all iron work. This exception, however, does not apply to sill plates or any part that is to be finished in connection with the body or wood work. After a coat of varnish color has been applied, which is the last coat of color, the ornamentation and lettering is put on. Our style of ornamentation and lettering, we believe, is simple and yet very neat in design, consisting of a fine line, a broad line, and a small corner ornament worked into the fine line, thus making the ornamentation not expensive, but very neat in appearance. We are of the opinion that expensive and elaborate ornamentations on street cars are needless, a waste of money, and do not appear as well on the cars as a less expensive design. The great objection to expensive designs for ornamentation is not only their original cost, but it is more difficult to touch up when damaged in service by some careless teamster who has punched a hole in the panel with the pole of his wagon, or scratched the entire length of the body and thereby damaged the side of the car. This class of car damage is a very frequent occurrence in the large crowded cities and much increased by careless teamsters. After the lettering and ornamentation is complete, we finish the entire surface with two or three coats of varnish of standard quality, the first coat being rubbing varnish, if two coat work, also the second coat being rubbing varnish, if three coat work, the last coat being finishing varnish. We do no rubbing with pumice stone on the rubbing varnish, as we consider it unnecessary for street car surface to waste time and money in rubbing down finishing varnish. We object to rubbing with pumice stone as, in our opinion, it reduces the life of the varnish.

INTERIOR FINISH ON OPEN OR CLOSED CARS.

Apply one coat of good wood filler for hardwood work. Stain all softwood work for molding or otherwise to such tint as desired, clean up with fine sandpaper and apply a very thin coat of varnish, allowing it to stand about 24 hours. Then sandpaper and apply a second coat of coach rubbing varnish, then sandpaper lightly with No. 0 sandpaper and apply the third coat of varnish. We use no shellac on our soft or hardwood finish. We object to shellac being used in connection with car finish in any particular. We prefer to have the first coat of varnish applied on the wood next to the hardwood filler or applied on the soft wood. Interior of panels are finished with two or three coats of good standard paint applied on the canvas and other unfinished woodwork.

Roofs.—All roofs are painted with three coats of standard paint, or a good brand of white lead, tinted as desired.

Floors.—All floors are painted with two coats of standard floor paint or Prince's mineral paint.

Trucks.—All trucks are painted with one coat of Prince's mineral paint and one coat of standard truck color, striped to some extent if desired on trail cars.

Time Required for Painting Cars.—Cars, open or closed, can be painted and finished ready for service on this system in eight days.

REPAINTING.

Our system for repainting cars, so far as the painted surface is concerned, is about the same as that already described. When their condition requires the old paint to be removed to the wood, we do so by burning off all the old paint to the wood, then scrape the surface smooth to receive the priming coat and then proceed in the same manner as described with glaze coat, color, ornamentation, lettering and then finish with the same number of coats of varnish as in the case of new work. If, however, the old paint is not cracked too much, and the surface has sufficient life to receive new paint, we clean up the entire car by thoroughly washing it, then sandpaper the surface smooth and apply two coats of body color and a coat of varnish color, on which we put our lettering and ornamentation. We then finish with one coat of rubbing and one coat of finishing varnish. The interior we revarnish with one coat of finishing varnish, except the seats and other hardwood surfaces of open cars, which we revarnish with one coat of varnish, one-half rubbing and one-half finishing. Two coats may be applied in the same manner if the condition of the car requires it.

MAINTENANCE OF STREET CAR BODIES.

I am of the opinion that the best manner to maintain the life of street car bodies is:

First.—At the car station from which the cars are run have them properly and thoroughly washed every day with cold water and a good quality of pure non-alkali soap prepared ready for use in liquid form at the paint shop of the company, or some other shop, provided it is of equal quality, avoiding the use of warm water, as there is a great possibility of the car washer using the water too warm and thereby damaging the life and appearance of the varnish. After the car has been thoroughly washed, all the varnished surfaces should be thoroughly rubbed dry to prevent water remaining on the varnished surfaces and thereby causing damage thereto and shortening the life of the varnish.

Second.—All street cars, closed or open, should pass through the car shops once each year for general repairs, and be thoroughly cleaned, touched up and revarnished with one coat of varnish, interior and exterior, two coats of varnish if their condition requires it, and the roof painted with two good coats of white lead or standard roof paint. Floors, platforms and all canvas and unfinished interior wood work should be painted with two coats of paint, and the trucks and all iron work repainted with at least one coat of good standard paint.

Mr. Harrington, Camden: I would inquire if Mr. Brydges is here, if so, whether he can give us any of the costs of the work he has referred to?

The President: Mr. Brydges is not here. He is not in very good health and was not able to come to the meeting.

Mr. Harrington: I have prepared some statements of the cost of the various kinds of painting we have done. I made some statements last year at the meeting which seem to be rather low in price. I have prepared these figures from work actually done and took five different operations; took them from our detailed sheet. This work is done on the piece work system. Under the usual system of hiring labor, we usually found our work cost in labor 50 to 100 per cent more than under the piece work system. I have taken these figures from our books, and have had some talk on the subject with other street railway managers, and they think that the figures are very satisfactory.

COST OF CAR PAINTING.

Camden & Suburban Ry., Camden, N. J.

First Class Operation.

18-ft. Body. Contract, \$28.00. Bonus \$10.

1. Outside, burning off old paint.
2. Outside, sandpapering.

3. Outside, two coats of priming.
4. Outside, four coats of surfacer or rough stuff
5. Outside, rub to a smooth surface.
6. Outside, first coat of color.
7. Outside, second coat of color.
8. Color and varnish.
9. Outside, striping and lettering.
10. Outside, one coat rubbing varnish.
11. Outside, one coat finishing varnish.
12. Outside, blacking off iron work.
13. Roof, one coat of paint.
14. Inside dashers, one coat paint.
15. Floors and platforms, one coat paint.
16. Inside, one coat rubbing varnish.
17. Inside, one coat finishing varnish.

Material.

6 sheets No. 1½ sandpaper.....	\$ 03
6 sheets No. 2 sandpaper.....	03
25 lb. priming color.....	1 63
½ gallon coralline or rough stuff.....	1 25
16½ lb. cream color.....	99
6½ lb. special red.....	2 99
4 books gold leaf.....	1 40
1½ books aluminum leaf.....	18
2½ spools Coe's ribbon gold.....	2 18
¼ lb. golden ochre.....	07
½ lb. sizing.....	24
¼ lb. white paint.....	02
¼ lb. drop black.....	08
¾ lb. Venetian red.....	19
2½ quarts rubbing varnish.....	2 20
2 quarts inside finishing varnish.....	1 76
1 quart black iron varnish.....	19
2 gallons red rubber paint.....	2 34
2 quarts outside finishing varnish.....	2 02
Material, \$19.79; labor, \$27.90; Bonus, \$10. Total, \$47.79.	

Second Class Operation.

16-ft. Body. Contract, \$22.50. Bonus, \$2.41.

1. Burning off.
2. Outside, sandpapering.
3. Outside, one coat of priming.
4. Outside, three coats of surfacer or rough stuff.
5. Outside, rub to a smooth surface.
6. Outside, first coat of color.
7. Outside, second coat of color.
8. Outside, color and varnish.
9. Outside, striping and lettering.
10. Outside, one coat rubbing varnish.
11. Outside, one coat finishing varnish.
12. Outside, blacking off iron work.
13. Roof, one coat paint.
14. Inside dashers, one coat paint.
15. Floors and platforms, one coat paint.
16. Inside, one coat finishing varnish.

Material.

4 Sheets No. 1½ sandpaper.....	\$0 02
4 sheets No. 2 sandpaper.....	02
14 lb. priming.....	91
3 pints coralline or rough stuff.....	94
16½ lb. cream color.....	99
6½ lb. special red.....	2 99
4 books gold leaf.....	1 40
1½ books aluminum leaf.....	18
2½ spools Coe's ribbon gold.....	2 18
¼ lb. golden ochre.....	07
½ lb. sizing.....	24
¼ lb. white paint.....	02
¼ lb. drop black.....	08
¾ lb. Venetian red.....	19
1¾ quarts rubbing varnish.....	1 54
2 quarts inside finishing varnish.....	1 75
1 quart black iron varnish.....	19
2 gallons red rubber paint.....	2 34
2 quarts outside finishing varnish.....	2 02
Material, \$18.07; Labor, \$17.08; bonus, \$2.41; total, \$37.56.	

Flurd Class Operation.

Contract, \$14.60 Bonus, \$1.02.

1. Outside, painting vestibule and dashers.
2. Outside, cutting in all painted work.
3. Outside, relettering and striping dashers.
4. Outside, blacking off iron work.
5. Outside, one coat rubbing varnish.
6. Outside, one coat finishing varnish.
7. Roof, one coat paint.
8. Inside dashers, one coat paint.
9. Floor and platforms, one coat paint.
10. Inside, one coat finishing varnish.

Material.

4 lb. special red	\$1 84
8 lb. cream color	48
2½ books of gold leaf	88
½ spool Coe's ribbon gold	44
¼ lb. golden ochre	07
¼ lb. sizing	12
¼ lb. white paint	02
¼ lb. drop black	08
¾ lb. Venetian red	19
1 quart black iron varnish	19
1¾ quart rubbing varnish	1 54
2 gallons red rubber paint	2 34
2 quarts outside finishing varnish	2 02
Material, \$10.21; labor, \$12.38; bonus, \$1.02; total, \$24.21.	

Fourth Class Operation.

Contract, \$8.50. Bonus, \$1.42.

1. Outside, painting vestibules and cutting in dashers.
2. Outside, touching up main body.
3. Outside, blacking off iron work.
4. Outside, one coat finishing varnish.
5. Roof, one coat paint.
6. Inside dashers, one coat paint.
7. Floors and platforms, one coat paint.
8. Inside, one coat finishing varnish.

Material.

2½ lb. special red	\$1 15
2 lb. cream color	12
½ lb. Venetian red	13
1 quart black iron varnish	19
2 gallons red rubber paint	2 34
2 quarts outside finishing varnish	2 02
2 quarts inside finishing varnish	1 70
Material, \$7.71; labor, \$8.50; bonus, \$1.42; total, \$17.63.	

Fifth Class Operation.

Contract, \$4.00. Bonus, \$66.

1. Outside, touching up dashers and main body of car.
2. Outside, blacking off iron work.
3. Outside, one coat finishing varnish.
4. Roof, one coat paint.
5. Inside, dashers one coat paint.
6. Floors and platform, one coat paint.

Material.

1½ lb. white paint	\$0 12
1 lb. special red	46
1 quart black iron varnish	19
2 gallons red rubber paint	2 34
2 quarts outside finishing varnish	2 02
Material, \$5.13; labor, \$4; bonus, \$66; total, \$9.79.	

Mr. Foster: I would ask through you, Mr. President, the price paid by Mr. Harrington for the labor in doing that contract work.

Mr. Harrington: Twenty-five cents an hour for the painter; the assistant painter gets 15 centst an hour.

Mr. Riggs: I move that the paper be received, and the thanks of the association be extended to Mr. Brydges. Carried.

The secretary announced that on Friday at the Convention Hall there would be a vaudeville entertainment provided by the supply men.

The meeting then adjourned until 11:00 o'clock Thursday morning.

THURSDAY, OCTOBER 18th.

The clear air and warm morning sun contributed to a general feeling of good nature, and every-body was in good spirits and attendance was the largest of the week, every chair being occupied.

President Roach called the convention to order at 11:10 a. m. Secretary Penington announced that the following 16 companies had joined at this meeting:

Dallas Consolidated Electric Street Ry. Co., Dallas, Texas.
 Danville Street Railway & Light Co., Danville, Ill.
 Detroit, Rochester, Rome & Lake Orion Ry. Co., Detroit, Mich.
 Jackson Railway, Light & Power Co., Jackson, Mich.
 Kansas City-Leavenworth Railway Co., Kansas City, Kansas.
 Lebanon Valley Street Railway Co., Lebanon, Pa.
 Meridian Street Railroad & Power Co., Meridian, Miss.
 Skuykill Traction Co., Norristown, Pa.
 Hoosac Valley Street Railway Co., North Adams, Mass.
 Ottawa Railway Light & Power Co., Ottawa, Ill.
 Ottawa Electric Railway Co., Ottawa, Ontario.
 Holmesburg, Taconey & Frankfort Electric Railway Co., Philadelphia, Pa.

Monongahela Street Railway Co., Pittsburg, Pa.
 Rockford Railway, Light & Power Co., Rockford, Ill.
 Saratoga Traction Co., Saratoga, N. Y.
 Terre Haute Electric Co., Terre Haute, Ind.

The President: Gentlemen, we will now proceed to the regular order of business this morning. The paper on the program is entitled:

DOUBLE TRUCK CARS; HOW TO EQUIP THEM TO OBTAIN MAXIMUM EFFICIENCY UNDER VARYING CONDITIONS.

By N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

In order to prepare a paper which would be of any value to the members of this association, it was necessary to learn the conditions governing the operation of double truck cars on different systems. The conditions under which cars are operated, vary to such an extent that it is impossible to construct and equip a car that can be operated with equal economy on all systems. In order to keep within the time allowed by the committee, and the more readily to convey to the members the writer's opinion as to the most desirable double truck car, the subject matter will be taken up under the following divisions: Trucks. Electric motors. Double truck car body and equipment.

TRUCKS.

The double truck for use on street railways has not received the attention it merits. These trucks have been constructed along the lines of the single truck, and to meet the varied views of railway managements. One has only to observe the different styles of trucks now in use to find how at variance have been their views.

The 55 years experience of the steam railroads in the development of the double truck now used by them, should be a warrant to the street railway managements in adopting only trucks that conform to the lines used by these roads; the diameter of wheels, with the tread and depth of flange should be changed only where conditions prevent using the Master Car Builders' standard.

I present drawings of a double truck designed along steam railway lines to meet the varied condition of street railway service. In the design of this truck it has been the aim of the designer to include all known good features of the present street railway truck and to add improvements of value. This truck is constructed with a minimum number of parts consistent with safety, strength, accessibility, lightness and cost of maintenance.

In giving a brief description of this truck, it will not be necessary to mention the wheels further than to say that they are cast chilled, 33 in. in diameter with a 3-in. tread and 1 in. flange, formed to fit the modern rail, and weight 380 lb. The axles are of forged steel, high in carbon, with a 2-in. hole bored through the entire length. The key seat at the gear wheel-fit is cut above the line of motor bearings and journals, in order not to weaken the axle.

The oil boxes are constructed so that the journal brasses may be

readily removed, and with dust guard placed in position from the underside of box. An extra guard is placed from the same side and where it will retain the oil at the highest point.

The journal brasses and boxes are finished in such a manner as to obtain the full journal bearing under all conditions.

The side frames are made from two $\frac{3}{4}$ -in. steel plates, thus allowing the main equalizer to be supported between the two frames on long helical springs. With this arrangement the bar can be removed for repairs without in any way taking the truck apart. This form of frame allows the greatest freedom of access to all parts, and the use of the extended equalizer bars gives extended spring movement, with a perfect side movement on curves and at low places in the track, minimizing the blow to the car body, rail joints and special work and reducing the cost of maintenance of track and equipment. The side frame is so strongly constructed at points where the transom joins the frame that it is not necessary to continue frame around the end and



N. H. HEFT.

connect it with the other side of frame to keep the truck in alignment. This also allows the placing of the truck near the end of the car body without coming in contact with the steps.

The brakes are placed inside of the wheels, without using a brake beam. This position insures the most positive action, with either hand or power and independent braking on each wheel. The wheel base, 5 ft. 6 in., allows the motors to be suspended between axles and transoms.

MOTORS.

The writer, having had experience with heavy and light motors, mounted with two motors on one truck, the other truck being an idle or trail truck, as well as with one motor on each truck, has found that, while greater efficiency is shown with the latter method, the two motors mounted on one truck show a saving in labor, first cost of the trail truck, and cost for maintenance.

Maximum efficiency, with minimum cost of maintenance, with both heavy and light motors, has been obtained by mounting two motors on each truck, making a four-motor equipment. With this form of equipment, higher speed and quicker acceleration are obtained with lower power consumption, both in the average and total for the whole trip.

After an experience extending from the time that the first railway motor was constructed, the writer knows of no mechanical apparatus in which the development has been so rapid and the point of perfection so nearly attained. Yet the future promises even greater development, both in the direct and alternating current motors. With the great corps of engineers employed by our large manufacturing concerns working with the men who are operating these motors and constantly suggesting and demanding improvements, the ideal commercial car equipment will be developed.

The writer desires to call the attention of electrical and mechanical engineers to improving ventilation, increased copper, insulation, bearings, hollow armature shaft, decreased armature speed and gearless motors.

The controllers have not, as far as space and weight are concerned, kept pace with the motors. This part of the apparatus should receive the attention of the best talent of our manufacturing companies. The four-motor controllers, in their present

form, are large cumbersome affairs, placed in that portion of the car body where it is inconvenient and expensive to support. A more satisfactory controller can be produced by using a small pilot controller placed on the platform, with some developed form of main controller underneath the car body.

DOUBLE TRUCK CARS AND EQUIPMENT.

From information furnished by the operating department and from personal observation, the writer is led to believe the following dimensions are the most desirable: Length over all 40 to 50 feet. Width over all 7 ft. 6 in. to 8 ft. 8 in.

With the increasing demand from the travelling public for the extension of present systems to suburban districts with a more frequent service and increased speed, also the construction of long interurban lines, the present managements, to meet this demand, are turning to the double truck car constructed along the lines of the steam railroad coach.

The drawings show a double truck car, which the writer believes will become justly popular. This car combines the largest number of good features and is so constructed as to admit of placing the electrical equipment where it is accessible and less liable to come into contact with the truck or brake equipment.

The car body can be carried at the lowest point and the trucks placed near the end of the body. This car gives the maximum efficiency, durability, speed, safety and seating capacity, attractiveness and ease and comfort to passengers, coupled with the minimum cost of construction and maintenance, and less dead weight per passenger, based on seating capacity.

The total weight is made up as follows: Trucks, 3,970 lb. each; four motors, 2,385 lb. each; car body and equipment, 12,300 lb.; a total weight of 29,780 lb. This amount divided by 63 passengers gives a dead weight of 473 lb. per passenger. The cars of today show a dead weight, based on the seating capacity of 750 lb. to 1,100 lb. per passenger.

While the writer does not claim that the truck and car body described are perfect, yet he believes they are along lines that will become attractive to managers when taking up the cost of operation. Decreased cost of operation can only be obtained by purchasing equipments that are designed to perform a specific duty where all weights and speeds are known.

The President: Gentlemen, we invite the members to come forward and inspect the plans prepared by Colonel Heft at considerable trouble and expense, showing the details of the construction of the car he has spoken of. (A number of the members then inspected the plans of the car.)

President Roach: I would state, gentlemen, for your information, that all of the cuts as shown here will appear in the minutes of the meeting to be printed hereafter and distributed among the street railway men of the United States and Canada. I desire personally to thank Colonel Heft for his able paper that he has read here, and we will be much pleased to hear it discussed by the members of the Association. To start this discussion, I take pleasure in calling upon Mr. E. C. Foster, of Lynn, Mass.

Mr. Foster: I have listened with a great deal of interest to the paper read by Colonel Heft, and have also given a casual glance at the drawings submitted. I think that Colonel Heft is on the right line in the way of making improvements. We all know that it is desirable to have cars constructed as light in weight as possible, and yet to be sufficiently strong to meet all the requirements and conditions. I am very glad that Colonel Heft has taken up this subject. We all know that the varying conditions under which we operate in the various states and municipalities require a different kind of equipment. There are places, of course, on the interurban lines where an equipment designed similar to that submitted here could, without doubt, be operated very successfully. The Lynn & Boston Railroad Co. is operating lines running into Boston. We operate one line over a distance of 16 miles from a small town on the coast, Marblehead, through Swampscot, Lynn, Revere and Chelsea to Boston. On that line, we are operating 12-bench double-truck open cars, equipped with four motors. The box-car equipment is a 25-ft. box-car, double truck, with four motors. We have been operating over this line about 15 months, and we are running at a maximum speed of 30 miles an hour, and we have found by experience that the operating of four motors is more economical than the operation of two motors over the same

line under the same cars and under the same conditions. To be sure, there is an increased consumption of power. We are all willing, I believe, to concede that, and I think Colonel Heft will agree with me, although he shakes his head to the contrary. From tests made, we are sure of it. The operation of four motors, of course, depends upon the speed you wish to attain, and that it is desirable to attain. In operating upon a line where your speed is more than 12 to 15 miles per hour, I question whether it would be wise to adopt the practice of using four motors. We are also operating on many lines, 16, 18, and 20-foot cars. With those cars, we operate, as is customary, the usual two motors. We have various types of motors, but we have learned by our experience that the double truck car, with two motors, or four motors, is more desirable and profitable to operate; and we are now rebuilding some of our smaller cars and converting them into 25-ft. cars. We are doing that successfully. We are also building a large number of new 25-ft. double truck cars.

Mr. Chamberlain (Brooklyn): You will appreciate that the average mechanic in this country has his "hobbles" as well as the average professional man. Without referring to any part of the electrical equipment which Colonel Heft has designed for his peculiar class of cars, there are two or three innovations from the present practice in the construction of the car body, which may well attract attention. With most of us, innovations of this character are subject to adverse criticism. I know of nobody who would be subject to adverse criticism less than the author of this paper, who has had such a vast amount of experience in this direction, and it seems that it is right and proper he should make an innovation of this character. I speak more particularly of the construction of a car without longitudinal truss rods. I think that Colonel Heft has designed a car of something over 42-ft. in length, and gains his body support by a number of cross transoms built in the form of the ordinary iron body bolster, welded at the ends, filled in with wood, and supported through the center with longitudinal I beams running from one end of the car to the other. The author of the paper has evidently, by this plan, succeeded in obtaining the minimum of weight with the maximum carrying capacity, and I think you who are practical men, and you certainly all appear to be, will agree with me that that is the object to be sought.

One question I would ask is with regard to what might be the result of an end collision. I do not know whether this truss running longitudinally through the car from one end to the other, would be adequate, and would perform the functions and give the proper camber to the car, that the ordinary longitudinal truss rods do. You will recollect some years ago, that the managers of the steam roads went wild, in following out the idea of reducing the weights of their rolling stock, until they reached a point where they almost passed the limit of safety factor. Colonel Heft advises me that he used an ample factor of safety. If he has done that, he has certainly covered all the ground that is necessary to make the vehicle safe and one that would do good service in actual practice. I was very careful to inquire of the Colonel whether he placed all his strength on a line with the sills. When we have a collision, we do not collide with the clear story of the end of the bonnet; but we generally get it on the end of the buffer. Of course, we all know there are some roads which never have any accidents, and they do not have to experience any difficulties of that kind. I was particular to ask him whether the strength was on a line with the longitudinal timbers, and whether the frame above that included posts and trusses in the framing, and the clear story was lightened up correspondingly. It would be a difficult matter to put all of your strength in your clear story, or on a line with the roof, because when you do that, and your car runs into any obstruction, your roof would probably keep going on and the body remain where it was.

Not to occupy any more of the time of the meeting, I would like to ask the author of the paper whether he has sufficient strength with the transverse brace to overcome the difficulties which I have outlined?

Mr. Heft: I have endeavored to get all of the strength longitudinally, lightening the upper portion of the car, but constructing it in such a manner that the upper portion is braced to the lower portion and tied to it, both longitudinally, vertically and otherwise. We have five of these cars under contract and expect that the first

one will be turned out in from four to six weeks. We expect to operate this car from Port Chester, N. Y., to New Rochelle, N. Y. I would be very glad to show the car, when in operation, to any of the members of the association. I may be wrong in my ideas concerning this car, but we are putting up our own money to build it. If it is a failure, we will have to foot the bills.

Mr. W. E. Harrington (Camden): The question of four-motor equipments seems to be one of a mooted character. There are a large number of roads using four-motor equipments, but there seems to be relatively very little known as to the number of watt-hours per car-mile which the different equipments require, and with the idea of bringing out that point as a feature of discussion, I would like to place this question before the meeting. What is the experience of those present, who have made tests, as to the watt-hours required by the different equipments mentioned? Mr. Foster says it takes more power with the four-motor equipment, and Colonel Heft says it takes less. They are both highly representative men, and yet they differ on this point. Our road is about to place some equipment orders. I have been urging four-motor equipments, and yet I must confess I am somewhat in the dark as to the relative merits of the different equipments. I know from tests I have made that the double-truck, 40-ft. car equipment, with two 3S-B Westinghouse motors, on maximum traction trucks, have taken an average of 2,000 watt-hours per car-mile, whereas the same weight of car, with the center pivotal truck, with No. 49 Westinghouse motors, 35-h. p., under identically the same conditions, takes an average of only 1,200 watt-hours per car-mile; a single truck car, under similar conditions, an 18-ft. body car, takes an average of 900 watt-hours. I would like to know if there are any data from actual test to show the number of watt-hours consumed by these different equipments. I have made a series of tests on different classes of cars, showing the watt-hours. I deem this matter of very great interest, and I will file with the secretary the results secured in these tests. I did not encounter any difficulty in getting information of this character, and I think the information obtained by me would be interesting to the other members, in showing the number of watt-hours per car-mile with the various forms of equipment.

Mr. Heft: I do not remember the figures, but we have made a series of tests during the last three years with double truck cars, equipped with one, two, and four motors, as I have stated in the paper, and we have kept a very close and accurate record of the results. The weights of the different trains on which these tests were made varied from 15 to 250 tons. The speeds varied from 10 to 65 miles an hour.

There is no place where the car is operated with an increase of current with the four-motor equipment, except while accelerating, but you gain a quicker and higher acceleration by this increased consumption of power. The average consumption of the current, however, and even the total consumption of the current, in the running of the cars, is less with the four-motor equipment than with the two-motor equipment. That is beyond dispute. I can furnish data to that effect, and I think the General Electric Co. and the Westinghouse Co. also can furnish any of our members with data which will substantiate that statement. It is unquestionably correct.

Mr. Wason: I would ask if the additional cost for the drilling of the hole through the axle and the armature shaft is commensurate with the results, and whether he is seeking to lighten the axle, or to be assured of the quality of material?

Mr. Heft: I am willing to admit that the drilling of the axle is a debatable question. About five years ago, we commenced to use hollow axles on our high speed motors, and the results have been so favorable in the way of reducing the number of hot boxes, hot journal bearings, and everything of that kind, that we have decided to adopt that form of axle. It decreases the weight about 25 per cent, with a loss of strength, varying according to the size of the axle, of from only 3 to 5 per cent. We have never had any of them break. We had a great deal of trouble with our axles on our heavy high speed motors, and we found it necessary to increase the diameter and weight of the axles. We were loath to do this, and so we adopted the plan of drilling a hole through the axle to lighten it. We not only lighten the axle, but we get the benefit of having a ventilated axle. It overcomes crystallization in the axle.

Mr. J. I. Beggs: In connection with the statement that four-motors take no more current than two motors, I would ask Colonel

DATA ON WATT-HOURS PER CAR-MILE REQUIRED WITH DIFFERENT EQUIPMENTS. SUBMITTED BY W. E. HARRINGTON, GENERAL MANAGER CAMDEN & SUBURBAN RY. CO., CAMDEN, N. J.

Date	Car	Con-troller	Average Points	Resistance	Truck	DIA. WHEEL		WHEEL		WEIGHT WHEEL		Motor	HP	Average Watts	Average Volts	Average Amperes	Maximum Amperes	Full Speed	Time Using Current	Time Coasting	Between Haddonfield and Fed. St. Ferry, Up and Down	Time Start to Stop	Watt Hours Per Car Mile
						Large	Pony	Tread	Base	Large	Small													With Axle
Aug. 17	120	K-11	3.5	No. 3 West. Col.	St. Louis, Dble	33 in.	24 in.	2 in.	4 ft. 2 in.	1,125 lbs.	725 lbs.	2-38-B	50	24,250	485	50.8	185	70	27.4 min.	10.6	To ferry, 6.99	38	2,092
" 21	134	K-10	4	G. E. 1-101, 1-102	Brill 27-G "	33 "	24 "	2 "	4 " 2 "	1,125 "	725 "	2-No. 3 West.	50	22,419	477.5	47.5	200	70	26.75 "	12.25	To Had., 7.35	39	1,845
" 23	114	"	4.8	No. 3 West. Col.	" 21-C	33 "	24 "	2 "	4 " 2 "	900 lbs.	"	2-No. 3 West.	30	17,719	470	37.7	160	60	31.75 "	10.5	To Had., 7.35	42.25	1,690
" 23	114	"	8.1	No. 3 West. Col.	" 21-C	33 "	24 "	2 "	4 " 2 "	900 lbs.	"	2-Walker No. 5	30	14,382	470	30.6	125	40	27.2 "	9.8	To ferry, 6.99	37	1,249
" 23	114	"	2.8	Davis West.	Mapier	33 "	24 "	2 "	6 " 6 "	900 "	"	1-No. 3 West.	30	7,986	488	18.5	85	35	23 "	14	To Had., 7.35	42	795
" 16	58	D	"	"	"	33 "	24 "	2 "	6 " 6 "	950 "	"	2-No. 3 West.	30	7,055	538	13.3	60	37.4 "	14.6	Mer. to C., 4.34 *	29.75	812	
" 22	129	K-10	8.01	G. E. 2-1042, 4-102	Brill 27-G Dble	33 "	24 "	2 "	4 " 4 "	1,050 "	"	2-No. 49	35	13,464	519	26	60	31.4 min.	15.2	Bridge to C., 3.43 *	18	1,180	
" 22	80	"	2.8	Westinghouse	" 21-E	33 "	24 "	2 "	4 " 4 "	1,050 "	"	2-No. 3 West.	30	11,988	451.7	34	125	22 "	16	To Had., 7.35	47	1,479	
" 24	80	"	3.4	"	" 21-A	33 "	24 "	2 "	6 " 6 "	1,050 "	"	"	30	9,541	470	20.3	118	22 "	11.7	To Had., 7.35	40	864	
" 20	107	"	3.2	2-Westinghouse Col.	"	33 "	24 "	2 "	6 " 6 "	1,050 "	"	"	30	8,068	474	17	72	24.8 "	11.7	To ferry, 6.99	36.5	690	
" 20	"	"	"	"	"	33 "	24 "	2 "	6 " 6 "	1,050 "	"	"	30	8,892	494	18	88	24.6 "	15.5	To Had., 7.35	40	714	

Heft whether he meant four-motors of the same size, or two motors having the same capacity as the four might have had?

Mr. Heft: We have made experiments with motors of different capacities, but all of the motors were of the same size, and used on the same class of equipment.

Mr. Beggs: I do not know whether I made myself clear. We made some very exhaustive tests, and they were so opposed to the position which Colonel Heft now takes, that I took occasion to have Mr. B. E. Sunny, the western manager of the General Electric Co., and also Mr. Theodore P. Bailey, the manager of the railway department of the General Electric Co., Chicago, to come and witness the tests made on this mooted question of the amount of current consumed by these different equipments. Of course, this matter is a very important one to all of us.

We adopted double truck cars as a standard for our entire system five years ago. We have been using them ever since, and are continually increasing the number. We have given a great deal of attention to the development of the most advantageous car, the most durable car, the car which will best stand the strains to which Mr. Chamberlain referred, as ours is one of the roads that has collisions and a number of them, unfortunately, and some pretty severe ones. We operate 350 miles of road, and have one electric line 61 miles in length. We try to build the equipment so that it will be interchangeable, in city use or in suburban service, as we have a consolidated system, and we run the cars interchangeably. I must take issue with Mr. Heft's statement, to the effect that four motors do not take more current than two motors. If you equip a car with two G. E. 1000 motors, or four G. E. 1000 motors, I think the four motors will take 20 per cent more current than in the two motors; but the service with the four motors will be 50 per cent better. That has been our experience. Our cars for three years were equipped with two motors. For the past two years, after careful experimenting and taking into account the various costs entering into the matter, of which the smallest is power, we have adopted four motors as a standard, be they of whatever size they may. We can get much better results from 150 h. p. in four motors under a car, than we can with 250 h. p. in two motors under the car. The results may differ in various sections of the country, but with us, the four motors have certainly taken from 20 to 25 per cent more current than the two motors, running exactly similar conditions; not for the purpose of test, but in regular service on long distance or city lines, with wattmeter, voltmeter and ammeter on the car, so as to cover all the points. The use of these four motors is a very important thing on our standard car, which is 41 ft. over all, and seats 44 passengers, with cross seats, and weighs somewhat more than the car referred to by Mr. Heft. I trust that Mr. Heft will succeed in making his car all that he desires.

I was very much interested in the points raised by Mr. Chamberlain as we have found that, in order to put a car on the tracks in our city so that it will stay there, in spite of a head-on collision, as we some times have, even with the greatest degree of care, it requires some weight and strength to withstand the shock so that the car will not be absolutely shattered. We had a case recently with a green motorman on a curve, where our car was thrown off the tracks across the street, with the result that the car was not much injured except that a corner post was knocked off. I think Colonel Heft has seen how our cars are braced. We use the longitudinal truss rod and truss plank, with a rod through it. We do not feel that we can take chances with the longitudinal brace; we want the strongest construction possible to put in the car. Therefore, I should take issue with Mr. Heft on that point.

As stated, the results of the tests made were somewhat contrary to what the experts had led us to believe we might expect would be the draft upon the power plant, and for that reason, I had Mr. Sunny and Mr. Bailey come to Milwaukee on two or three different occasions to make those tests, not simply tests on a special car, but on the regular service, equipping different cars on our regular service, with different types of motors; two G. E. 57; two G. E. 1000, and four G. E. 1000 under different cars. I do not believe there is any question that the four motors will take more current, but as has been said, you get quicker acceleration. You have no slipping wheels. We are going to put two additional motors on all the cars we equip in the future. The higher speed you can make compensates for the increased power consumed. In the city service where we use these cars, as we do entirely, with

blocks running from 200 ft. in length, it is an important matter if you can save a second or two on each street corner in getting the car into rapid motion; and when the car gets on a slight grade, or starts on a slippery rail, it will immediately pick up and get off without spinning the wheels. That is what the four motors will do. I believe that four smaller motors are much more effective than perhaps 50 per cent increased capacity in two heavier motors. We have some 300 of these double truck cars running. We control all the city lines in Milwaukee and Racine, 25 miles south, and run 35 miles south to the city of Waukesha. We run a complicated system, but it is run as one entire system. If we have a call for cars on any of our interurban lines, we can take our city cars for this purpose, because they are interchangeable.

In order to compete with our friends of the steam railroads, we are now giving our attention to the development of a new car that shall be 50 ft. over all, upon which we propose to mount four 75-h. p. motors, such as you will find in the exhibit hall below. The steam railroads throughout our Western country are beginning to realize that they have a real competitor in electric lines for distances of 50 or 60 miles, and as a consequence, they are reducing the rates of fare very materially and putting on additional high speed trains to run short distances. We propose to build an electric car for the double purpose of being able to make 60 miles an hour with four of these motors and with the further purpose that in case we have a congestion of travel on any of the lines running to our summer resorts, we can hitch three or four trailers to the car and make 35 to 40 miles an hour, and to handle a larger body of people at a much reduced cost. We may have peculiar conditions in our city, but that is one of the things we have in mind. With these cars which we are going to build, and under which we are to put four motors, we should want a more substantial construction than the cars shown in the drawings which have been submitted to us, although these cars may be all right for the service for which Mr. Heft designed them.

Mr. Heft: Mr. Beggs' statement is true, judged by his conditions, but I also insist that my statement is true taken from my conditions. Mr. Beggs' cars, I believe are operated largely through city streets and are stopped and started; and as I stated in my reply to Mr. Foster, there would be a greater current consumption in producing the acceleration of the car when starting and stopping so often.

Mr. Beggs: This test was not made on a city line. It was made on our Waukesha line, a 20-mile road, with a train every hour each way. We make the run in 52 minutes, and keep up an hourly service with two cars. The test was made on that high speed line, upon which there are very few stops and sometimes no stops in a distance of ten miles.

Mr. Heft: Then I must insist, under that condition, that my statement is correct. (Laughter.) I will say, to satisfy Mr. Beggs, if he will come down to inspect our system, I will give him an opportunity to witness a test, and if he does not agree with me I will pay his expenses to Meriden and back.

Mr. Beggs: It will be a pleasure and worth all the expense to spend a day with the Colonel, outside of the test; but I shall take advantage of the opportunity he offers to have this test made. I shall, however, want to know how his instruments are calibrated. I shall also want to take some expert along with me to see these tests. I am not an expert in electric railroad matters, except on the commercial side; but I feel sure there is some mistake in the readings of the meters. I was told what the Colonel tells us, but it did not agree with my own practical experience, and what I considered would be the result when I was seriously considering three years ago, this very question of whether or not we could afford to go to the current consumption required for four motors. The first report which came to me from a gentleman whom I considered to be a highly scientific, technical engineer, harmonized with what Colonel Heft has told us, and the report went further and said that four motors saved 10 per cent, and he submitted the figures to demonstrate it. Then I concluded I would call in other experts and I did call in Mr. Sunny and Mr. Bailey, and I went on the cars myself with these gentlemen, and spent several days with them, with the result that I found it took fully from 20 to 25 per cent more current with the four motors than with the two motors, on the same character of service, the same cars and load, and running exactly during the same hours as we made the tests on different days so as to get exactly the same conditions.

Mr. Foster: The conditions under which Colonel Heft has been making tests are different from the ordinary conditions under which street railways operate, as I understand it. The conditions there are these: That the test was made upon a steam railroad roadbed, with the stops made at infrequent intervals; that is to say, that the run would be made from one station to another, and it might be two or three, or five, or even ten miles distance. That being so, I think it is possible, and without a doubt it is true that they do operate as he says, without consuming a greater amount of current than they would with two motors. Our experience has been in operating four motors on the same type of car, over the same road, under the same conditions, as near as it is possible to obtain them, that it requires from 15 to 23 per cent more current to operate four motors than two motors. We make tests twice a year, and pay for current on that basis, and we believe that the tests are carefully made, as they are made by the representatives of the Boston Elevated Railway Co., over whose tracks we operate, and which furnishes power to our company, and the tests are also made by experts representing our company.

Mr. Wason: On one of our suburban lines, we started two years ago to put on two 75-h. p. motors on each car, and found it almost impossible to make our time in the city, or in the country where there was any grade. We did that for the purpose of eliminating one-half of the repairs, as we supposed. Later, we removed the two 75-h. p. motors and put on four 50-h. p. motors, with much more satisfactory result, as we were able to make our time, and consumed but a very small amount of power more than the two 75-h. p. motors. The results were very much more satisfactory, and I think there is no question but for all suburban work, four motors are preferable to two motors, no matter what the amount of power you put into the motors is.

The lightening of a car for suburban work seems to me a little questionable. I think Colonel Heft will, a year from now, be able to give us some more definite data on this point. We have been strengthening our cars from the start, rather than making them lighter. They sometimes now leave the track for a shorter road across the fields which is not always advantageous for the rolling stock. It seems to me we ought not to consider making the cars lighter, unless we are running a car shop—possibly some of these gentlemen are interested in the manufacture of cars—and want to have the repairs of our cars or supply us with new equipment. The ordinary railroad man buys his equipment and expects it to last a reasonable length of time, and it seems to me that it must be strong. Of course, the strength should be put in the best possible places, and I think that, rather than making the car lighter, we should make it stronger. In the steam railroad practice the car is cambered up in the center. In the first of our suburban cars, the makers insisted upon putting the camber in the center, but we found after using the car a short time, we could put the camber there ourselves. The trouble was to keep it from bulging up in the center, so that a truss rod in a long car, a 40-ft., was a useless thing.

Mr. Harrington: I would ask Mr. Beggs what the tests showed where they ran two No. 57 motors, compared with four G. E. 1000 motors; whether the results from the four G. E. 1000 motors showed a lesser consumption in power than they had in the use of the two No. 57 motors.

Mr. Beggs: The current was less on the four G. E. 1000 than on the two No. 57.

Mr. Harrington: Did you get better results?

Mr. Beggs: We got quicker acceleration. Whether your service is for eight miles an hour, about the standard for city service—our city service is maintained pretty close to nine miles an hour on the average—whether your service is for eight miles, or fifteen miles, or for fifty miles an hour, put four motors on a double truck car. The distance does not make any difference whatever. The main question with many roads in this matter is the increased investment, but you will save the interest on the increased investment in reduced cost of maintenance. It costs considerably less to maintain four motors under a car than it does to maintain two motors under the same car. The difference in cost of maintenance will more than offset the interest on the increased cost of the investment.

Mr. Heft: To remove any doubt from Mr. Wason's mind as to this car, I will say that at the present time, I have not a dollar's worth of stock in any car manufacturing plant.

Mr. Connette: Mr. Beggs has just answered the question I was going to ask, whether or not the increase in the efficiency of the motors by reason of having four motors rather than two, would compensate for the increase in the investment. I presumed that would be the case with four motors as compared with two motors. Mr. Beggs states that the maintenance is less. I wanted to know something about that point, and as that question has been answered, I do not think I have anything further to say.

Mr. H. H. Vreeland: Our peculiar conditions in New York are such that we cannot go into the character of construction which warrants the use of the standard double-truck car with four motors. We do it on a number of lines controlled by the syndicate which owns the New York lines, and wherever it is possible, and we are not held down to the matter of a sixteenth of an inch in step heights, as we are in Greater New York, we go to the square body car, and use the four motors. In New York longitudinal lines, by reason of Central Park, have to use very narrow streets. We have to conform to the old type of construction, with sunk panels, to keep the cars moving. We have a number of cross streets through which the important lines operate, and the difference between the sunk panel car and the square body car, means keeping the line in operation all the time, as against stoppages every once in awhile of from ten to twenty minutes, owing to the numerous teams using the streets during the day. Take on our 59th St. line, running across town, if an ordinary truck is standing at the curb, the hub will go under the sunk panel of our car; and if we used a square body car, we should not be able to pass. We also find it necessary to have step raisers.

We are not trying to do gilt-edge railroading in New York. I mean that these things are not necessary. I had a man recently say to me that he thought it was an unwise thing to have step raisers under the control of the motorman of an open car. It means to us on the down-town streets of New York that the motorman can signal the conductor to raise the step and pass a truck without a stoppage of the car, which, under the ordinary conditions of a solid step, means a stoppage of the car, and when you are running the cars five seconds apart as we do in Center St., down-town, it is a great advantage to be able to raise the step and allow the car to pass.

The question under consideration is so local with us in that respect, that to discuss it from the standpoint these gentlemen have discussed it would not amount to much, except as concerns our experience with the consolidated system in New Jersey, where we run high speed, long distance, interurban cars. On that system, we use the large car with four motors. We get the largest carrying capacity car we can with the highest speeds, and do not consider particularly whether there is more or less power consumed, if we can compete successfully with the surrounding steam railroad conditions. We have long lines and in every instance they are in competition with the steam railroads.

We made some experiments and found that, with the same sized motors on single and double truck cars, there was an increase of about 20 per cent in the consumption of current in the double-truck car. I speak of this, because I am uncertain whether it was due to the increased weight of the car or the increased length of the car. As far as the question of general car construction is concerned, which has been discussed here, we have not to consider so much the question of collisions at high speeds, as we have the question of a "hogging" of the cars, as we term it; and as our friend, Mr. Wason, says, it is no trouble at all to get any kind of a camber in our Broadway cars, as the normal condition of the cars is such that my friend Colonel Heft says that he usually prefers to walk down town and leave room for three passengers in the car.

Mr. Sergeant: I have been extremely interested in this paper which Mr. Heft has presented. I want to say that I have seldom seen so much valuable matter so admirably put in such few words. I think this paper is a model of brevity and information. On the question of power for four-motor cars there seems to be a considerable difference of opinion. While we have had no experience in actual service with four motor cars, for the purpose of determining what the power consumption was, we made some very careful tests, under what would be ordinary conditions, with the ordinary railway motors of different types, two to the car, and under these conditions we found that we got a little better acceleration with the four motors. We got, as a matter of fact, ten per cent decrease in

time, better speed, but we had to use 50 per cent additional current to get it. I should suppose the question is one of local conditions. Certain electricians have been trying to persuade me for years that two motors consumed less power than one motor. We have records covering a good many years that one motor consumes less power than two motors.

In regard to our elevated equipment, possibly we have been making a mistake. We are intending to use motor cars having one motor truck with two 150-h. p. motors on that truck. One motor truck and one trailer truck, every car a motor, using the multiple control system. I hope that inside of the next year, if you come to Boston, we can show it to you in successful operation. It will be the only elevated road which will go underground as well as elevated, and we have to overcome long grades of 5 per cent, and have descending grades of eight per cent, and therefore, we feel we want the greatest acceleration we can get.

Mr. Heft: There is a gentleman in the room who has had a great deal of experience making tests with trucks mounted with one and two motors. I think he will give a reason why any car equipped with four motors, with all the eight wheels available as drivers, gives better results than a two-motor equipment. I would like to hear from Mr. Ira A. MacCormack, of Cleveland.

Mr. McCormack: While I was with the Brooklyn Rapid Transit Co., the president of that company thought it was advisable to have double-truck cars, and the first car that was built had the wheels all of one size, and the question came up whether it was advisable to put four motors on the car or two motors. Tests were made and it was finally decided to equip the cars with two motors on account of maintenance. An order was placed for double truck car bodies. We had not yet determined whether we had the right kind of truck and whether it was still advisable to use the four motors or to use the two motors. We had some maximum traction trucks on the road, and in making the test in regard to the power and the efficiency in acceleration, it was found that the maximum traction truck was giving much better service. In consequence, we adopted the maximum traction truck, and I believe it was the only truck we could work with two motors and continue the service in Brooklyn. The 15 cars referred to were equipped with wheels which were all of one size, and we had to pull those cars off the road. I complained to the president but he thought I was wedded to the maximum traction trucks and insisted on running them. One day, he happened to be at Richmond Hill going to Brooklyn. It was a 24-minute run from Richmond Hill to Ridgewood. The president got on one of the cars with wheels all the same size, and he was 52 minutes getting there. He thought the wheels traveled a thousand miles. These cars were equipped with two motors. The next day, we discontinued the use of the 15 cars, equipped with these trucks because we had so many delays. They dragged the road and it was found impossible to operate them.

In Cleveland, when I went with that company, I found that all the cars were double truck cars with wheels the same size. Some time ago I had a cyclometer put on the driving wheel, the wheel equipped with the motor, and a cyclometer on the idle wheel, and the record showed that the driving wheel made many more revolutions than the idle wheel. Mr. Heft's paper gives us more food for thought and study than any other paper presented to this association. There is one important thing he speaks of, and that is doing away with the brake beams, having the brakes hung and operated direct without brake beams. I think that is something that can be appreciated, particularly in view of the trouble we have had in regard to chattering brake beams and brake beams catching up rubbish on the road, and sometimes when we have accidents, we will find that brake beams are a large factor in them.

Mr. McCulloch (Chicago). Colonel Heft's paper has been discussed almost entirely on the question of economy in power, and from the standpoint of the strength of the car in its construction to resist damage from collisions. Most of us who have been in the street railroad business a good many years remember when our cars were only 10 ft. in length, and today we have them 46 ft. in length; then they weighed 4,000 lbs; now they weigh 40,000 lbs. Then we had only one horse or two horses; now we have 268 h. p. We did not consider the question of power at all, nor the question of the strength of the car to withstand shocks. We were considering how we should be able to carry more passengers, and how we could better please the man who has the nickel. I do not think it is a question at all of whether we shall use a little more

power or not if we can carry in greater safety the passengers who are in our cars, and we can carry a larger number of passengers, we can very well afford to burn an additional bushel of coal, if we can carry a few more passengers to pay for it.

As to the collisions which have been referred to, and the construction of the cars to withstand the shocks, I suppose the only way to prevent collisions is to run a road with only one car. When we have a collision, we do not consider what has become of the car, whether its transverse section is weak, or how much it will cost to repair it. What we do is to institute inquiries to find out whether there was some woman in the car whose transverse section was weak, and we shall have to pay for it. (Laughter.) I move that the paper be received and placed on file, with the thanks of the association to Colonel Heft for having written it.

The secretary announced that the members of the Association were cordially invited to visit the plant and park of the East Side Electric Railway Company. An invitation was also read from the Country Club of Kansas City, Mo., extending the privileges of the club to the members of the Association. A further invitation from the American Stoker Co. was read, inviting the members to visit the power plant of that company.

President Roach: The next order before the convention is the report of the Committee on Nominations. This committee will also include in its report a recommendation as to the next place of meeting.

Mr. McCulloch: With the consent of Mr. Rigg, the chairman of the Committee on Nominations, I would like to make a statement. In suggesting those who shall be our officers for the coming year, some member of our Nominating Committee has guaranteed strict attention to the duties of the office by each one of those we recommend, and we will ask any of the gentlemen who are nominated if he does not mean to attend to the duties of his office, if he is elected thereto, and give his earnest support in helping to carry the association along in a successful way, and give his personal attention to the meetings of the committee, we would like to have him decline the election, and let some one else be put in his place who will attend to the duties of the office.

Mr. Rigg, chairman of the Committee on Nominations, presented the following report:

Your committee respectfully recommends New York City as the next place of meeting, and the following gentlemen for officers of the association for the ensuing year.

President, Walton H. Holmes, president Metropolitan Street Railway Co., Kansas City, Mo.

First Vice-President, Herbert H. Vreeland, president Metropolitan Street Railway Co., New York, N. Y.

Second Vice-President, N. H. Heft, president Meriden Electric Railroad Co., Meriden, Conn.

Third Vice-President, J. B. McClary, general manager Birmingham Street Railway Co., Birmingham, Ala.

Secretary and Treasurer, T. C. Penington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee: The president, the vice-presidents, and John M. Roach, Chicago; F. L. Fuller, Wilkesbarre, Pa.; George W. Baumhoff, St. Louis, Mo.; John R. Graham, Quincy, Mass, and John Harris, Cincinnati, O.

The following resolution was unanimously passed by the Committee:

"Resolved, That the next meeting of the American Street Railway Association be limited to three days instead of four, and that the day set apart for the personal examination, by members, of the supply men's exhibit, be the middle day of the interval."

Mr. Bean, (St. Joseph): I move that the secretary be authorized to cast the unanimous ballot of the meeting for the gentlemen nominated. Carried.

The secretary duly cast the ballot and the president declared the gentlemen nominated to be duly elected as officers of the association for the ensuing year.

President Roach: There will be no further meeting of the association, but we will adjourn until tomorrow night at 7 o'clock to meet at the Coates House for the annual dinner.

I desire to thank the members of this association for their kind consideration while I have been your president, and if there is anything I can do at any time to help the association, I shall be pleased to have you call upon me while here and at home. (Applause.)

I will state in reference to the paper which was to have been presented by Mr. Nicholas S. Hill, Jr., general manager of the Charleston Railway, Gas & Electric Co., of Charleston, S. C., on "The Storeroom and Storeroom Accounts," that Mr. Hill has been ill for a long time, and has been unable to prepare the paper.

On motion of Colonel Heft a vote of thanks was given President Roach, and on motion of Mr. Vreeland a vote of thanks to the Metropolitan Street Railway Co., of Kansas City, and the citizens of the city who have so generously entertained the convention.

Adjourned to meet at the banquet Friday evening.

THE ENTERTAINMENTS.

The entertainments as provided by the local committees and outlined in the official program included a reception at the headquarters hotel, the Midland, on Tuesday evening, a trip to Armour's packing houses Wednesday afternoon, a theater party Wednesday night, an excursion to Ft. Leavenworth on Thursday and a shopping trip for the ladies Friday morning. The guests were glad to avail themselves of these entertainments and voted Kansas Cityans the best of hosts.

In addition to these there were other things not on the program. The Messrs. Holmes entertained the executive committee at the County Club on Tuesday. A trolley ride was given for the visiting ladies on Wednesday. Friday morning the Messrs. Heim received visitors at their brewery and street railway plant. Friday afternoon the Accountants' Association with the ladies in attendance were the guests of Mr. J. A. Harder, auditor of the Metropolitan company, who gave a trolley party. The Kansas City Club, the Country Club and the Elks' Club extended the courtesies of their houses to the wearers of buttons.

The supply men owned Convention Hall Friday afternoon and their vaudeville entertainment was a great success.

Friday evening the annual banquet was held at the Coates House, Vice-President John A. Rigg presiding in the absence of President Roach, and this function was a happy climax. Mr. D. B. Holmes acted as toastmaster and the speakers of the evening were: W. S. Gilbert, Judge McAnany, J. H. Stedman, Frank B. Walsh, and Chester Snider. The new officers were then installed and the Convention of 1900 passed into history.

PENNSYLVANIA STATE MEETING.

The ninth annual meeting of the Pennsylvania Street Railway Association was held at Reading, Pa., October 10th. Mayor Leader delivered the address of welcome and Pres. W. B. Given responded. "Railway Joints and Track" was discussed in a paper by George L. Hall, of the Weber Rail Joint Manufacturing Co., and "The Successful Station Manager and His Responsibilities," by S. D. Missimer, chief engineer of the United Power & Transportation Co., Reading.

Officers were elected as follows: President, John A. Rigg, Reading; first vice-president, E. H. Davis, Williamsport; second vice-president, A. L. Johnson, Allentown; secretary, S. P. Light, Lebanon; treasurer, W. H. Lanier, York; executive committee, John A. Rigg, Reading; William B. Given, Lancaster; W. H. Lanier, York; B. F. Meyers, Harrisburg.

In the evening the association was given a banquet by the United Traction Co.

TRAMWAY AND RAILWAY WORLD.

Our London contemporary, the Tramway and Railway World was the only foreign paper represented at the American Street Railway Convention in Kansas City. The World had headquarters at space No. 42 where Mr. Charles H. Perrine, its Chicago representative, did the honors. All those who had the pleasure of meeting Mr. A. M. Willcox, the editor of the Tramway World, at the Chicago convention last year regret that he could not have been present also. It must be remembered, however, that Mr. Willcox has had two conventions nearer home to look after. The International Tramway and Light Railway Exposition in London in June and July last was arranged by the Tramway and Railway World, and the International Tramway Congress at Paris also demanded attention.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

Fourth Annual Convention Held in Kansas City,
October 16-19, 1900—Large Attendance at the
Meeting—Association in a Prosperous
Condition—No Change in By-Laws
—W. F. Ham Elected Presi-
dent—Secretary Brock-
way Re-elected.

TUESDAY, OCTOBER 16th.

The 4th annual meeting of the Accountants' Association was called to order at 10:45 by President Duffy, who introduced Mr. Daniel V. Kent, auditor of Kansas City. Mr. Kent warmly welcomed the association in a few well-chosen words and after a brief response the president delivered his annual address.

PRESIDENT'S ADDRESS.

Gentlemen of the Association: In welcoming you to the fourth annual convention of the Street Railway Accountants' Association of America in this progressive, hospitable western city, permit me to refer briefly, and with great pride, to the present standing of the association, what it has accomplished and what it should accomplish.

The association is now on a solid foundation. The membership embraces the representative companies of the United States, Canada and Mexico, in addition to companies representing England and Scotland. Whatever may be the political faith or opinions of the Accountants, there can be no doubt that they are thorough "Expansionists" on the question of membership in this association. Notwithstanding the fact that the annual dues have this year been increased from \$10 to \$20, and that numerous consolidations have been effected in the year 1900, I am glad to say that our membership has not been materially affected. The deficit in the treasury, reported at the last convention, has been more than wiped out by the voluntary subscriptions of the members; we have a substantial cash balance on hand and no unpaid bills or other obligations outstanding.

For the fourth time, we are holding our annual convention in the same city, in the same building, at the same time as the American Street Railway Association. We are under many obligations to that association for the hearty support and earnest co-operation they have extended to us, for the privilege of attending their meetings, and for other courtesies that we have enjoyed at their hands. Unquestionably, the attitude of the older association towards this association has brought the operating and accounting departments of street railways in closer touch with each other, to the mutual advantage and benefit of both departments, as well as the good of the companies represented. To the American Street Railway Association we owe much, and I take advantage of this opportunity to express our appreciation of what it has done for us.

The Standard System of Street Railway Accounting of this association, strongly endorsed and unanimously adopted by the Convention of Railroad Commissioners of the United States, is now the standard of that body. All reports to State Boards of Railroad Commissioners (who are members of the National Association) of the fiscal year beginning July 1, 1900, will be made in accordance with the Standard System, thus placing it in the same position with reference to street railways that the Inter-State Commerce classification of accounts occupies with reference to steam railroads.

The Department of Blanks and Forms is now firmly and permanently established and in successful operation. This valuable collection of thousands of blanks and forms, securely bound in books, perfectly arranged and classified, thanks to the genius of our worthy secretary, Mr. Brockway, forms a library of rare and valued books, of which each member is privileged to make use.

This feature is of special value and assistance to all members of the association. The exhibit of the blanks and forms at the annual conventions is one of the most interesting and instructive features of our meetings. A valuable addition to our library is the "Railway Official's Private Report and Reference Book," published by an enterprising supply firm and distributed by it gratuitously. The first copy of this book issued, with the name of the association stamped on the cover, was presented to the association by the publishers. In publishing this book, which is pocket size, admirably arranged and a marvel of the printer's skill, the publishers have recognized the growing importance and value of accounting work in street railways and paid our association a graceful tribute by dedicating the book to it.

In connection with the use of the Standard System of Accounting of this association, we have a strong committee at work, charged with the responsibility of determining a Standard Unit of Comparison. The members who attended the Chicago convention one year ago, will remember the valuable paper on this subject presented by Mr. H. C. Mackay, the able and energetic chairman of



W. F. HAM,
President, 1900-1901.

the committee, and will recall the animated and interesting discussion that followed the reading of the paper. The committee will present another report to this convention; it is hoped you will give the subject the earnest, thoughtful consideration its importance demands, that there will be a thorough discussion in which every member present will participate, and that we will agree on a Standard Unit of Comparison which will be acceptable from every standpoint and go hand in hand with the Standard System of Accounting.

The advantages of membership in the Accountants' Association, to those engaged in the street railway business, are many and varied. No man could ever hope to accomplish, single-handed, what the association can accomplish, as a body. The annual conventions give the members an opportunity of meeting each other, interchanging ideas, learning from each other and acquiring knowledge and experience which could not be obtained in any other way. The Classification of Accounts of the association is a self-instructing text book; the Department of Blanks and Forms is a valuable library of reference. Where, outside of the association, could the street railway worker find such advantages? To those of us who struggled through the disadvantages of an unsystematic accounting system, incident to street railways prior to the advent of modern transportation methods, going through the evolution of horse, cable and electric railways, construction and operation, these advantages appeal strongly. What would we not have given to have had then what we have now? The work of the association, chiefly educational in its character, has only begun.

Having thus referred briefly to the present standing of the association and what it has accomplished, I will now draw your attention to the more important question of what it should accomplish.

Our first and most important duty is to increase the membership. There are some large companies and many small ones not represented on our membership roll, which should be with us. An earnest, determined effort should be made, in a systematic way, to see that every company is solicited to join the association, and that they are made acquainted with the advantages and benefits to be derived from being members. This effort should not only be made by the association as a body, but each member individually should take up the work, as a personal canvass is often successful where other measures fail. The life and success of this association depend upon its membership.

I earnestly recommend that this association consider the question of formulating a standard system of accounting and a standard unit of comparison applicable to the lighting and power business. The growing importance of this industry, owing to the introduction of modern electrical machinery, making it possible to generate current at one central power plant, economically transmit and distribute it at long distances, the increased consumption of current for commercial and domestic purposes and the tendency of the present day to combine the railway, lighting and power business, demand that we give this subject immediate attention. There are a number of our membership companies now engaged in the railway, power, electric lighting and gas business. I would suggest that a committee be appointed, charged with the responsibility of this work and that they be instructed to make their first report to this association at its annual convention in 1901. I would advise that this committee confer and co-operate with a similar committee of the National Electric Light Association, to whom has been delegated the same work for that association. I am pleased to announce that our William F. Ham has been appointed a member of the National Electric Light Association committee. This is a compliment to Mr. Ham, a recognition of the valuable work he has performed for this organization, and an honor to our association of which we may well feel proud.

It would not be amiss to state that the committee on a Standard System of Accounting, at the suggestion of Mr. Brockway, gave this question of a classification of accounts for lighting and power companies some consideration prior to the annual convention of 1899, but decided not to present it to the 1899 convention, as there were other matters of more direct importance to this association to be considered at that convention. This accounts for our association not taking the initiative.

Accounting is one of the vital elements of business. This is being recognized more and more every day. In reading the proceedings of the conventions of different organizations held during the current year, I was so impressed with this fact, that with your permission, I will present for your consideration some of the more important points which were brought out with reference to accounting, as I feel we should take advantage of every opportunity to study this broad subject in all its phases. At the convention of the New York Street Railway Association, held in Buffalo, Sept. 18-19, 1900, Mr. G. Tracy Rogers, the president of the association, in his annual address, said: "Much has been accomplished in the standardization of our accounts which will work out untold benefit to the roads; besides strengthening our securities, it will give confidence to the public, and afford us material for comparison."

In discussing a paper before the Southwestern Gas, Electric and Street Railway Association, the president of a railway and lighting company said in part: "The point of a comprehensive set of accounts to be kept so that the condition of business can at all times be understood is a great deal more important than we imagine until we go into it, and the more you get into it the more information you will get. We are trying to be able to tell the details of the cost of producing a kilowatt-hour from the time the coal leaves the car until the consumer pays for it. This looks at first as if it was uncalled for, and I have had the question raised that it took too much time. After you have once got into it, it does not take any more time than it did a year ago, to make out your monthly report, with a detailed, statement, and you can see any little difference as to where your expenses are increasing or decreasing."

In appointing a committee to formulate a uniform system of accounting, the National Electric Light Association recognized the advantages of a uniform system that would be a standard for all

to conform to. At the convention of this association, held in Chicago, May, 1900, Mr. J. B. Cahoon presented a paper on "Uniform Accounting." He pointed out the necessity of a system of accounting that would show "true costs," not by single companies, but by a great body, all of whom would follow the same method and use the same system of account in determining the cost of production.

In discussing this paper, Mr. Samuel Insull, president of the Chicago Edison Co., said in substance: The first step in this matter is to have our own members, if we can educate them to a uniform system of accounting, state in their accounts what their cost is, and stop them as far as moral suasion will stop them, from working their construction accounts. If moral suasion will not stop them, if we can get copies of their reports, kept on a uniform system of accounting, we should bring them up here in the convention and ask them to explain their accounts, when some company shows an abnormal profit as the result of immoral accounting, fooling itself.

The question of publicity of accounts of corporations, especially companies engaged in operating public utilities, is receiving close attention. At the twelfth annual convention of Railroad Commissioners, held in Milwaukee in May, 1900, to which this association was invited and officially represented, the president advocated the enactment of legislation that would compel street railways in all states to make reports to the railroad commissioners, as steam railroads now do. At the convention of the National Electric Light Association, the point was brought out in Mr. Cahoon's paper on "Uniform Accounting," that there was no objection to publicity of accounts if "true costs" were shown.

At the last convention of this association, it was suggested that we should have not only a standard unit of comparison, in connection with the standard system of accounting, but a standard form of report, full and complete in every particular, a standard system of blanks and forms, and a standard system of accounting methods. I most heartily endorse and approve this proposition in all that it embodies. Now that we have adopted a uniform system of accounts, we should bear in mind one of the fundamental objects of the association, as set forth in Article II. of the Constitution, namely, "To improve the work of the accounting department." On the principle that he who does not go forward, goes backward, it should be the fixed purpose of this association to broaden and perfect the Standard System of Accounting in every feature of its practical working application, so that the best results possible from every standpoint may be attained. How shall we do this? The question of a Standard Unit of Comparison has already received careful consideration from the committee to whom it was referred, and they will report to this convention.

As to a Standard Form of Report, I will say that the matter has received attention and will be submitted for your consideration later.

With reference to a Standard System of Blanks and Forms and a Standard System of Accounting Methods, I would recommend that a committee be appointed, charged with the work of preparing model blanks and forms, general in their adaptability and use, with such explanations and instructions as may be necessary or desirable. These blanks and forms should cover the accounting work of every department. I would suggest that the best form for each specific purpose could be selected from the library of the association, and in that way a book of model forms could be prepared. The necessary explanations and instructions concerning the use of forms should include in a general way, suggestions as to the methods to be pursued in gathering the figures and data that are to be compiled in each specific form. These suggestions must of necessity be general in their application. Special local conditions will require special study and treatment.

In connection with what this association should do as a body, "to improve the work of the accounting department," each member individually, for himself, for the association, and especially for the company he represents, should take up this work and devote to it all the energy, ability and application that he may have. We should be thoroughly posted on the affairs of the company we are connected with and have a general knowledge of the operation of the road in all departments, or our sphere of usefulness and the value of our work will necessarily be limited.

We should closely study the special local conditions which are a part of the operation of every road, so that the accounting

problem involved may be correctly solved and the conditions of operation clearly and comprehensively set forth.

We should aim to make our system of accounting practical, complete, thorough and economical. The advantages of modern methods in commercial business, and the introduction of labor-saving devices should be thoroughly investigated and made use of if they can be used to advantage. We cannot be producers of "gross earnings," but we should be increasers of "net earnings." We should be careful not to duplicate work or expend labor that is unnecessary or yields no return. We should not be carried away with a mass of figures and statistics that have no practical value or serve no good purpose, neither should we go to the other extreme of dismissing as useless and valueless, much that may be of vital importance, simply because it increases the work of the accounting department or necessitates the expense of additional clerk hire, when results may be produced which would more than repay the work and expense involved. I believe in an accounting system of such scope and extent that the grasp of the affairs of the company, as well as the operation of the property, is at all times within the hands of the accounting officer in charge; a system that will furnish any information that may be required or desired, promptly; a system that will make it possible to answer any question which may be asked.

There are two propositions that enter into the work of the accounting department; though different, they are intimately connected with each other. One is "accounting," the other is "railroading." Mr. H. H. Vreeland, president of the Metropolitan Street Railway Co., of New York, at our last annual convention, said this about the calling here represented: "I, from my experience, have always looked upon the auditor, or accounting officer, of a railroad as the most important lieutenant and aid of the president or managing officer of the road. I look upon the man at the head of the accounting department as the confidential accounting adviser of the head of the property."

The papers to be presented to this convention deal with practical accounting questions and are along the lines of the work that this association should now take up. The subjects of the papers were selected and the program of the convention was arranged with this special purpose in view. To the gentlemen who have responded to the demands of this convention, we are under many obligations. I desire to express our most sincere thanks and appreciation for their hearty co-operation.

Special mention is due our able and energetic secretary, Mr. W. B. Brockway, for the valuable work he has performed for this organization. To Mr. Brockway's efforts the association owes much of its success.

To the "Street Railway Review" and the Street Railway Journal, and our good friends and honorary members, Messrs. Windsor and Higgins, we are under many obligations for courtesies extended. The columns of the "Review" and Journal have always been open for the publication of anything that would further the interests of this association.

Formal notice has been given, as required by the By-Laws, that a change is proposed in Article VII of the By-Laws. This means that the question of changing the time and place of holding our annual conventions is to be voted on at this convention. I earnestly hope that the question will be fully and thoroughly discussed from every standpoint, and that every member present will express his opinion as to what he thinks is best for this association to do, before the matter is put to a vote.

With reference to the next convention, I am reminded of a question of the utmost importance to the association, and one that has given your present officers much concern. I refer to the assignment of papers. The success of our meetings depends in a large measure on the selection of proper subjects for papers and having the papers prepared and presented to the convention. Any member of this association, when asked to prepare a paper, or perform any other duty assigned to him, should appreciate the honor sufficiently and have the interest of the association at heart in such a degree that he would gladly respond when called on and give the association the benefit of his best efforts. This is a duty that every member owes to his fellow members and the calling he represents, a duty that should not under any circumstances be disregarded or shirked.

In conclusion, permit me to express my appreciation of the honor you have conferred on me, that makes it at once my duty and privilege to preside over the deliberations of the fourth annual con-

vention of this body. To be president of the Accountants' Association is an honor I esteem more than words can express. I thank you for the honor bestowed and for the many acts of kindness and courtesy that I have received from your hands, as well as your valued assistance in many ways. Let me bespeak from you faithful attendance and close attention to the proceedings of the meeting, and especially, full discussion on all subjects. I earnestly hope that this convention will be a fruitful source of information and education, as well as a pleasant reunion for us all. Gentlemen, I commit the business of the convention into your hands.

The secretary and treasurer then submitted his annual report as follows:

REPORT OF THE SECRETARY AND TREASURER.

The report of the work done in this office for a year has become a rather large undertaking, caused by the three divisions into which the office has resolved itself—viz., secretary, treasurer, and the Department of Blanks. In each there has been so much accomplished that it seems better to divide the report so as to cover each section of the work separately. This is without any desire on my part to imitate the well known Poo-Bah, but if any such charge should be made, I would promptly lay it upon the happy faculty the association has of being successful and busy, and keeping the secretary busy, too.

In reporting the membership as it is today, the prophecy made in last year's report as to the effect of consolidation has been, to a large extent, verified; but the applications for membership that have been presented have neutralized the loss, so that, from a numerical standpoint, we are but very little worse off than a year ago.

Applications have been received from the following twenty-one companies:

Indianapolis Street Railway Co., Indianapolis, Ind.
 Charleston Consolidated Railway, Gas & Electric Co., Charleston, South Carolina.
 Louisville Railway Co., Louisville, Ky.
 St. Joseph & Benton Harbor Electric Railway & Light Co., St. Joseph, Michigan.
 Union Traction Co. of Indiana, Anderson, Ind.
 Chicago Consolidated Traction Co., Chicago, Ill.
 Manchester Corporation Tramways, Manchester, England.
 St. Louis Transit Co., St. Louis, Mo.
 Portsmouth, Kittery & York Street Railway Co., Portsmouth, New Hampshire.
 San Antonio Street Railway Co., San Antonio, Tex.
 Conestoga Traction Co., Columbia, Pa.
 Chicago Union Traction Co., Chicago, Ill.
 Washington Traction & Electric Co., Washington, D. C.
 Winchester Avenue Railroad Co., West Haven, Conn.
 Cleveland & Eastern Railroad Co., Cleveland, O.
 Connecticut Lighting & Power Co., New York, N. Y.
 Consolidated Traction Co., Pittsburg, Pa.
 Bridgeport Traction Co., Bridgeport, Conn.
 Seattle Electric Co., Seattle, Wash.
 Buffalo Railway Co., Buffalo, N. Y.
 Erie Transit Co., Erie, Pa.

Resignations have been received from the following twenty-five companies:

Southern Electric Co., St. Louis, Mo.
 Nassau Electric Railway Co., Brooklyn, N. Y.
 City & Suburban Railway Co., Washington, D. C.
 Brooklyn, Queens County & Suburban Railway Co., Brooklyn, New York.
 Citizens' Railway Co., St. Louis, Mo.
 People's Railway Co., St. Louis, Mo.
 Lindell Railway Co., St. Louis, Mo.
 Missouri Railroad Co., St. Louis, Mo.
 Kokomo City Street Railway Co., Kokomo, Ind.
 Columbia Railway Co., Washington, D. C.
 Hamilton Street Railway Co., Hamilton, Ont.
 Columbus Central Railway, Columbus, O.
 Metropolitan Railroad, Washington, D. C.
 Union Depot Co., St. Louis, Mo.
 West Chicago Street Railway Co., Chicago, Ill.
 Cicero & Proviso Street Railway Co., Chicago, Ill.
 Hawaiian Tramways Co., Honolulu, H. I.

Oakland Transit Co., Oakland, Cal.
 Fair Haven & Westville Railway Co., New Haven, Conn.
 Milwaukee, Racine & Kenosha Railway Co., Racine, Wis.
 Syracuse Rapid Transit Co., Syracuse, N. Y.
 North Chicago Street Railroad Co., Chicago, Ill.
 Brightwood Railroad Co., Washington, D. C.
 Central London Railroad Co., London, England.
 Lowell, Lawrence & Haverhill Street Railway Co., Lowell, Mass.

The statement of growth in membership is:

Charter members, Cleveland, March, 1897.....	25
Additions reported at Niagara Falls, October, 1897..	12
Additions reported at Boston, September, 1898.....	32
Additions reported at Chicago, October, 1899.....	31
Additions reported at Kansas City, October, 1900....	21

Total applied.....	124
Withdrawn.....	28

Membership October 16, 1900.....	96
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This shows a net loss of but 4 members. But the average number of applications received per year has been 34, while 1900 shows but 21, a drop of 13 in the average. These figures show plainly the need of a definite action on the part of the present members toward the gathering in of every company within reach. It is not so much that a larger showing may be made that this effort seems necessary, as it is to make the association so representative that its deliberations may carry the positiveness which comes from such a larger point of view.

During the year furniture has been added to the equipment of this office, including a second-hand typewriter, a book-case, a copy-press, etc., costing less than \$60.00. All of this was very much needed.

The financial statement is interesting, showing as it does that the increase in dues has been well received by the membership, and that the necessity of a larger income is appreciated.

The receipts have been as follows:

In Bank, Oct. 14, 1899.....	\$ 19.28
Donated account 1899 deficit.....	160.00
Dues for 1900.....	1,570.00
Dues for 1899.....	10.00
Applications..	310.00
Interest on deposits.....	7.65

Total.....	\$2,076.93
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The expenses have been as follows:

Salary, secretary....	\$200.00
Secretary, office expenses.....	75.90
Postage.....	62.00
Office furniture..	59.25
Printing 1899 Report.....	260.65
Stenographer, Chicago Report.....	110.00
Printing..	58.05
Department of Blanks.....	12.75
Printing 1899 Standard Report.....	129.50
Note paid..	125.00
Miscellaneous.	88.59

Total.....	\$1,181.69
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Balance in bank, October, 1900.....	895.24
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Had the dues remained at \$10, and expenses for this year as they are—and it is difficult to see how they can be reduced—the result would have been an income of \$1,120, and a deficit of \$61.69. This income includes \$160 contributed at the last convention; without it, the deficit would have been \$221.69. To take into account that the expenses are \$210.05 less than last year, will make the wisdom of the increase in dues more clear.

At this point I wish to explain, that with his customary liberality, President Duffy has refused to receive his expenses to New Orleans to confer with the secretary in March of this year, or to Milwaukee, to attend the meeting of the National Convention of Railroad Commissioners. In the latter trip, Mr. F. E. Smith, auditor of the Chicago Union Traction Co., took the same action; and it is through the kindness of these gentlemen that the treasurer is enabled to report a decrease in operating expenses and so large a balance in bank.

For the Department of Blanks and Forms, there is to report a

considerable increase in the blanks filed by the addition of the issue of 12 companies and the re-filing of a number of re-issued forms. All of these add to the interest and value of the collection, which has reached such large proportions through your co-operation.

Among the new blanks received is a large set from the Glasgow Corporation Tramways, which, on account of the differences in practice, were rather difficult to fit to our classification of blanks, and have been filed in a separate book numbered 15. An examination of this set will be found very interesting.

Owing to economy of space, instances will be noticed where blanks have been filed on top of others, in all cases showing the full size and composition of each; but at times by a similarity of papers, the dividing line could not always be easily distinguished. To remedy this, a light black line has been ruled around every blank, giving a result very noticeable to those who examined the collection at Chicago; and, at a glance, rather than by close scrutiny, the blanks are separated and compared.

The new collection of rubber stamp impressions, while not representative, is an interesting addition and assists to the result aimed at by the department.

Some changes are contemplated in the arrangement of the permanent set and the sets used for requests, all helping in what experience has shown is needed to make the collection a positive benefit, and not let it become merely a curiosity.

It is a pleasure to state that the friendship and help heretofore shown by the officers of the American Street Railway Association and the street railway papers has been continued unwaveringly, and the most cordial thanks are again expressed to them and the many others who have assisted in bringing the association to the position it now occupies.

W. B. BROCKWAY.

In addition to the new members given in the report the secretary stated that there should be added to the list of new members as read, the Washington Power Co., of Seattle, Wash., and the Syracuse Rapid Transit Co., of Syracuse, N. Y., which had resigned and rejoined.

In relation to the list of resignations read, the secretary stated that most of them had been caused by consolidations which were prophesied last year. He thought there were only about 7 of these 25 that resigned on account of the increase in dues.

President Duffy: Gentlemen, you have heard the report of the secretary and treasurer, which is very gratifying when it is considered that we have 98 members, as against 100 last year, and \$895 in the bank, instead of \$75 in red ink. What is your pleasure?

On motion of H. L. Wilson, Boston, the report was accepted and ordered filed.

President Duffy: The next order of business, gentlemen, according to the printed programme, is the appointment of committees. On the Committee on Nominations, I will appoint Mr. H. L. Wilson, of Boston, Chairman; Mr. S. E. Moore, of Pittsburg, and Mr. Simpson, of Augusta. On the Committee on Resolutions, I will appoint Mr. Wm. F. Ham, of Washington; Mr. Chas. M. Hemingway, of New York, and Mr. Suda, of St. Louis.

The next order of business is the paper, or, rather, the address, of Mr. John I. Beggs, general manager of the Milwaukee Electric Railway & Light Co., on "What Does the General Manager Want to Know from the Accounting Department?" and in this connection I desire to say that Mr. Beggs has very kindly filled the place of another gentleman on the programme, at very short notice. Mr. Wyman had this paper assigned to him, but has recently gone out of the street railway business, at least out of the direct charge of a road, and he has been called to Boston, and it was impossible for him either to attend the convention or to prepare a paper, and Mr. Beggs, very kindly consented to address this body on the same subject.

ADDRESS OF MR. BEGGS.

Mr. President and Gentlemen: I must apologize for not having given more time and thought to the subject which you expected to hear discussed by Mr. Wyman. It was only a few days, or possibly a week ago, when I was requested by your executive officers to prepare a paper upon this subject. I have never prepared a paper in my life, and am almost too old to learn new tricks. Therefore, what I shall say upon this subject will be simply the thoughts

that are suggested to me as the manager of one of these public utilities.

What the general manager wishes to know from the Accounting Department, I should narrow and say, "What Does the General Manager Wish to Know from the Head of the Accounting Department?" I would not be presumptuous enough to think that I, in the few minutes that I shall occupy, could stand here and tell to you what the general manager wants to know from the accounting department, when so much time has been so well expended by your association for several years past developing and demonstrating just what he should know. The system of blank forms and accounts that you have developed is highly creditable to your association. It will do much to save the industry in which we all are so vitally interested. The first thing the general manager wants to know from the accounting department, in my judgment, is that the accounting department believes in the general manager's policy. He wants to know that he has loyal, enthusiastic, energetic supporters in carrying out what may be the general manager's policy, and that they will aid it conscientiously and fearlessly; and when the head of the accounting department cannot subscribe to the general manager's policy he had better tender his resignation. As a rule the general manager stands for the board of directors, and they are supposed to stand for the stockholders, which is the capital. Unfortunately they have not always done it, but they should do it, and I think that the executive man-



JOHN I. BEGGS.

agements of these public utilities are year by year giving a stricter account to the great body of stockholders. In order to do this we must have conscientious, earnest work both on the part of the general manager and of the accounting department. Unfortunately, the general manager is not always a trained accountant; he is too often not competent to analyze and determine whether or not the accounts and the various statements that come to him are made up intelligently, or to analyze and determine whether or not they have been properly kept. And that, in days gone by, has been responsible for the failure of some of these public utilities, and caused them to be re-financed. They have run aground without knowing it; like the mariner whose compass has become disarranged or does not know how to read it, they are cast ashore; they run against the breakers, and it is the easiest thing in the world, because too often it is to the interest of the general manager and the board of directors to make too glowing a statement of what they were doing, and this is particularly the case during the years of construction or development when they have a capital account to be drawn upon.

Capital account has covered multitudes of managerial blunders and extravagances. Therefore, I always take the position that it is best to close up the construction account as quickly as possible. If there is going to be any error made in your accounting departments, gentlemen, let it be on the other side. Have a little more property than you think you have. When a man puts his hand in his pocket and expects to find seventy-five cents, but finds, instead, a dollar, he feels very good. It is not a very large amount, but nevertheless it is on the right side. He has just a little more than he expected. But if he puts his hand in his pocket and finds he has only fifty cents, he is disappointed; he says, "I certainly thought I had that," and such is the case with many of these properties that they go on deluding themselves; because there is a con-

struction account, they charge into that many things that should have gone to operation. It is one of the reasons why many new enterprises seem to show such phenomenal results. I have seen a statement very recently of a certain line running into the city of Chicago, or nearly so, showing the expenses to be down to somewhere about 30 per cent. (Laughter.) Now, we all know how that is produced. Of course, that is not done in order to show what the actual results are. It is produced in order to unload a promoter's property upon an unsuspecting investing public. I only refer to that because that statement has been brought to my attention within a few weeks, being on the market. But very often our properties get into the same condition, because of a lack of intelligence. Therefore, the general manager wishes to know from the head of his accounting department—and I shall deal with the head—that there is an intelligent understanding, and an honest practice in the making up of either the daily, the monthly, or the annual statements.

As I said at the outset, the general manager wishes to know that the head of the accounting department is in sympathy with and believes in his policy, because a general manager should lay down the policy for his corporation. He is put there for that purpose. Now, he must know that his associate who is in charge of the figures believes in that general policy, will help him carry it out, will in every manner co-operate with him, will watch and see that there is consistency throughout every department of the company's business.

Some of our properties are in a little more complex condition than others. Take the property with which I am associated; we conduct a very large electric lighting business in three or four different cities, some part of it under our main company, some under a traction company which we operate. Consequently, it is very difficult at times to feel that the same general practice is observed in each one of the co-ordinate companies, possibly under the name of one, and that the head of each particular department observes the same methods as are observed in every other.

In the street railway business it is highly important that the general manager shall have confidence in the integrity, in the vigilance and discrimination and keen perception of the head of the accounting department, and know that he will watch that there is no injustice permitted even to the humblest employe of the company, and that the trainmen are held to strict account. The idea should not get abroad among your force of conductors that there are not too many shortages being reported, or that there is too much carelessness in the accounting department. We make it a rule to have the accounting of the trip sheets and the returns of the various conductors directly under the head of our accounting department. We have but one head of "figure wrestlers" as I call them. We do not have it divided into transportation department, and so on, but all is under one head. I am a great believer in centralizing responsibility, and in having one head responsible and giving him the highest degree of confidence. One of the most important things in dealing with the conductors on street railways, is that they have absolute confidence in those who pass upon their daily returns. They should not, every day or two, be brought face to face with the charge, "You have a shortage to-day of a dollar," or fifty cents, whatever it may be; that creates distrust and it soon permeates the whole mass of men. They begin to distrust the accounting departments, and to believe that their methods are not accurate. That comes back, it works almost incalculable harm among our men, and we who are managing these properties to-day are carefully studying that there shall be no cause of unrest, of dissatisfaction among our trainmen. You have seen a number of serious labor troubles among that class of men during the past year. We went through it, four and one-half years ago, one of the first large railway strikes. We have watched it carefully ever since. It very often comes from the accumulation of a multitude of these trivial matters, that give good cause at times for unrest.

These are some of the things we want from the head of the accounting department. I am ignoring your system of blanks entirely. I did not conceive that was what you wanted to hear about, or that it would be a thing of particular value to you, because you are giving labor and conscientious thought to that subject. The blanks are being perfected from year to year, and developing in greater detail. I thoroughly understand that in different corporations there are varying conditions that do not apply to all. Consequently there must be, with your system of accounts,

provisions for some flexibility that may suit the peculiar conditions of various corporations, many of which are interested in a variety of things, and have more than one interest to provide for. They must likewise be sufficiently flexible to permit, sometimes, of what may be the peculiar or unreasonable notions of the general manager. He may have an idea that he wants injected into them certain additional features, or, possibly a very good reason from his standpoint, which is not always recognized, perhaps, by the head of the accounting department. The general manager should have the confidence and command the respect of the head of the accounting department to such an extent that, notwithstanding it may cause some additional labor to provide these auxiliary accounts, as we might call them, for his information the work will be cheerfully done. The manager may have better reason for asking for them than appears on the surface, and it may entail, as the head of our own accounting department has sometimes found, a considerable amount of additional labor; but it is not useless; it is for some good cause. I am well aware that all managers have ideas that are different possibly from those of the heads of their accounting departments because of some previous experience they themselves had in the science of accounting. I use the word "science" advisedly, because accounting is a science, and if the broad, fundamental, underlying science of accounting is thoroughly understood by the head of the accounting department it will be much easier for those charged with the operating of the properties.

I had something to say when this association was being organized as to what should be included, having given considerable attention to the various forms of accounting of this and its kindred industry, electric lighting, for a great many years. In fact, I was one of a committee some fifteen years ago to standardize a system of accounting for electric lighting plants in that early day. They had done more I think in the line of standardizing their accounts, or at least one branch, electric lighting. I speak more particularly of the old Edison Association of Illumination Companies, which was a close corporation and still is I believe, but I was the president of it for seven or eight years and we had a very carefully devised system of accounting whereby we could, with a great degree of accuracy, compare the results of various companies throughout the United States. Though more limited than this association, we demonstrated, at that early day in the electric lighting industry the great advantage of being able to compare accounts. That is highly advantageous, absolutely essential, even in the street railway business. The general manager wants to be assured that the head of his accounting department is watching his expenditures from day to day, watching that the estimates made of construction, or of some piece of reconstruction, do not seriously exceed the requirements, or if they do, that the fact will be brought to the attention of the general manager in order that a proper remedy may be applied; that the practice throughout the various departments of the corporation is uniform, so he may not have, as is sometimes the case, an employe in one department asking to be transferred to some other department in the business of the same corporation for the reason that the practice is different. Such a condition should not exist, and yet it may exist if the comptroller, or the auditor, or the head of the accounting department, by whatever name he may be known officially, does not bring to the attention of the executive head the facts that exist. Take it in our own corporations, where at times our employes number anywhere from two to three thousand men; it is impossible for the general manager to attempt to know what every specific rate of pay is throughout all departments, and that there is uniformity in the pay rolls and uniformity in the hours put in in the various departments. All of these things come directly under the eye of the head of the accounting department, and where irregularities exist it is highly important that he should report them in order that a remedy may be applied.

It is furthermore important that he keep the general manager advised as to how the receipts are on the various lines. While some general managers try to follow those things, they do not all do so. They would not all be competent, because of a lack of early training in the science of accounting, of determining whether the matter was accurately compiled and put in shape. The manager should see that the various lines are being operated with the smallest number of cars in order to produce given results. If on one line a car is earning two dollars per car-hour—you notice, gentlemen, that I said, "car-hour" (laughter)—and on some other

line a car is earning only one dollar per car-hour, and that going along month after month, there is some reason for it. It may be a good one, but nevertheless, it is the duty of the accounting department to bring the matter to the attention of the general manager. The accountant may be conversant with the reasons why certain things are so, but as these matters are coming under his eye day after day, if discrepancies exist he should promptly bring them to the attention of the general manager.

The general manager desires, furthermore, to know that the head of the accounting department is taking occasion to correspond with other roads of similar size operated under practically the same conditions, is obtaining copies of their reports, comparing them and bringing to the attention of the general manager features in them which would seem to show that as regards certain features the other lines were being operated more economically than his own. The points wherein we are operating better than the others, I do not care to know about. I arrange to have the heads of departments go away two or three times a year to some other city where perhaps there is a very good system of operation and management and a good system of accounting; I am very glad indeed to have the head of my accounting department take two or three short trips during the year: to go to different cities, and observe their methods, and I always say: "I don't want you to come back and tell me a single thing that we are doing better than they are. I don't want to know that. That will take care of itself. But go and find something that they are doing better than we are, and we will try to copy that, and if possible, improve on it just a little." The managers want to know, and they do not always have the time to investigate for themselves, that this comparison of accounts is made; otherwise, what is the use of this uniformity if you are going to close it up and lock it up in a safe? I want any company, the head of any accounting department, allied to this association, or to the street railway association, to feel that it can send to the Milwaukee Electric Railway & Light Co., or any other company in which I am in an influential position, and obtain any data that we have. (Applause.) We do not consider it a burden to give information to you, if we have to put on a clerk to copy the reports, we will do it. I want, likewise, to feel that if we wish to have some information from any member of this association, or of the street railway association, that they will not feel that we are burdening them when we ask for it. In our practical operation, I many times take time that I could not command for myself, but I do take it, to go over our system and show its various phases to gentlemen who come from a distance to see what we are doing, and I take pleasure in doing it. The exchange of ideas is valuable, and unless these various statements, these various reports and results that are being realized by the various companies, are going to be interchangeable, of what use is this uniformity of accounts? It is for some purpose. It is for the purpose of being able to make fair, intelligent comparisons, that we may know what we are doing. Above all, have the head of your accounting department keep his accounts in such a way that you do not need to fear if at any time your state railroad commissioner, or if perchance there should be a national railroad commission, should order your books closed. Let your accounts be upon the same basis as is adopted by the national banking department at Washington; when an order is given for a statement of accounts, it is not of some day in the future, but always some time in the past, so that there is no opportunity to fix up the books. So our accounts should be. We want particularly to know, or at least I want to know, that if the head of my accounting department and all of his assistants are called hence, that a new set of accountants can go to their desks in the morning and find nothing to clean up for yesterday—that the work is kept up day by day. That is highly essential, and if that were always done, it would not take so long for many managers to get a statement of what their actual condition is. It is highly important to know that there is promptitude with all these accounts, that the work is always right up to date. It will save many errors and many blunders. It is one of the hesetting shortcomings of many accounting departments that they are always going to do something, going to prepare some statement sometime in the future. The future is not theirs. Consequently it is highly important that accounts shall always be up; that if the general manager wants to know something he can send with assurance to the head of the accounting department for such and such a statement and it will be forthcoming as soon as it can be transcribed

from the books, or from some other statement, or that he can send the original. Two of the most important things that a general manager wants from the accounting department are accuracy and promptitude.

As I said at the outset, I have to apologize, for not having prepared an address such as would no doubt have been prepared by my friend, Mr. C. D. Wyman. I am substituting for him this morning. I have been substituting for him for four years. (Laughter.) I desire, on behalf of the managers of street railways, to extend to this association, my earnest, heartfelt appreciation of the good work your association has done, still is doing, and which I hope it will continue to do. I think no higher compliment could be paid to your association than the co-operation asked for by the steam roads and by other organizations of this kind in their efforts to perfect a standard system of accounts and of forms. This matter of standardizing forms is as important as the standardization of accounts, the forms on which the accounts pass from the various heads of departments into the accounting department. Much of the accuracy of the accounting department will depend upon the comprehensiveness of the forms that go out from the storerooms, from the heads of the various departments, from the man in the shop as showing the cost of a certain piece of work, and so on down the line. There is quite as much necessity for making these various blanks uniform throughout, as there is for the accounts themselves, because if these various blanks are not fairly uniform it will be much more difficult to make uniform the accounts based upon them. I do not know just what forms the association has adopted. I think in our own practice we subdivide to a somewhat greater extent than is provided for in the standard forms of your association. However, we keep the various heads so thoroughly in accord with the standard system of accounts of this association that they are practically the same, with the exception that I subdivide to a greater extent some of the expenses of maintaining equipment. I have the cost of all labor and all material subdivided.

I can keep the cost of material in my mind. When I see a statement that material costs so much, I can check whether or not that is about right, without asking any additional figures; but they can cover up a multitude of sins in the item of labor, omissions and mistakes, because that is much more difficult to cover. In all work, my suggestion would be that you subdivide and differentiate between the cost of labor entering into any piece of work and the cost of the material entering into it, because the general manager, if he is familiar with his business, knows about the amount of material. If it is putting a set of wheels under a car, I know what those wheels cost. I do not know if the thing comes to me bulked, called wheels and labor; I cannot tell whether the labor has cost \$1.50, which would be about the cost of putting on a pair of wheels, or whether it is \$2.50 or \$3, if it is all covered up in one item. Therefore, I urge upon the Accountants' Association the advisability of subdividing the cost of materials as against the cost of labor that is necessary to put that material into use. We subdivide in our own practice. For car bodies, for instance, we keep carefully the cost of painting, etc., as an item by itself. Likewise the cost of heating, the cost of lighting cars. Many of these things that are coming to him in that way the general manager wants to know in order that he may be able the better to analyze and determine whether these various items are being kept down to the lowest point consistent with the highest degree of perfection in the maintenance of his construction.

Above all, urge upon your municipality and legislative bodies that they shall call for the publication of your accounts. I for one believe you owe it to them. You are simply trustees for certain rights which they give you in the municipalities. You will quiet much of the criticism we hear regarding public utilities when you make public your accounts. We have had a pretty lively time in the city of Milwaukee for several years, as some of you no doubt know. We have finally got them harmonized to a certain extent by having had passed by our municipal legislature, or common council, so called, last winter, an extension of our franchise and the straightening out of certain questions in connection with it, up to Dec. 31, 1935. We are here to-day with a decision from the Supreme Court of Wisconsin, handed down on Friday last, affirming that franchise and quieting all these various questions. It was claimed that we were suppressing our accounts. That our profits were much greater than they ever were, and the Municipal

League and other associations went before the legislature some eighteen months ago, at the biennial session, last winter a year ago, to present a bill requiring us to file our accounts, and annual statement, with the officers of the state. They expected that we would antagonize and oppose them, and possibly by underhand means defeat it; instead of this I urged the passage of that act. Our accounts should be kept, as I said before, in such a manner that you do not need fear the closest possible scrutiny, either as to the underlying policy of the corporation or as to the methods employed in working them out. Once be honest and you will quiet much of the criticism in the various localities in which you are operating. Under the law of Wisconsin to-day, every street railway and electric lighting company must file a statement giving in very great detail the results of its operation every year, and we have no hesitation in doing so. We believe that it will do much to bring about a better state of feeling between the general public and the corporation that is serving it. I believe in the broad, general, underlying principle that a street railway company is, of all corporations, one in which the general public is most vitally interested, and it has a right to be informed as to your methods of operation and of management. We are public servants, and we are the one class of public servants with whom everyone in the community must come in contact. He may escape everything else, he may escape the tax gatherer, except once a year, the undertaker, except once in a lifetime, but the street railway company he is coming intimately into contact with several times a day. In our own city we are carrying at the present time an average of one-half of the entire population every 24 hours. They are vitally interested, gentlemen. Do not attempt to deny it, but proceed upon the broad, general principle that they have a right to know that the property is being conscientiously operated so as to afford them the greatest possible degree of convenience, of comfort, of safety and of reliability, and to this end, the heads of our accounting departments can do much to assist the general manager and relieve him of many of the details of the complex position in which he is placed.

I thank you, gentlemen, for your patience; I thank you for the courtesy of calling upon me to fill the gap left in your programme. I only regret that time has not permitted me to have given to the subject more analytical thought, that I might have presented these views in possibly briefer form, and possibly in form that would have produced what I wish to produce, make your organization more valuable if that is possible to the great interests that we represent. (Applause.)

President Duffy: I wish to especially thank Mr. Beggs in behalf of this association for the able, interesting and instructive address he has given us this morning. Everyone here should go out of this hall with new lessons to learn. If we had more general managers like Mr. John I. Beggs, we would have more accountants like the accountant of his company (applause); we would have more accountants such as accounting officers should be; not machines, not book-keepers, not, as he termed it, but in a different sense, "figure wrestlers," but accountants. The lessons that Mr. Beggs has pointed out to us, each and every one, should take home to himself, and I earnestly hope that we will have more of the gentlemen across the way in attendance; and I again thank Mr. Beggs for coming here and giving us the benefit of the thought that he has so ably expressed here. (Applause.)

Mr. Beggs: Mr. Chairman, just one other word, because I must ask to be excused and return to the other side. I consider the head of my accounting department my most important associate in the management of the property. I always have done so; I do now. I consider him not so much, as is often the case, in the light of an employe, but really an associate in the management of the property; and so, every head of an accounting department should fit himself to be in reality an adviser upon many of these points that are coming to him daily, hourly, day in and day out throughout the entire year. He is to a certain extent, the right hand of the general manager.

President Duffy: Gentlemen, if I may be permitted to digress a little from the regular order of business—it is with great pleasure that I observe that one of the Old Guard is present this morning. He has honored this association by his presence, and further honored it by the presence of his wife. Gentlemen, we have with us Mr. and Mrs. Henry J. Davies, of Cleveland. Mr. Davies, as you

all know, was formerly an active member, an extremely active member. He is now an honorary member, but nevertheless we would be very glad indeed, if upon this occasion he would be an active member. Mr. Davies, will you kindly come forward?

Mr. Davies: Mr. President and Gentlemen; I am glad to be with you again. I hope that in some capacity, either as an accountant or as a supply man, I shall continue to meet you yearly as long as your association meets. I am sorry that I did not hear all of Mr. Beggs' address. That which I did hear was good. It must be, it seems to me, a delight, to work as an accountant for a general manager like Mr. Beggs, a general manager who knows what he wants to know, and who knows how to get at it, and appreciates the work involved in getting at it. But when you are an accounting officer of a company whose management, perhaps, does not know what it wants nor how to get at what it thinks it wants, your responsibility is greater and your services are more valuable to that company. Mr. Beggs, in his address, covered the ground of the topic assigned him, it seems to me, and I can add nothing to it, unless it be to emphasize two or three things that he said. First, the accountant should study the condition of his company, its receipts, its expenses. He should present to his management comparative figures, figures showing what one line does as compared with another line; what the company did this year as compared with last year, this month as compared with last month; what his company did as compared with another company whose lines are similarly situated. Your general manager will not care for all the details, all the process by which you get at results; he probably will not care for all the results at which you arrive, nor would it be wise perhaps to present them all to him. If your lines are all running along about as they should, if there is no remarkable difference between the operation of one line and another, between the operation of your company and another, he won't care to know the process, the figures by which you arrived at that result. A mere statement of the fact is sufficient. But, if in studying your accounts, you find a remarkable difference between the cost of operating one line and the cost of operating another, between the car-mile expenses of one road and the car-mile, or car-hour, expenses of another, present that fact to him as clearly, as emphatically and as startlingly as possible. Let him ascertain why, help him ascertain why, if you can. Gentlemen, I did not mean to make a speech or discuss any subject. (Applause.)

President Duffy: Our friend, Mr. Davies, said something about being a supply man. He is now the secretary of the National Carbon Co. In speaking of the car-hour I presume that he was thinking of the carbon hour. (Laughter.) I have an announcement to make here. The Kansas City Club, at Twelfth and Wyan-dotte Sts., extends open house to the persons wearing badges. This extends over two weeks.

Mr. Duffy, as chairman of the committee on "A Standard System of Street Railway Accounting," then submitted the following report:

REPORT OF COMMITTEE ON STANDARD SYSTEM OF ACCOUNTING.

No changes in the present classification of accounts or in the forms of monthly and annual reports suggest themselves to the committee; none have been suggested, therefore we recommend that the classification stand as it was adopted at the Chicago convention in 1899, unless this convention directs otherwise.

Your committee received very few queries from members regarding the classification of accounts. These queries were promptly answered. It is assumed that the classification as it stands, in the absence of any information to the contrary, is satisfactory to all. Your committee would be pleased to hear from the members regarding this question.

With reference to the Classification of Material and Supplies, submitted by this committee to the 1899 convention, in a supplementary report, no official action was taken by the association. Your committee, in referring to this matter now, desires to explain that the classification submitted was not intended for anything more than a suggestion to the convention that would possibly aid in dealing with the important subject of material and supply accounts.

The Standard System of Accounting is now in general use, recognized and accepted as the standard for street railways. One

of the most valuable features of the system is, that it admits of comparisons between companies. This feature is especially appreciated.

At the convention of the National Electric Light Association, held in Chicago, May, 1900, a paper on "Uniform Accounting" was presented. This paper criticised the Accountants' Association for treating Taxes as a deduction from income, stating Taxes should be considered a part of operating expenses. This position was endorsed in the discussion of the paper, following its reading. Mr. Stuyvesant Fish, president of the Illinois Central Railroad Co., in an article published in the "Street Railway Review," was quoted as saying that the Inter-State Commerce Classification of Accounts did the railroads an injustice and caused them to make misleading reports, because Taxes were not treated as a part of operating expenses. All of this is very interesting in view of the action taken by this association on the question of the classification of taxes. Your committee does not care to provoke any further discussion regarding this matter, but begs leave to refer to its position as it explained and sustained it, and was sustained by this association at the conventions in 1897, 1898 and 1899. The paper presented to the National Electric Light Association, not only classified "Taxes" as an operating expense, but "Interest on Investment," "Interest on Current Liabilities," "Investment Insurance," (depreciation), and "Reserve for Sinking Fund." These five accounts are all classified as operating expenses, grouped under the heading of "Capital Accounts." The reason for doing this was, it was held these accounts should all be included as a part of operating expenses and not as deductions from income, in order that the "true cost" of production could be determined. Your committee does not wish to do anything more than present this matter for your information and consideration, without comment, further than to refer to the grouping of these five accounts under a heading entitled "Capital Accounts." The gentleman who presented the paper frankly stated that his stand was open to criticism; for that reason, and because your committee believes that this association should not criticize the position taken by other associations on questions of accounting, it is desired that the matter should not be discussed by this convention.

This association was invited to attend the Convention of Railroad Commissioners of the United States, held in Milwaukee, May, 1900. Messrs. H. C. Mackay, F. E. Smith and the chairman of this committee, attended the convention, responding to the rollcall when our association was called. We were officially recorded in the minutes of the meeting as having been present and representing this association. Nothing transpired at the convention of any direct importance or interest to this organization, except that Mr. Ashley W. Cole, chairman of the Board of Railroad Commissioners of the State of New York, a member of the committee on Classification of Construction and Operating Expenses of Electric Railways, reported for the committee that the 1899 convention adopted the committee's report (this report was the classification of accounts adopted by the Accountants' Association). Mr. Cole stated that some of the states recommended that report to the corporations within their jurisdiction, and the state of New York has had that report printed in pamphlet form and is now sending it to all the electric railroad corporations in the state.

Your committee has made a strong effort to induce the Federal Census Bureau to use the Standard System of Accounting of this association, in the work of compiling statistics concerning street railways, in connection with the Census Report of 1900. We hope to succeed in this undertaking and feel encouraged from the following statement of the director of the census, made in a letter dated July 24, 1900: "The subject of street railways is a special one, which will not be taken up for about a year. I will have the letters placed so that they will have full consideration when the proper time comes. I am glad to receive suggestions at any time."

F. E. Smith, Chicago: Mr. President, I move that the report be accepted and be placed on file.

The president put the question on the motion and it was carried.

President Duffy: Gentlemen, that about completes the order of business for the morning, but we have a gentleman here with us, whom we all feel very kindly towards, and who has done a great deal for the street railway accountants. I refer to Mr. J. H. McGraw, of the Street Railway Journal. Mr. Higgins is an honorary member and is unable to be present at the Convention, and Mr.

McGraw has honored the association with his presence this morning. Mr. McGraw, I would be very much pleased if you would say a few words to us.

Mr. McGraw: Mr. President and gentlemen; I am not going to take your time with any speech whatever, but I assure you I appreciate the honor of being called upon to address this body of gentlemen, forming the Street Railway Accountants' Association of America. I will not attempt, sir, to take up or go into a discussion of your work, which is well known throughout the country, not only to the accountants themselves and the street railway presidents and managers, but to a large body of outsiders who are interested directly or indirectly and are closely watching your work. I want to commend most highly the work of this association. I am sure, and I know, that it has been thorough and effective, and the respect in which this association is held by the street railways throughout the country, not only the street railways but the bankers, the capitalists represented in street railways with which I come in contact, take occasion frequently, to speak in the highest terms of the work this association is doing. I thank you again for the honor of being called upon and for this opportunity of saying a good word, which I do most heartily, in favor of the work of this association.

President Duffy: Gentlemen, we have a little time yet, with nothing special for this afternoon, and I would be very glad to hear from any gentleman present who would be good enough to give us the benefit of his thought, or suggestion, or criticism, a sort of a brief and informal discussion on any subject pertaining to accounting. We have one here with us that is comparatively new in our association, at least his company is. I will ask him to say a few words. Mr. Moore, of Pittsburg.

Mr. S. E. Moore: Mr. President and gentlemen: I think the president should state what he would like the few words particularly about before he calls on a delegate so unceremoniously as that. I can only say that I am glad to meet with all of the gentlemen of the convention and that I hope to be able to do something before it is over, that may be of use, not only to the accounting end of it, but to the street railway work generally.

Mr. Duffy: Well, gentlemen, we have another new member in our association, Mr. Hemingway, of New York, representing the Connecticut Light & Power Co. Mr. Hemingway, we would be very much pleased to hear from you.

Chas. M. Hemingway: Mr. President, this is my first appearance in the association and I am very much interested indeed in the papers and reports. One subject in your opening address I am very much interested in. That was the uniformity of accounting where the same company operates railways, electric light and gas plants. That comes particularly under my department and I am very much interested to see something put forward in that department. I have nothing else to say just at this time, but I have learned a great deal from the meetings.

President Duffy: Is there any other gentlemen good enough to favor us with a few remarks, or has a suggestion to make, or shall we adjourn. We have established a record for punctuality which we maintain this morning by a very narrow margin. It is ten o'clock until it is eleven. We would like to open to-morrow promptly at ten, and I would ask all of you to make it a point to be on hand early, so as to take your car out on time. If those gentlemen who are on the executive committee will be good enough to go to the Midland Hotel directly, we will have our executive committee meeting so that the report can be presented to-morrow morning.

On motion, adjourned until 10 a. m.

WEDNESDAY, OCTOBER 17TH.

The meeting was called to order at 10:30 a. m. Wednesday by President Duffy, who at once announced the first paper:

THE ROUTINE OF A STREET RAILWAY, ELECTRIC AND GAS LIGHTING COMPANY.

By C. O. Simpson, Auditor Augusta Railway & Electric Co., Augusta, Ga.

In this paper upon the routine of a railway, electric and gas light company, no attempt has been made to go outside of our own office, but I will touch briefly on some points which have come

under my observation in the past ten years, or while in the street railway line. I do not, however, confine myself to the street railway business alone, as there are a great many companies like the one with which I am associated, that have the electric light as well as the gas business of the cities in which they are located.

First the railway, starting with the report from the conductor to the accounting department. The office furnishes the train dispatcher the night before with the "Portable" registers, and a list showing the number of same, the register and the register readings. The dispatcher gives out registers only to the daylight and six hour men, as they start out in the morning. All other registers are given out at the office. This list (Form 1) is returned to the office by the dispatcher, not later than 9 a. m. with the name of conductor filled in and certified to by him. This goes to the young man in charge of the car earnings record (Form 2), also the trip sheets (Form 3) and envelopes (Form 4) containing the conductors remittances after they pass through the cashier's hands. The cash is handled by only one person and goes direct from the conductor to him and from there to bank which furnishes a duplicate deposit slip which is turned over to the chief clerk for entry on general cash book, after a comparison with earnings record.

All money when ready for bank is put up in such shape that it will be accepted by the teller without counting bills, or wrapped silver at time of deposit. Currency is put up in \$50, \$100, and \$250 packages; on the wrapper are marked the company's name, the



C. O. SIMPSON.

date and the amount. Silver is also wrapped and marked accordingly, small change to make up balance of deposit is put in envelope.

Cash tickets are checked up with the earning book by the auditor every month and burned. Transfers are counted, and after comparing with the trip sheet are destroyed.

Conductors reports are filed daily, that is, each day is fastened together and kept in a convenient place in the office until the end of month when they are filed in store-room.

A small ledger with index is kept of over and short account. An account is opened with each conductor; the Dr. side is short, and the Cr. side is over. This book is kept where conductors can see it every day, and if they find a shortage, they make their remittance that much more, or vice versa, to balance the account as shown by this ledger.

The cashier also handles all collections of the electric light and gas departments, keeping a separate petty cash book for each, giving as much detail as possible to the bookkeepers in charge of the different department ledgers, and general cash book (Form 5) into which it is condensed, as the latter is ruled so that only the amounts are necessary, except in the sundry column.

The electric light register (Form 6) is used entirely as a load book, that is, it shows the number of each c. p. light, motor power, fans and if on meter, meter readings in kilowatt hours. The reading of electric meters are recorded on cards (Form 7). These cards are turned over to bookkeeper on the completion of each route, for entry on register.

Bills (Form 8) are made from the register and are then carried to the light ledger, each account is numbered, having the same number in both books. The light ledger (Form 9) shows the balance forward each month, if any; amount of bill for the month; total column, rebate, amount paid and date of payment. These books are made to run six months, with the addition of a short

leaf, they can be made to run twelve months, but owing to the accumulation of dead accounts, and new business, this is hardly satisfactory.

The light ledger contains 42 accounts or lines to a page, and the register only 14, which gives three pages equal to one of the ledger, making it easier to balance and check as you go along. The cash column in the ledger is balanced with the general cash book. With this form of ledger, it is not necessary to keep a collection list as the accounts are compact enough if posted regularly every day, from which the collector makes his delinquent list. We use the card system in connection with the changes; that is, one side of the card is used as an order to the electrician (Form 10) the other side (Form 11) shows the work done on the order, and from this entry is made on the light register. At the end of each month a recapitulation is made of the changes to show the loss or gain in any part of the service.

The names of customers are kept in both register and ledger, alphabetically and in the order of the vowels. When transfer is made to new books at the end of six months, we do not give a numbered place in the ledger to accounts that show balance only, but on one of the back pages of the ledger we keep these delinquent accounts under the heading of "Balances." The total being carried under the same heading, and given a number in the front of ledger, until finally paid or written off. Advance customers are treated in a similar manner, except that they are given a number preceded by the letter "A." I also wish to add that all churches and Chinamen are put together under letter "C," but are given a regular number.

The gas books are similar to the electric light books, except the register or load book (Form 12), which only shows the meter reading, past, present, and consumption for both lighting and fuel at the different prices per thousand feet.

The gas bill (Form 13) is almost a copy of the register book, but in addition is ruled to show discount for prompt payment before 10th of month, following consumption.

The reading of gas meters are recorded in a book (Form 14) printed and ruled for that purpose. The routes are divided into what we call the up-town and down-town routes, and are read by two men, who alternate every other month. The bookkeeper takes these readings direct to the register or load book.

The recapitulation of the register or load book compared with the register of output at plant will show the leakage.

We use the addressograph in connection with both electric light and gas bills, this machine prints the number, name, address and date of bill, in one tenth the time it formerly took our bookkeepers to do the same work.

We use a bill register (Form 15) in which are recorded all bills due the company for material sold or labor performed. One line is used for each bill and the book is ruled as follows: date of bill, number of bill, against whom item, date rendered, amount, date paid, account credited, and remarks. Each bill (Form 16) is numbered.

All bills and accounts against the company are paid by voucher (Form 17) which gives all the details. There is provision made for inserting a description of each bill and in addition to the description on each voucher, the original approved bill is attached, but the latter never leaves the office. If the voucher is paid through the mail, all bills are attached to a slip, the same size as that of a folded voucher, called a "tracer" (Form 18) and remains there until the voucher is returned, receipted, all papers are then attached to voucher and filed away.

Vouchers are numbered consecutively, commencing with No. 1 each month. The voucher record (Form 19) is ruled to show first voucher number, month, in whose favor, amount of pay roll, or voucher, account charged, store stock, operating expenses, sundries account, etc. The recording of a voucher will occupy as many lines as there are accounts to be charged in the distribution and are charged on the record direct to the operating, construction or other accounts affected. No bill for sundries or material, etc., is vouchered until approved by the purchasing agent and superintendent. It is then made up by the chief clerk and goes to the auditor and president for their approval before recording or payment. The pay roll voucher (Form 20) is made up from reports of time (Form 21) from the heads of departments. The distribution is made and it is entered in the record and filed as a regular voucher.

Unclaimed wages, that is wages uncalled for, after six months

are credited back to the account as charged on pay roll, and record made on pay roll accordingly.

General journal entries are made from a manuscript statement, which is a recapitulation of the several books, such as cash, bills and vouchers, and these statements become a part of the permanent file. Therefore the items are not entered in detail in the journal. The traffic statement (Form 22) is made from the car earnings book, and gives all data necessary to make up statistics as to the traffic on the road for the month, but only that portion pertaining to the revenue and how earned is journalized. A recapitulation is also made of the bill book and the entry made charging bills for collection with the total amount of bills and crediting the different accounts, as shown. The recapitulation of the voucher record is made in a little more detail. The operating accounts of the railway and electric light departments are separated as well as the construction and sundry accounts, and the voucher number and amount of each voucher charged to that particular account are given. The entry is then made charging each operating, construction and sundry account with the total for the month and crediting vouchers and pay rolls their respective amounts. The recapitulations of the cash book and light ledger are similar to the others, but more attention is given to the cash book, as it embraces the particulars of receipts and disbursements and clearness in entering transactions is of great importance even in the general cash book.

There are a number of what we call "regular journal entries" such as the transportation of letter carriers. An entry is made charging the United States Post Office Department (which is an open account on the ledger) and crediting the earnings account with one twelfth of our yearly contract and when the quarterly payment is made by the Post Office department it is credited direct to this account on the cash book. Similar entries are made for the rent of power for the operation of a short line running from Augusta over the Savannah River into South Carolina which we do not control. Chartered cars are usually paid for in advance, or on the day following their use and are credited direct to the account through the cash book, if not they are billed and so pass through the bill register. Interest on the bonded indebtedness is charged to "Interest on Bonds" and crediting "Accrued Interest on Bonds." Semi-annually an entry is made charging the latter account, with the semi-annual interest and crediting "Interest-Coupon Account." When remittances are made for this interest to our eastern representatives, it is charged to their open account, and it so stands on the ledger until the coupons are returned to the company, as they are very seldom all paid and returned at one time, or within 30 or 60 days after due. The journal entries then made, or made from time to time as they are returned, are necessarily in detail, giving the series and numbers of each, charging to Interest-Coupon Account, and crediting our eastern representatives.

We have also an account called "Advanced Expenses" into which we charge direct from voucher when payment is made for such items as taxes, coal, water for power, etc., which are paid quarterly and annually, or extraordinarily heavy purchases of material. An entry is made each month to the respective operating accounts, charging out approximately what would be, or has been used in that month.

The balance of many accounts is shown by the balance sheet the first of each month, for instance the amount in the debit column to gross electric light and power account, will be the same as the total of the balance sheet of the light ledger which comprises something like 1,500 individual accounts. The balance of bills for collection consist of the unpaid bills as shown by the bill register, the balance to vouchers shows those unpaid at that time, also the pay roll account.

We use the ordinary check book, as everything is paid by vouchers, the stubs of which show the name and number of vouchers covered by the corresponding check, which is all that is necessary for entry in the cash book. Separate check books are used, one for the Railway & Electric company, and the other for the Gas Light company, as they are at present separate corporations, but are handled as one as much as possible to reduce expenses.

Monthly statements include the railway and electric lighting departments on one statement, but the earnings and operating accounts of each are shown separate. The Gas Light company's statements are made separate, but the form and accounts correspond with those of the Railway & Electric company as much as possible.

The most valuable of all papers I consider the real estate deeds

and plats representing all the realty of the company, whether used in the operation of the road or not. A separate book is used (10 x 14 in. in size) called the Real Estate Book, on the left hand page of which is a plat of ground, and on the right hand, or as many pages following, as is necessary, is a description of the property. The index to this book is complete, indexing perhaps under six or seven headings as the property is referred to a great many times, as the tract of some of its former owners or by the company as the "power house property," "sand pit," "east station," or "west station." The deeds are kept in a bankers' file, and given the same number as per folio in book.

Contracts are also filed in an ordinary bankers file.

Ordinances are usually published in the daily papers, and a copy is pasted in a scrap book; if not printed, a written copy takes its place.

Letters are filed in the ordinary files, but in addition to copying, the stenographer makes a carbon copy of the answer which is attached to the letter before filing.

The stock ledger (Form 23) and the transferring of stock is very simple. The ledger is ruled first giving at the top of the page space for the name, address and any other information as to the payment of dividends, etc. The rest of the ruling shows first date, transferred from, or to; certificate number; Dr. shares; Cr. shares; Cr. balance. All stock certificates when cancelled have written across the face, to whom issued, and number of new certificate. This certificate is then attached to the stub bearing the corresponding number.

As is well understood in this association a frank discussion is invited of the methods and forms I have explained. Any system adopted by a company is more or less a growth evolved from emergencies and circumstances, and side lights thrown by opinions from different points of view are always valuable.

President Duffy: We are very much obliged to Mr. Simpson for his able and instructive paper, and I think it would be well to follow his suggestion concerning the discussion. I will ask Mr. Smith, of Toronto, to open the discussion.

J. M. Smith: This is, I am sorry to say, my first appearance since the organization of the association. I feel somewhat on the outside, with you American gentlemen, for the reason that we do not operate our system altogether as you do here. I think you are all familiar with what they call the coffee-pot system we have over there. We do not use the registers, and in those particulars we are not similarly situated, but we run our accounting departments right in line with yours. We found that we were not in such very bad shape at the time you organized, but we have benefited by the suggestions of your various committees that have reported from time to time. I enjoyed Mr. Beggs' remarks yesterday and those of Mr. Simpson this morning, and I think we have reason to be very much encouraged from what has been said and done, and the way the efforts of the association have been appreciated by outside concerns.

Mr. Mackay: Mr. President, I would like to ask Mr. Simpson how he handles the meter readings; whether he tries to equalize the lighting bills by reading shorter months in winter time and the longer months in summer time. There is a great difference in the method of reading electric lighting meters. I would like to be informed on that point.

Mr. Simpson: We have always made it a point to start on a certain day of the month. On the 26th we read all our meters, except in the month of February. We make that two days longer. As far as comparing the amount of bills for each month is concerned, we have never had any complaint as to that. The car registers are kept in the accounting department, and go out from there.

Mr. F. E. Smith: And no matter where the car may start, the conductors have to come and get their registers where they first start, early in the morning.

Mr. Simpson: They are sent out from the power house. They are started from there early in the morning. The rest of the day they start from our office. They leave the registers there and also get the registers from that point.

Mr. Smith: How about the fellows that get through at one or two o'clock in the morning? Do they leave them in there, too?

Mr. Simpson: No, they are returned to the power house and taken care of there, and returned to us later.

Mr. Smith: Then the register that comes in at one or two o'clock in the morning you are not able to put out again until later in the day?

Mr. Simpson: Yes; we have a double set of registers, using one one day and using another set the other day following.

Secretary Brockway: Mr. Simpson, what style of registers do you have?

Mr. Simpson: We are using the Meaker portable register at present. The first of the year we are going to use the stationary register.

President Duffy: May I ask you what induced you to change your style of register?

Mr. Simpson: I am not in a position to answer because the matter has been heretofore left with the superintendent of the road, and I have paid very little attention to it. As we are situated a man has to come to the office anywhere from a half hour to an hour before hand to get his register and go down and take out his run. Sometimes he is delayed, and that leaves the register in his possession too long in our opinion. That is one reason, I think, why we have made the change.

Mr. Tripp (Seattle): Do you have any difficulty in keeping the expense in the railway department and the light department and your power stations separate?

Mr. Simpson: No, we depend upon our engineers to a great extent. We use very little coal. We use water power, and have two stations, one principally for the electric light and the other for the railway, although we do use the railway station through the day for the alternating current and the day lighting, using what we call the lighting station at night only. We make an arbitrary charge for the station that we run both kinds, making the charge from the electric station to the electric lighting department. We do not subdivide on the kilowatt-hour basis.

Mr. Mackay: I would like to know how you subdivide your general expenses between your gas, electric and street railway divisions.

Mr. Simpson: Well, it is not charged. I have two sets of books. Being a separate corporation, I make my vouchers on the Gas company. In other words, the railways company pays the expense of the office, the general expense, to a great extent, and I will make my voucher of the gas company in favor of the railway company for its portion, which is arbitrary, and the balance is charged to general expenses, you may say, divided between the two departments equally, railway and electric.

Mr. Mackay: How you arrive at your arbitrary figure? Is it on the basis of earnings?

Mr. Simpson: On the basis of earnings; yes, sir.

Mr. Moore: It might be interesting and supplementary to Mr. Simpson's answer to Mr. Mackay as to meter readings in the matter of light, heat and power, to say that in Pittsburg we read the meters daily, subdividing the city into districts; for instance, taking 20 to 25 meter readers, and each provided with a meter reading book which covers a day's work. Each of the 25 meter readers finishes up his own simple district each day. He follows again the next day, and every 25 days, when the collectable accounts come in they are all in for the current month, and then we put them onto the prepaid meters and simply collect all through the city for the whole amount of prepaid—that is, the slot, meters. When the meter reading books come in in the morning they are passed over to the bill clerks and each one has his day's work allotted; then they pass on to the registry clerks and are entered, and passed out in the mail that night. Thus we are right up to date as to the amount of gas, natural or artificial, or electricity, that has been consumed by the customers in that district every day. Those districts are then allowed 15 days in which to pay, in 10 of which they would get a discount. Five days after that they get a delinquent card. Each clerk having charge of one registry follows up every day, and when he finds, 15 days after he has made his bill, that there is a delinquent customer, the latter then gets his little blue card. They all know what that means. In that way the readings are kept up continuously, the collections are kept up continuously, and I think we have a pretty good system as regards meter reading and billing.

President Duffy: Mr. Moore, may I ask you what particular point you want to cover by having a daily record of the meter readings, or daily reading of them, rather?

Mr. Moore: It is only a daily record every month with each cus-

toomer. Each house is called on regularly on, say, the fourth of the month, and out of those districts each one comes in, and our revenue comes to us regularly, day after day by the amount of the meters read.

President Duffy: You have meter readers who work daily, but the particular meter in any particular residence is only read once in 30 days?

Mr. Moore: Once every month.

Mr. Heminway: The bills go out every day in every district?

Mr. Moore: Yes; bills continually going out, continual collections.

Mr. Mackay: That has the same effect as though it was a reading of the separate days of the month, only on account of the number of customers you are obliged to record it in that way.

Mr. Moore: Exactly. We pro-rate our work right along, subdivide it daily and close it up.

Mr. Mackay: At the end of the 15 days do you cut a customer off?

Mr. Moore: Provided he has a record, we do.

Mr. Tripp: I would like to hear some more discussion on the question of dividing expenses between the railway and the light department, such as do not divide themselves, as in the case of one power station furnishing current for both the railway and the light department. I would like to hear some one suggest a way to divide the coal or water, general expenses and those things.

Mr. Mackay: I don't understand why the kilowatt-basis is not applicable. You are furnishing so many kilowatt-hours and the same fuel that furnished the railway kilowatt-hour also furnished the light, possibly right at the same time. That is our system. We divide it on the basis of kilowatt-hours.

Mr. Tripp: Suppose a station doesn't have wattmeters?

Mr. B. L. S. Tingley (American Railway Co., Philadelphia, Pa.): We have one station which is occupied jointly by electric lighting and power plant. We apportion the current by meter, charging the railway company and crediting the light so much per kilowatt-hour for its current. We regularly bill it to them, because in the state where we are operating we are not allowed to consolidate. We charge them a fixed monthly rent for the use of the office, and we apportion the salaries of everything but the station force. That is, the office salaries are apportioned prorata as to the gross receipts of the two companies.

President Duffy: Is there any other gentleman interested in the railway and lighting business that can further enlighten us about apportioning the expenses?

W. F. Ham (Washington, D. C.): We are in the railway and lighting business. We apportion our general expenses of the railway and lighting companies approximately on the basis of gross earnings. It is a fixed scale for the year, however. We do not attempt to change that ratio from month to month. Where there are expenses of a single power station which furnishes power to both railway and lighting companies, the expenses are pro-rated on the basis of the output, except that certain railway companies have fixed contracts with the lighting companies which existed prior to the practical consolidation. In those cases the rate continues as heretofore, and with any increase in the price of coal the railroads get the very much end of the bargain. What is the general custom of the members of this Association, or what is the best way, of filing cancelled coupons? I think that the plan of keeping a record in the general books of the outstanding coupons is an excellent one. I think it is preferable always to keep the general books in such a way as to reflect the exact condition of the companies, and to do away with as many auxiliary books as possible. Therefore, the scheme which Mr. Simpson has outlined shows at all times the coupons which have not been returned cancelled. I would like to know what is the best way to file or to keep the cancelled coupons. The way I have been accustomed to doing it is an expensive way, pasting them in coupon books, and when you have a heavy capitalization, as some of us have, with a great many coupons, it takes much time and considerable expense.

Secretary Brockway: What form of books do you have, Mr. Ham, providing a place for the bond?

Mr. Ham: It is virtually a scrap book. Every page is numbered with the exact coupon which is to go into each space, and it is so arranged that we have at the time of the maturity of a single coupon—not all of one bond to be pasted on one page, but all of one maturity to go on successive pages. For one of our bond

issues, we have one book alone for each maturity, 20,000 coupons in a single book; but to sort those and to paste them in the book is a heavy expense. Now, in some cases they file these in boxes or packages, and whether the trustee of the mortgage is satisfied with that record when he is asked to satisfy the mortgage is a question in my mind.

Secretary Brockway: A steam road with which I was once connected filed the two ways, as you are doing, with the maturities, and then when a new issue was made, a very large issue, they adopted the box plan. The Central Trust Co., of New York, accepted it as being conclusive evidence of payment.

Mr. F. E. Smith: The Erie road has been doing that for years. It has a big bond issue.

Secretary Brockway: I use the maturity books, but the books which were in New Orleans when I went there had a page per bond providing a place at the top for the cancelled bond as it came in, or when it does come in. But that required very large books and many of them, heavy and cumbersome, and with our new issue I adopted the maturity plan with one year's maturity; that is, two payments in each book. We do not have 20,000 coupons.

Mr. Ham: Not very long ago I had the coupons audited by a company which I was then with very carefully. They wanted to know that every cancelled coupon which we showed cancelled had been cancelled. Now, if we had attempted to do it with boxes or anything of that kind I think we would have been several months in getting through with it, because that would have meant the recounting of all those coupons. As it was, we had a hundred coupons on a page, and if there was any missing coupon, the blank space would stare you right in the face. So, just as fast as you could turn the pages over you could verify the account. Certainly it is a very nice way, but it is a question whether there is any other way which is equally as good.

Mr. Smith: Suppose you had a box with a number sticking up, say No. 99. You have your number up there instead of your coupon. Wouldn't that satisfy most anybody, if after counting the coupons you found that the original numbers that were in the box agreed with your book account? I should think an auditor would take that.

Secretary Brockway: Yes, if you could satisfy them that all you said were there, were there.

Mr. Smith: I have not attempted to use the box system yet, but I hope to if we get out any more bonds. As I understand it, the Erie road has been doing it for years, is to use a box, say, to hold 1,000 coupons, say, January, 1901, coupons, from such an issue of bonds; blank numbers are stuck in there which are just a little higher than the coupons will be, with the numbers from 1 to 1,000. As fast as the coupons come in these numbers are taken out and put into the July box and the coupons put in their places. Thus, at all times, they can see the numbers of the coupons which are out, from these little pads that are sticking up. That is the way I am going to do.

President Duffy: Do I understand that you file those coupons in tin boxes like you would throw cash in a tin box?

Mr. Smith: No, in a paper box. Then, when those coupons are all in, have them counted by two or three people and sealed. Then, if anybody comes along, the trustees of the mortgage, you can turn over that sealed box to them. If they are not satisfied with the certificate, let them count them.

President Duffy: Mr. Ham, may I suggest that, in answer to that question as to the verification of the canceled coupons, do you not have a special coupon account deposit with your bank?

Mr. Ham: You might have and you might not.

President Duffy: The point I was getting at was this: If you make a deposit on coupon day, and if your bank book is balanced, and you exhibit that to your expert who examines your books, that in itself is a certificate that a certain number of these coupons have been paid. I think that would cover the point which was raised.

Mr. Ham: In the particular instance to which I referred it would not have answered, but, generally speaking, I should think it would.

Mr. J. M. Smith: I have found a difficulty with my coupons where I have opened a special bank account. There are always a number of these coupons outstanding. I have some outstanding, running over a period of three or four years, and I do not know that that would be proof to the trustees that the whole thing was

paid. It is quite an important item. I use a certain file for a certain coupon and paste all the coupons in. As Mr. Ham says, it takes a lot of labor and expense, but I think the trustees would rather see that done than to take for granted that all the coupons are in a box. As the box is a simple method, it is a very good suggestion; but I do not know whether the trustees would accept it.

Mr. Tripp: Is it not a fact that the trustee is usually the man who pays the coupons?

Mr. Smith: Not in all cases.

Mr. Tripp: It generally is with us. In that case it is up to him to show whether it is or not.

Mr. Smith: No; with us there is a trust company that is trustee for the bondholders. We pay through the bank. We have bankers and trustees, so that the trustees have nothing to do with it.

Mr. E. D. Hibbs (Jersey City): We follow the method outlined by Mr. Ham, filing and using a numbered book for the maturity bonds. That is very simple, because the trustees of our mortgage really pay the coupon. We deposit with them the full amount due and open an account with them for each coupon, and on the term of the coupon we credit it. While it does not show the actual number of coupons out, it shows the information which the Manhattan Trust Co., which is our trustee, wants. I do not know of any other methods that would be so satisfactory as the coupon book, the scrap book, and filing.

Mr. W. G. McDele (Cleveland): We had at the time of consolidation three sets, which, of course, are taken care of with the new bonds, but we had them all scattered around and put them in boxes. Each company had different boxes and had them outlined for several years to come. Mr. Davies and myself started the box system. We had a large tin box made of very heavy tin, with little compartments to take care of the coupons still due, and when they came in they were put in that box, putting the date on the outside of the box.

Mr. Mackay then read the following report:

REPORT OF COMMITTEE ON A STANDARD UNIT OF COMPARISON.

H. C. Mackay, Chairman, F. E. Smith and A. H. Ford, Committee.

At the last annual convention of this association, the Unit of Comparison, as treated in the paper presented by Mr. H. C. Mackay, was referred to this committee to report at this convention, action having been deferred for the lack of sufficient time to discuss the matter properly and to admit of further unbiased investigation.

It is a matter that, since the adoption of electricity as a motive power, had received very little serious thought; and the discarding of a unit that had for years been recognized as the standard, naturally brought up questions requiring more study and investigation than could then be given them. It is but fair to say that this committee's opinion was divided as to the merits of the different units advocated, but, after studying the matter in all its bearings, we are convinced that the motor car-hour is the best unit yet advocated; and, being the same on all systems, large or small, it cannot be otherwise than practicable. Since that time, it has been put to practical tests, having been adopted by some of the largest systems; viz., Minneapolis and St. Paul, Minn., and Milwaukee, Wis. This test has demonstrated that the motor car-hour is a stable and correct unit, and it has further conclusively shown that the car-mile is an unreliable unit, even between lines of the same system. To illustrate, we submit the following figures taken from actual service and applied here to comparison of earnings.

Line.	Speed per hour.	Earnings	
		Per car-mile.	Motor car-hour.
No. 1.....	8.3	33.25 cents	\$2.76
No. 2.....	16.2	28.57 cents	4.63
No. 3.....	10.7	26.79 cents	2.86

The supposition was (up to the time of comparison on the basis of motor car-hours) that line No. 1 was proportionately the best earning line of the three, but the truth is, it is the poorest. This erroneous result was made to appear true on the basis of car-miles, simply because this line was operated at a lower rate of speed, the smaller divisor naturally leaving a greater quotient.

As applied to operating expenses, we submit other figures.

Car mileage	3,653.00
Motor car-hours	350.00
Earnings per day.....	\$1,367.50
Operating expenses per day (50 per cent).....	683.75
Earnings per car-mile.....	.3743
Earnings per motor car-hour	3.91
Operating expenses per car-mile.....	.1871
Operating expenses per motor car-hour.....	1.955

Reducing the speed of this line 25 per cent, retaining the same equipment and running the same length of day, what is the result? We have, without changing the cost of operation, reduced the mileage made from 3,653 to 2,740.

The expense per car-mile was \$.1871, and is now \$.2495, an apparent increase of \$.0624.

The expense per motor car-hour was \$1.955, and is now \$1.955, showing no change, as none exists.

Speed, then, is shown to be the factor that prevents the car-mile from being used as a correct basis. Speed does not enter into the motor car-hour. The absence of this variable quantity of speed, together with the fact that labor, the principal item of expense, is computed on the basis of the hour, or multiple of the hour, sustains our position.

It is interesting to note the conclusions of the steam railways regarding the use of the car-mile as a unit. The following figures were taken from the report of the 33d annual convention of the American Railway Master Mechanics' Association. The committee emphasized the unreliability of the car-mile by the following comparisons, showing the cost of operating a simple or ordinary engine to be \$.2449 per car-mile and the cost of a compound engine to be \$.2883 per car-mile, an apparent difference of 17 per cent in favor of the simple or ordinary type of engine. Yet, by reason of the greater capacity of the compound engine, the cost per 10,000 ton-miles was \$3.23, as compared with \$4.03 for the ordinary engine, thus showing an actual gain of 24 per cent in the work performed, in favor of the compound.

For special comparisons, it is recognized that special units are required, as for example, the output of a power station would be based on the kilowatt-hour, this being more closely relative to the work, but for all general comparisons of earnings or operating, the motor car-hour is advocated.

As to the question whether a standard unit is practicable or not, it would seem that, given a unit of comparison, which is admitted to be identical in every case, the question is not debatable. If the unit is correct, the result or comparison must be correct, as the component parts of all accounts have already been standardized by this association. It has been claimed that the variation in cost of operating, between a high and low speed line, affects the value of the motor car-hour as a unit. The high speed line certainly requires more current, and its repairs to electrical equipment are greater, but we are at a loss to understand how this can affect the unit. We could as consistently question the value of the yard as a unit of measurement because one kind of cloth cost 10 cents and another kind 12 cents per yard.

If a manager was shown that the cost of maintenance of electrical equipment of cars was 25 per cent more on his system than on another, it would certainly be to his interest to investigate, to determine whether more improved motors were being used, or if greater care was not being taken in the use of them. Very true, the investigation might develop that the difference in cost was due wholly to greater grades or to excess of travel on his lines, but it would show him the facts, and wherever a difference did exist, would advise him of it. This would be a practical use of a standard unit.

It was contended that the cost of ascertaining the number of motor car-hours would be such as to preclude its use on a large system. As a matter of fact, it is so much more easily determined than is car-mileage, that the cost is naturally less, and the readiness with which it is ascertained is one of the strong arguments in favor of its adoption. Especially is this the case in cities where large numbers of cars are run without reference to schedule time, but wherever and whenever deemed necessary. Experience has shown that reports of mileage made by trainmen are only approximately correct, but the record of the time of the starting and pulling in of a car at the station can be accurately kept and verified by the time of the motormen. The unit of comparison as applied to electric street railways has not kept pace with the rapid changes

which have been made in every feature of this industry during the past decade. The unit adopted by the steam railways, the passenger mile, was adopted by the street railways, but, owing to the impossibility of determining the distance each passenger was carried, that element was discarded, and, though its usefulness as a unit was impaired, it has continued to do duty as a standard unit to the present time. It applied very well to the old horse car, where the variation in speed was an unimportant factor, but time has wrought its changes, and a new unit to fit up-to-date conditions is deemed necessary.

With the past few years, a new problem has arisen owing to the construction and operation of high speed electrical suburban and interurban lines. These are but the forerunners of what will shortly be in active and aggressive competition with the steam railways. These lines will, doubtless, be controlled and operated by the street railway systems of the large cities, or at least in conjunction therewith; hence, creating a necessity for a unit of comparison applicable to both high and low speed lines.

We believe that the objections raised to the car-mile as a standard unit in the paper presented at the last meeting of this association are logical and that the motor car-hour meets all conditions better than any other unit yet advocated.

We herewith offer the following resolution for your consideration: "Resolved, That this association recommends the adoption of the motor car-hour as the Standard Unit of Comparison."

Mr. Mackay then said: In this connection, gentlemen, I wish to say that it is not the intention of our committee to preclude the use of any other unit. We simply wish the car-hour established as a unit of comparison and adopted by all the roads, so that we can make comparisons upon that basis. There is no objection to the use of any other unit, as I say, and we would be glad to hear from you on that subject.

President Duffy: Gentlemen, this is one of the most interesting and valuable reports that we shall have at this convention.

Mr. Dimmock: Mr. President and gentlemen: From the managers' standpoint I consider the adoption of a unit which we can all agree upon is the most important thing in the keeping of the books of an electric railway. When we go to our directors and they wish to know the condition of the road, they will immediately compare the condition of their own road with the condition of other roads, and what brings the conditions about. In our own case we have found that in every instance there has been a difference of opinion and an unsettled feeling as to this unit; but I do feel that we can reach a point where we can all agree upon one unit this association will have done more good for the general managers of the different roads than anything that I can imagine. From my standpoint, in both departments, I feel if we could get the unit question thoroughly settled we would immediately commence to correspond with one another, especially the managers, as to what their percentages were during the different periods of the year. I was not present when that question was brought up last year, and I would like to hear a brief discussion as to what the motor-hour is based on, or consists of, in order that I may be posted as to what is going on now relative to this question.

Mr. Mackay: The motor car-hour is merely the car-hour for the time that the car is in service. If the car started out at seven o'clock in the morning and ran until ten o'clock, it would be out three car-hours. The only reason why we called it the motor car-hour was that we eliminated the trailer as a factor altogether. It was based upon motor car-hours.

Mr. Wilson: As the car pulls out from the car-house at a certain hour and is returned at a certain hour, supposing it runs 10 trips during that time, and has a lay-over of 10 minutes each trip, do you have some method by which you eliminate the lost time?

Mr. Mackay: Not at all; your expenses are going on just the same.

Mr. Wilson: A great many of your expenses are not.

Mr. Mackay: Your expenses are practically going on, with the exception of your power, and, of course, some maintenance that is eliminated; but that is a feature of operation which is largely controllable, and I do not see that that would alter the case anyway, any more than your mile. If you were using the car-mile your car is remaining stationary, and your expenses are going on in some cases, and not in others.

Mr. Dimmock: The running delays and everything of that kind would be the same for each method, you consider?

Mr. Mackay: It would be about the same on each road.

Mr. Dimmock: Do you divide your total operating expenses pertaining to the service into the number of car-hours, or vice versa?

Mr. Mackay: Using it as a divisor, yes, sir.

Mr. Dimmock: That gives you the cost of one car-hour?

Mr. Mackay: That gives you the cost of one car hour, and as you can readily see, speed cuts no figure in the matter at all.

Mr. Dimmock: If you run three or four cars in one train, do you only consider the hours of the motor, provided there were two or three conductors?

Mr. Mackay: That is a problem, I presume, that the individual road would have to take up. We do not operate, and I think as a general thing two or three cars are not run in a train. Trailers, as a rule, are simply put on to bring the capacity of the motor car up to a certain standard. There are certain cases, and Mr. Duffy's is one of them, I think, in Chicago, where they operate two or three cars together, and in that case it might be necessary to consider each car as a car hour; but that is a matter, for the few roads interested to take up and decide by themselves.

President Duffy: Mr. Smith, of Chicago, is a member of this committee, and he sometimes runs more than one car at a time in a train. Perhaps he can enlighten Mr. Dimmock on this question of whether it should be car-hour or motor car-hour.

Mr. Smith: I do not see why it would not be a car-hour with us. Would it not be with you?

President Duffy: I should think so.

Mr. Smith: I cannot figure on the motor car-hour exactly. I should think it would have to be the car hour.

Mr. Dimmock: You have a conductor on each car in Chicago, probably?

Mr. Smith: But we do not have a motorman. On our cable trains, for instance; four men run four cars. I do not see why we would not have to have it on the car-hour.

Mr. Mackay: It would seem to me that each road would have to decide that for itself. If the car is running its full capacity, and it is simply a question of operation, whether you can pull one car through a street or pull four cars through at the same time; your streets being so crowded, it is a difficult matter to decide how you are to get your cars through and in getting the motor car through, you may just as well pull four or five. It seems to me that is a different proposition altogether from the ordinary railway, which is operating its cars upon regular schedules.

President Duffy: In Chicago some times the third or fourth trail car in a train is a motor car.

Mr. Mackay: Do you mean that there would be three motors followed by a trailer?

President Duffy: No, sir; there is one motor behind three cable cars. It seems to me we would have to use the term car-hour.

Mr. Mackay: You might use the term car-hour, but I think with nearly all roads, with these few exceptions, that the motor car-hour would bring them nearer to a standard basis.

Mr. Tripp: Mr. President, I was not here at the last meeting, and did not hear this discussion. I would like to have an explanation made why speed does not have some effect on the car-hour as a unit.

Mr. Mackay: Because your hour has not the same length.

Mr. Tripp: It costs more to run a car 20 miles an hour than to run it 10 miles?

Mr. Mackay: Certainly, it costs more to run at a higher rate of speed, but your expenses would show in just that same proportion. Now, on the basis of car-miles, the reverse is the case. If you use a car-mile as a basis, and you increase your speed, your divisor is just so much greater, is it not? And instead of showing the actual results, you show that as a decrease. Now, with the car-hour your expenses are increased and your showing is just that much more.

Mr. Tripp: I think that is right.

Mr. Moore: We run trailers in Pittsburg and it seems to me that we would have used the car hour itself, because we would have to man each car. We are like you, we would have to put a man on each car and to get the proper figures we would have to count the car-hours and not motor car-hours.

President Duffy: May I ask you to give us the benefit of your opinion as to the car-hour proposition?

Mr. Moore: It seems to me to be all right, but before following out the car-hour unit I would like a year to try them both together side by side, put them in parallel columns as it were.

Secretary Brockway: Mr. Mackay does not contemplate the displacing of one by the other.

Mr. Moore: No, I understand. The resolution might be open to that construction as it is. I would like to try the car-hour right along and I propose to do it when I go home.

Mr. Mackay: In my last paper I think I treated that trailer question pretty thoroughly, and while there are certain exceptions to this rule, as there are to almost any other, I still think that if the equipment were up to the standard, trailers would be a thing of the past, and in that case the motor car-hour does apply to almost all cases. The running of trailers as a general proposition is done simply because of old cars which are really too good for the scrap pile and yet they are out of date.

Mr. F. E. Smith: Are you going to count the motor car and the trailer as one car or as two cars?

Mr. Mackay: As one car.

Mr. Smith: Suppose you put on two trailers?

Mr. Mackay: I would still call it one car, except as I say in the case of your roads.

Mr. Smith: Suppose it was an electric line, say, going to the race track, something of that sort, and they put on a couple of trailers. Now, we have four men, three cars. Are you going to call that one car?

Mr. Mackay: I wouldn't operate it that way.

Mr. Ham: I don't know but that this question of a car-hour is just the same in the car-hour as in the car-mile. What do you call it now? Do you call it motor car-mile or car-mile? It is just the same question, whether you call it motor car-hour or car-hour. If you count your train now as two car-miles for a train-mile where there was a trailer, you would count it just the same with the car-hour. I think that is one point that we might pass upon, and I would suggest as an outcome of that, that where there is an extra crew or an extra conductor, that in that case, we should call it an extra car. If, however, it is operated with one crew, then we could call it a single car. Of course this question is going to become of great importance, especially in an interurban service, where very frequently as time goes on they will undoubtedly operate trains. They do it now on the third rail system where one motor car has a train of three or four cars. Now, in such a case as that I think that each car ought to be treated as a car. As we are situated in Washington, where we have only one crew for the same three cars, and we still continue to operate them, I think that those should be counted as single cars.

But coming back to the main point at issue, a unit should be something which is not variable, if possible. That is what a unit means, something which is not variable. In this matter we cannot get a unit which is not variable under different conditions. Therefore the unit to establish is that unit which is least variable. On the question of expense, for the last year, we have kept our accounts on the basis of the car-hours, or the car-day, which is the same thing, and also upon the basis of the car-mile; and I think that expenses can be determined much more reliably, as to the relation of those expenses to the earnings, on the basis of the car-hour. The platform expense in the operation of a street railroad is the largest single expense that we have. I think it is probably 40 or 50 per cent of the total expense of operating a street railroad. Now, that expense goes on whether the car makes 20 miles an hour or 5 miles an hour, because we pay on the basis of a day or of an hour. Then, the largest item in the expense of a railroad property being the platform expense, putting that in line on the car-hour basis is to put upon the right basis the thing which is the largest item. Now, the other thing to arrive at is maintenance and cost of production of power. I believe those two things are on fully as good basis on the car-hour as on the car-mile. It costs just about as much to run a car in a crowded street in a city, with frequent stops, six miles, as it does to take that same car out in the suburbs and run it twelve miles, where you would make the same time and you have to use about the same power, although in the one case you have only made half the mileage that you have in the other case; and I am told by people who know more about maintenance than I do that the chances are that the car which has

been running in the crowded district with frequent stops is liable to require more maintenance than the car that has been running out in the suburbs at higher speed with fewer stops; therefore, that the actual maintenance of that car in the city has been greater than the actual maintenance of the car out in the country, and the speed has been only half as much. I find that the expense of operating a car an hour is a much more permanent quantity than the expense of operating a car mile. The variation is much less between different lines, and I often think that the general manager or the other officials of the company are misled when they see that some particular line is earning only 10 or 11 cents a car-mile, and they say, "Why pull off those cars. They are not getting enough out there to pay expenses, or anything of that kind." Yet, when you can come around and show that you are operating that road for 5 or 6 cents a car-mile on account of the conditions existing there, you are showing that it is a good line to operate. Now, if that same thing were on the car-hour basis you would find that the car was earning up around what the other lines are earning, because, the speed being so much greater, it earns enough in each hour. I only wish we had more of the lines like Mr. Mackay's that earn, say, 30 cents a car-mile, and \$2.96 to \$5.00 a car hour, but ours are not that kind.

President Duffy: Gentlemen, we have Mr. Vreeland with us this morning. Mr. Vreeland, may I ask you to favor us with your impression of the car hour and car mile, or anything else in that connection that you will be good enough to speak on? Mr. Vreeland has a line that earns some times more than 20 or 30 cents a car-mile.

Mr. H. H. Vreeland (New York): Mr. President, I did not come in with the idea of saying anything. I come to gather some wisdom from the deliberations of men who are actually engaged in accounting. It seems to me that they are the men to decide what is the best unit for us to work on. It works out with us with the various kinds of service we have, on exactly the same basis, so far as our purposes of comparison are concerned, whether you put it on a car-mile or a car-hour, because the variation in conditions is equalized by the fact that it does not all go into one pot. Our whole system is operate by divisions or lines. Every particular line we have in New York City is reported, its car mileage, its earnings per car-mile and its cost of operation per car-mile, by the individual lines, so far as the purposes of comparison by the management are concerned. The operating expenses are compiled by lines. The aggregate operations are shown of course lumped, as you may have noticed in our comparisons for the last three or four years of operation. As far as our city is concerned the conditions there are such that men who are deliberating on this modern question do not give me any show. I have four or five thousand horses yet. If you can tell me how to eliminate that proposition I shall be glad to hear it. I am not modernized enough to enter into any discussion on the high plane of motor car-hours, etc., except to a limited extent. I should certainly very much rather hear from some of the gentlemen that are regularly connected with accounting work in the discussion of this question, because I am one of a number of fellows in this world that do not believe that the combined wisdom and knowledge is all in one man's head.

Mr. Wilson: Mr. President, I regret exceedingly that you have called upon me because because I have not gone into the subject thoroughly enough to express an opinion that would be of interest, and I have not seen the way in which it would be possible for the West End Street Railway Co. to keep the car-hours without an expense which would preclude our adopting it. I should be pleased to be enlightened on any method that could be adopted on our road to give the car-hours with an expense that would warrant its adoption. We run something over 300 different routes each day. One man gives the car-miles for the entire road; the labor of one man? We have a large book in which is entered each day under the different route headings simply the number of trips and the amount that that line has earned. Twice a month a footing is made of the number of trips and of the amount of money. The footing of the trips is multiplied by the length of the route and the money divided by that gives us the earnings per mile. That is all the expense that we have in determining our earnings per mile. Of course the total of that is taken to determine our operating expenses per mile.

President Duffy: Don't you pay your men by the hour?

Mr. Wilson: No, sir; we pay them by the day.

President Duffy: But the day consists of a certain number of hours?

Mr. Wilson: The day consists of not over 10 hours in 12 consecutive hours.

President Duffy: It would be a very easy matter to get the number of days, wouldn't it?

Mr. Wilson: Yes, but what are the hours? One man runs 9 hours and 15 minutes, another runs 9 hours and 30 minutes, another 9 hours and 50 minutes.

President Duffy: Would it not be possible to strike an average of the entire working day, the number of hours put in on all routes?

Mr. Wilson: No, because in Boston, with the congested district that we have in the center of the city, we never know the hours that a man may be out. Mr. Vreeland I think has the same trouble in New York. The car may start out. He is not always sure when that car is going to get back. Mr. Rossiter, I guess, has the same trouble in Brooklyn.

Mr. Mackay: It seems to me, Mr. President, that it is not necessary to know when the car is going to get back. When it does get back it is recorded, and that is all there is to it. All you have to do is to take this record of the time that the car goes out and a record of the time that the car pulls into the station, and you have your complete record. Mr. Wilson, as I understand it, has a record of the number of trips that the car makes, not only a record on this line, but also a record on some other line, because it is liable to be transferred a dozen times during the day. Now, instead of going into all this detail to work that out, all he requires is simply the time that the car starts and the time that the car gets back.

Mr. Wilson: Mr. Mackay, that would require proving each individual car. It might pull into the house once, it might be in three or four times. You would have to make a record perhaps several times a day. As it is, with the plan we have, we simply take the conductor's day card. It is necessary to know the amount of money coming in in order to find out what the earnings are. It only requires one extra column in which to put the number of trips. No return whatever is necessary from any car.

Mr. C. L. Rossiter: Ladies and gentlemen: I am glad to have the result of your arguments. I think Mr. Ham's arguments in regard to the car-hour have a great deal to commend them, yet at the same time I am very firmly convinced that simplicity in the keeping of accounts means a great deal, and I do not think that the car-hour would run into a great deal of additional labor. I cannot quite agree with the chairman that an average will answer the purpose. I think if you are going to have a car-hour, in order to locate your expenses so that your manager can place his services where he requires it, that an average would hardly answer the purpose unless that average was very correct; and I agree with the speaker in regard to the congested condition of traffic where the cars are making sometimes not one-half, as Mr. Ham stated, but I think really not one-fourth the number of miles in a given time. That certainly would indicate that the car-hour there was a very desirable thing to have. We have, unfortunately, some lines, not like brother Vreeland's, because I think he has no lines that earn less than 30 or 40 cents a car mile, but we do have some lines out in the country that I am sorry to see in the 10 and 12 cent class. While those lines are building up and developing very rapidly, it is quite a problem to so adjust the service to get all the earnings that can be reasonably expected.

I do want to say one thing, that I think this Accountants' Association has done a great deal in the last few years to assist managers in getting information. I appreciate it. I am very glad indeed to have the opportunity of saying so to you gentlemen. I think it means a great deal in the successful operation of a road, having the figures at hand, and I think that you have made very marked progress in enabling us to obtain them.

Mr. W. E. Harrington (Camden): We have some suburban lines and a few city lines where the differences in the car mileage rate were such that it appeared that the suburban lines were running at a considerable loss on the mileage basis, and I was confident that they were. Some time ago, so that we got it in this last fiscal statement, we adopted the car-hour unit in connection with the car-mile unit. It has not increased our office force at all to do it. One of the girls works it up and it comes in each morning with the regular statement of the receipts of the different divisions and

lines, each line being considered separate and distinct. I don't see how a road can run without the car-hour unit. The car-mile unit is all right and I use it generally to compare with other roads, because the data are up that way, but I am using entirely for my own comparison, for my own use on our line, the car hour unit.

Secretary Brockway: Mr. President, in New Orleans we have no grades, we do not have to heat our cars, and we have a number of other advantages, but we find that a comparison of units gives us this result:

Line A on a percentage of earnings, is first; on the car mile, it is second; on the car-hour it is second.

Line B on percentage of earnings is third, on car-miles is first and on car-hours is third again.

Line C on percentage is second, car-mileage third and car-hours first.

Line D is fourth in all instances.

Our management wished me to show those three comparisons, and I give them every day, furnishing them all of these details every day, and the line that we thought was our gilt edged line on the car mileage basis turns out to be third on car hours. Our speed is very fast in some instances. We run on the neutral ground, and taking all those things into consideration; they feel as though they want all three forms of comparison. We cannot very well tie up to any particular one, which is what Mr. Ford had in mind.

Mr. F. E. Smith: You figure it from three ways. Which is the best paying line?

Secretary Brockway: Line A.

President Duffy: How does that stand on the three units?

Secretary Brockway: It stands first on percentage, second on car-miles and car-hours. Line B is third on two and first on one. Line C is first, second and third. Line D is fourth in all instances.

President Duffy: In answer to what Mr. Rossiter said, that he did not believe in an average, I thoroughly agree with him on that. I believe in the accurate figures if it is possible to get them. I only brought up the question of the average because Mr. Wilson said that it was impossible to get the hours on his road.

Mr. Wilson: I did not say it was impossible. I said I thought the expense would preclude that.

President Duffy: I stand corrected. In Chicago we pay our cablemen by the trip. We pay our electric men by the hour. We know exactly how many hours should be run every day from the time schedules, as well as from the report from the depot that the cars start from. We verify and check and make our payroll according to these records. Consequently, we know actually, not only the hours, but the minutes, run by every man on every car, as a total; so that we can get the hours run absolutely correct. Now, if there is anybody who has such conditions as has Mr. Wilson, whose company pays its men by the day and for a half or a third of that day, they might be tied up and not work at all—that is a little different proposition. But I think on the ordinary road you can get absolutely and accurately the exact number of minutes that the cars run each day.

Secretary Brockway: My time-keeper furnishes that every day, the actual hours of the motormen and conductors of each line. We have a congestion annually in our Mardi Gras festival, during which practically the whole line, all the lines of the entire city, are tied up near Canal St. In that case the car mileage is not worth anything. Then our car-hour has its advantages. The percentage, of course, still remains the same, because the desire to travel seems to permeate every line in about the same proportion. Everybody goes down to Canal St. at Mardi Gras, but the car mileage is not worth anything as a comparison for that week.

Mr. Ham: Well, Mr. President, the objections which have been raised to this seem to be on the ground of the expense of determining how many car-hours are operated. In the cases of both Brooklyn and Boston I believe that could be obtained very readily with almost no work in the office. Every table is operated on a certain standard. That standard calls for a certain number of trips, a certain number of car-hours. It calls for a certain amount of pay. Now, for all over time above the standard a certain number of hours are made, and that is shown by an increase in the payroll. Mr. Rossiter is very familiar with that. Now, whatever that increase is, it is the item which, added to the standard, gives the total number of hours, and the depot master on the largest division in Brooklyn or Boston could give that information to the audi-

tor on the morning following the day in question. He could have it on his desk at nine o'clock in the morning. Mr. Wilson's scheme of furnishing the total number of car-miles only twice a month, would not answer for the average manager. The manager generally wants to know the following day, if possible what his cars have earned per mile, or per hour if you should adopt that as the standard. Mr. Brockway was asked, and this is something which I think is of importance, which was his best line; and he answered that the best line is the one that has the lowest percentage of operating cost. Now, right there is where we are apt to make a great mistake, and where the management might make a mistake. I think Mr. Vreeland's scheme of finding out the net returns from a line is really the only way. It is possible that with the best line of Mr. Brockway, by reducing the number of cars operated he will decrease the operating expenses, we will say, from 60 per cent to 50 per cent. But what has been the result? Have you as much net earnings? That is what we want to know. What is the final result on net earnings? On the other hand, we may take the line of Mr. Brockway's, which has been operated at 60 per cent, put on extra cars, and bring that up to 70 per cent, and still it may be a better line than it was before, because we are getting more net earnings out of it. That is why we have to be careful, in any of these bases of comparison, to remember that what we are finally looking after is net earnings and not percentages. You have heard the story of the old man who did not know anything about percentages, but he did know, if he sold something for a dollar for which he only paid fifty cents, he was not losing anything.

President Duffy: Mr. Ham, I think you are under a wrong impression as to what Mr. Brockway said.

Secretary Brockway: You misunderstood me.

President Duffy: Mr. Smith asked which was the best line. Mr. Brockway replied line A. Then I asked him if he would state how that best line stood on the three units, and in answer to my question he made that statement.

Secretary Brockway: I am taking income only into consideration. I am not considering the expense at all.

Mr. Ham: Was not your reply based upon the fact that the percentage of cost of operating that line was the lowest of the three lines or four lines?

Secretary Brockway: No; I am taking income only, just treating income in this consideration.

Mr. Ham: Well, how would you determine that, from the gross income?

Secretary Brockway: Gross income, certainly, of the four lines.

President Duffy: He means that the percentage earned by this particular line, of the total amount, was not greater on this particular line than any other. Just the percentage earned; not the percentage of expenses to receipts. Is that correct?

Mr. Brockway: Yes, sir.

Mr. Ham: That may be a longer line. That does not answer it at all. You might have a line that was a mile long, which would naturally be better than another two miles long. That isn't anything at all.

President Duffy: What I wanted to correct was the impression that he was taking that as the better line because of the low percentage. You were mistaken about that.

Mr. Ham: I thought he was, but I do not see that the amount that a line takes in determines the matter.

Secretary Brockway: That bears out what I said, that we cannot tie down to a comparison, we are using the three and showing that only one of the four lines agrees in each of the three comparisons.

Mr. Dimmock: I would like to ask some of the accountants who have been using the car-mile in the past, if, when they had a motor and a trailer in one train and that train should run one mile, if they would consider that two car-miles, if a trailer ran a mile and the motor ran a mile, say, two 16-ft. cars. Now, if it costs you, for illustration, a dollar to run that train one mile, and it actually covered that much ground, would you say that the cost per car-mile was 50 cents? I would like to have that answered.

President Duffy: I will answer that question as far as our company is concerned. We are very much interested in the prorate proposition. To begin with we have three kinds of power, electric, cable and horse. This is further complicated by the fact that some cable trains are operated two cars in a train, some three cars in a train, some four, towing an electric motor car behind a third car

on that train. The State St. line is supposed to be a cable line; we run horse night or owl cars on it, we run electric owl cars on it, and cable cars all day, and tow electric cars in day time from 18th St. up. When I first took hold of the accounts there one year ago, I found all these complex elements. I keep a daily record, first, of the number of cars operated, and secondly, the kind of cars. There are grip cars, motor cars, the first cable trallers, second cable trallers, or the first electric traller, or what I call the tow car. I keep those miles separate, and I show the thing every way. It is the only way that I can get at it understandingly.

Mr. Dimmock: Supposing that you had a road and, to make the question plain, that you just had one train on it, and your road was a mile long, and you made one trip a day one way—that would be making one mile—and there were three cars in the train. Would you have made three car-miles that day, or one car-mile?

President Duffy: You would have made three car-miles and one train mile of three cars.

Mr. Dimmock: We have a suburban car, which is just twice as long, we will say, as a 16-ft. or 18-ft. car, as it might be, holding just double the number of passengers. If you count mileage of trallers and of motors, of the short cars, as against the mileage made by the one car, would that not go to prove that car mileage is imperfect and not of much use to the manager?

President Duffy: That is the argument advanced by Mr. Mackay last year; the special argument was on the traller.

Mr. Dimmock: The length of the car enters into the car mileage from the fact that if you had two 16-ft. cars, one a motor and one a traller, and each one would hold 50 passengers and they would run that train one mile; if they should run two car miles and it cost a dollar for expenses the cost per car-mile would be 50 cents, would it not? Now, on the other hand, if a road operated with one car carrying 100 passengers, and the cost was one dollar, that would make the cost per car-mile show so different that it would see that it was almost valueless to make any mention of or for a manager to compare by it.

President Duffy: I think a safe rule to follow would be that every car that is manned, as was discussed here a little while ago, should be called a car. If you have two cars and one motorman and two conductors, that would be two cars.

Mr. Dimmock: I know of many cases as in Omaha, where they run a motor and a traller and have only one conductor and one motorman.

Mr. Vreeland: We have been a good many years in this work, and I have seen its evolution from the old days when in steam railroading we were like the fellow that kept the store. They asked him why he didn't have a book-keeper. He said he didn't want one. They said, "You might be bankrupt and you wouldn't know it." And he said, "If I was bankrupt I wouldn't want to know it." We are not in that shape. We want to know what our condition is all the time, and any standard that you gentlemen can arrive at or a thorough discussion of it, is of value. The thing that in my opinion you want to be careful about, and which is very prevalent in street railroad practice—things that 10 or 15 years consideration have been given to by standing committees in steam railroad work, is the attempt of the practical operating men and often of accountants and others to settle, in street railroading, in two hours. I had occasion to speak of this in Buffalo where a subject was up that was up 15 years ago, when I was a member of the American Society of Railroad Superintendents; I was on a committee, and they have a meeting tomorrow in New York, and I was asked to come before that society and speak tomorrow on the same subject that was up at that time. I do not mean to say nothing has been done. It has been carried along. But it was so important a subject that it has been carried from year to year, as a subject of discussion. Our move from a percentage to a car-mile basis was a good move, even if we now go to the hours. A gentleman asked me a few years ago, "What is the cheapest line you have in percent of operation?" I replied, "I have one that operates at 22 1/2 per cent." The man went off and told another man that I didn't know a thing about the business; he said there was not a man in the business who could operate a road for less than 50 per cent. The truth was, it cost me as much per car-mile to operate that as any other under average conditions for 24 hours, paying 25 or 22 cents per car-mile, and percentage did not mean anything there at all, based upon 50, 40, 30 or 20. We are operating many lines now at anywhere from 30 to 35 per cent. Of course the questions is en-

tirely one of the average cost per electric car-mile of operation. It stands the same throughout the system. Well, we have made that step since the last seven years, going in New York State entirely from that question of percentage up to the car-mile for a basis. Now, if you gentlemen from your conclusions on this subject show us that the car-hour is a little better, why we assure you we want the best, and we are with you. (Applause.)

Mr. Wilson: While sitting here I have been thinking over the subject a little more deeply, perhaps, than I had in the past. On a big system, a method may possibly be arrived at such that I shall be obliged to take back what I previously said as to the matter of expense. I do not say that it would be absolutely exact, but in the long run it might average so that it would come out in a satisfactory manner. With us there are over 30 car-houses. We are operating over 1,400 cars a day; I might say the 1,400 cars are running on over 30 different routes, the mileage of every one, of course, being different. If we took each car house and had the foreman in charge each hour, or each half hour, simply put down the number of cars that were on the street at that time, and take the total for the day, divided by the hours, or half hours, as the case may be, we would then have very nearly the car-hours of the cars from that house. Of course, it would not be exact, but if a car pulled in five minutes before the half-hour, or the hour, some other car might pull out five minutes afterward, and it might average up.

Mr. F. E. Smith: Why not have your thirty barn foremen send in reports?

Mr. Wilson: They have all they can do now, and a little more.

Mr. Smith: Let some one else send in once a month the regular schedule from each barn.

Mr. Wilson: We haven't any schedule. We have one, but it does not work.

Mr. Smith: Your first man is supposed to make 10 trips a day on some particular run. Now, if all the other men make their regular trips, why can not that first man send in to you every morning the regular schedule time for yesterday? Or if you have to send out an extra tripper, why cannot you say there was an extra made, and so on.

Mr. Wilson: We could, but that is where the trouble comes; there are so many of them, it is an expensive thing to attempt to do anything of that kind. Anything is possible.

Mr. Smith: I didn't think that there would be so many extra trips but that it could be done. Of course, you have regular extras, understand, but I mean trippers.

Mr. Hogarth (Denver): I suppose you are all familiar with the fact that we pay our conductors and motormen every night. We have a system of universal transfers and I would like to talk over later with some of the members here. I find that in the exhibit hall there are registers now providing for fares, transfers and tickets. That is a very important feature with us, and one I would like to go into and see if it is at all practicable.

President Duffy: Those questions can very well be taken care of in the informal discussion on the last day. I am very glad you mentioned that and brought it up, because it will provide material for discussion there.

Mr. Hogarth: We operate a few trailers, very few. We are joining our grips and trailers, making one large car out of them. The horse cars have been abandoned; the cable has been abandoned. We have nothing but electrical equipment. I think that the hour unit will be the unit for our purposes. The unit ought to be a standard that is not variable, or one that is the least variable. Managers like to make comparisons of their lines with others of the same size. If there are any great discrepancies they wish to know it; they wish to know it quickly; they wish to adjust it; wish to put their lines up to date. I think the hour unit is the coming one. I regret that I am unable to speak more fully upon the subject, but I have been with the company only two months, having been theretofore with the steam roads. They have a unit established for freight which is on the basis of the ton-mile; for passengers, the passenger mile. That is the system followed by the Inter-State Commerce Commission, and adopted generally throughout the United States.

Mr. Moore: I would ask Mr. Harrington as to his practice in computing his car-hours, whether he has trailers and whether they are manned by different men, and whether he counts the car-hours for the motor and trailer as well.

Mr. Harrington: We have no trailers and we keep our time

right from the conductor's tally sheet, the same as we compute the car-miles. The computation of the car-mileage, of course, is far more difficult by reason of taking the mileage at the different points the cars pass over, but it is very easy to get the number of car-miles from those tally sheets. We pay our men by the hour, and it makes it very easy for us to do that. We have not noticed any increase in the office labor. There has been no complaint on the part of our girls of the additional work thrust upon them, and we have our car-hour and earnings per car-hour on our tally sheet, that is made up by the conductor. As I said before, we have been using it a little over a year and three-quarters and it has proved a great help. We have had suburban lines where the car-mile was low compared with lines in the city which I knew were running at a loss, and it would appear they were running at a loss on the suburban lines, but the cars were running about two and one-half times faster, and by testing it on the car-hour basis it made the resulting figure almost double that which we received in the city, and put it on a basis such that we knew just where we stood.

(Mr. Ham in the chair.)

Mr. Duffy: This closing paragraph on Mr. Mackay's report reads: "We herewith offer the following resolution for your consideration." (Mr. Duffy reads resolution.) I would like to say a few words on this subject. To begin with, I believe that the varying conditions of operation, with the possible exception of speed—and that is the most important and most disturbing element in the proposition—are just as well, if not better, taken care of by the car-hour unit as by the car-mile unit. Certainly we are at no greater disadvantage by using the car-hour unit even to the exclusion of the car-mile unit, than we would be by using the car-mile even to the exclusion of the car-hour unit, and we have the advantage of eliminating the disturbing element of speed. Now, as to the size of the car operated, whether they are operated as single cars or in trains of one, two, or more, these are some of the peculiar local conditions that surround the operation of every road. Every road has its peculiar conditions. They must be studied specially and they must have special treatment. I believe that the safest thing to do is to consider that every car that has a position on a time-table with the run numbered, that is manned by a crew, and sent out for the purpose of hauling passengers, is a car. If you put two of them in a train it makes two cars. We should supply the information as to what that train is made up of. I go further and say that a car is a car whether it makes one trip or ten, whether it is out one hour or twenty, whether it runs at night or whether it runs in the day, whether it is put out for a baseball load or whatever the condition may be. I wish to explain by that that a car that is not on the time-table at all, but is manned by a crew for the purpose of hauling passengers, if it only makes one trip, that is a car; if it only makes one trip or runs one hour it is still a car. If you will establish that as your starting point you will get the number of cars that are operated daily, the kind of cars they are. I was very glad to hear Mr. Wilson say in his last remarks, that he was satisfied that with his peculiar conditions, which are different from those of any of the rest of us, he could get around the thing; and I have no doubt that anything is possible in the accounting line in Boston, if Mr. Wilson will undertake it. I know that you can get the number of car-hours, the total number of car-hours made per day, more accurately—at least, I believe you can—more easily, more economically, than you can the number of car-miles. Now, why shouldn't we have the car-hour? Mr. Vreeland's remarks, I think, were very good, especially his advice not to start to settle in two hours a question which the steam railroad people have been considering for fifteen years; but it seems to me if you know the number of cars that you operate each day you can very easily keep track of the kind of cars they were, whether they were run in trains or not, how many hours they made, and if you take the schedule speed that your time-tables call for you have something that will give you the number of miles that the car traveled from the car-hour figuring. You may not get it absolutely exact, but you will get it very close. Take a line that has 10 cars on its time-table. Suppose that each one of those cars ran 10 hours. You would then have 100 car-hours. Suppose that, including the lay-over, and including the allowance for stops and other delays, that those 10 cars are scheduled to take 10 hours each out of the 24 on the time-table. They will have run 100 car-hours. If you divide the

distance traveled into the number of hours that they are scheduled to require to cover the distance, you get, say, 10 miles an hour. Each car has been in service an average of 10 hours. Each car has traveled an average of 100 car-miles. The other way, you take the distance of the round trip and multiply it by the number of trips that are made. I see very little difference in the basis you are figuring from. I think Mr. Moore's suggestion that we all try it this year is a very good one, and if it meets with the approval of Mr. Mackay, I would suggest that we modify that resolution, that we recommend the adoption of the car-hour, not motor-hour, as a standard unit of comparison in connection with the car-mile, and it is my opinion that this subject should be taken up by each member individually, put in practice and tried for a year. Then we can come to the meeting next year and thresh it out all over again, and recommit this question back to the committee. I thank you for your attention.

Mr. Mackay: The amendment is satisfactory to me.

Mr. Moore: I would like to say just a word for Mr. Mackay's benefit in relation to our own lines. We differ in our equipment from some of the lines that we have spoken of here this morning, inasmuch as we have a new and splendid equipment. The trailers are just as fine cars as the motor cars, just as long and just as good. They are not ready for the scrap pile; they are manned by a conductor, just the same as the motor car is, and in our figures I think it is nothing but fair that they should have hours as well as the motor cars.

President Duffy: I would suggest, Mr. Mackay, that you make that motion with reference to the modification that I suggested, and let the gentlemen act upon it.

Mr. Ham: This resolution as it reads does not say that this shall be the exclusive unit, and therefore I move the adoption of the resolution, reading as follows:

"Resolved, That this association recommends the adoption of the car-hour as a standard unit of comparison."

Mr. J. M. Smith: I think if Mr. Duffy's suggestion were put in force, that if we take it for another year, we would come better prepared, and let each one undertake it, run the year through on both the mileage and the car-hour basis, and bring a report here, I feel satisfied if it is as the gentlemen say, that it will go through without any hesitation whatever.

President Duffy: Mr. Ham, do I understand you that you desire this resolution just that way, without modifying or qualifying it to the extent that it is to be with the understanding that it is to be tried for a year and it is recommitted back to the committee to be reported on again?

Mr. Ham: No, my intention was that we simply adopt it as read, that we move the adoption of that as a standard unit of comparison. That does not eliminate any other standard that we may wish to use or continue to use. It does not interfere with our throwing it out at the end of the year if we wish to. But I think it is a good thing. If we think, as many of us do, and I believe as most of us do, that it is a good thing to know what the earnings and expenses are per car-hour, then I think we are not making a bad move to recommend the adoption of that as a standard. We will continue to have the car-mile standard, and I do not think we are committing ourselves in favor of it any more than as an auxiliary standard.

Mr. J. M. Smith: I meant to say that while trying it for a year we might get into line with our managers and let them understand this discussion, and consider it with them. Then we can get their views as well as our own. We are not the heads of the roads. I think if we had a year to work with our managers, if it is going to be a success, we can, without any hesitation whatever, adopt it next year.

Mr. Dimmock: If I had not been here and heard this discussion I believe, as the resolution reads, it would be misleading to a manager. He would immediately reach the conclusion that these gentlemen had thoroughly sifted this question, and come to the conclusion that the car-hour was the better unit, while at the same time we have not reached that conclusion until we have tried it longer. My former remarks were made with a view of showing that the mileage basis was misleading in every sense of the word, and that we did need something better, but I do not believe this question has been studied enough to warrant the adoption of the resolution unless it is made in such a way as to show that it is a trial. If the resolution can be made to read so

as to not mislead the managers who are not present, when they discover what has been done, then it would be a benefit, and they would immediately say to their auditors and men in charge, "Now let us try this thing. The accountants are reaching a point where they believe this is the best," and yet they will understand that it is only for a trial.

Mr. F. E. Smith: I do not see the use of referring this back to the committee. You cannot change the opinion of the committee on the subject at all. It is for the consideration of the convention; let the convention decide.

Secretary Brockway: That is what the standardization committee said at Boston, and they changed their minds.

President Duffy: The standardization committee didn't change their minds, they changed their classification. I think to recommit is a proper procedure. Does any gentleman wish to make that as an amendment and have it acted upon?

Mr. Wilson: I offer it as an amendment.

Mr. Ham: I am perfectly willing to withdraw my motion. That will make it simpler.

President Duffy: My idea would be that this resolution should be, if you will permit the chair to make this suggestion: "Resolved, that this association recommends the adoption of the car-hour as a standard unit of comparison, with the understanding that it is to be put to a practical test by each company represented in the membership of this association, either in connection with the car-mile or not, as they may see fit, and that the committee report back at the 1901 convention."

Mr. Wilson: I don't like that phrase recommending the "adoption." It is true that we go on to explain it afterwards.

President Duffy: Suppose you use the word "use," instead of "adoption."

Mr. Wilson: I think it will be better, possibly.

President Duffy then put the question on the adoption of the resolution as amended, and it was adopted unanimously.

President Duffy: A matter that I would like to speak of is the Railway Officials' Private Report and Reference Book, that I referred to in my Address as President. The publishers, Messrs. Hanna & Gray, have left with Mr. Brockway several copies of the book. Any gentleman belonging to this association who desires one of those books will be very cheerfully supplied, if he will simply fill out one of the cards that Mr. Brockway has, and if he would prefer to have the book stamped with his name, if he will turn the card in Messrs. Hanna & Gray will send the book as soon as they can give the order to the printer. But if members wish the book now, by simply leaving the card with Mr. Brockway, he will provide them.

Secretary Brockway: There is one matter which is very close to my feelings with regard to the association, and that is the membership. It has been, I can almost say, our habit to go away from the conventions with fifteen or twenty members gained at the convention, and for your information I want to say that we have thus far gained two at Kansas City. We are considerably behind our record, and we are going to need the constant co-operation of all the members to gather in those who are not with us at present; if I can feel sure that everyone is keeping that in mind in talking with other railway men here, I think we can leave here with our usual record.

Mr. J. M. Smith: How would it be for some person or some member of the American Association to take up our cause and speak to the managers who are attending the convention on the other side of the hall, with a view to increasing our membership. There are managers here who could speak for their companies and join us while they are here in convention. If it is left for individuals to go around, we do not meet them to know them at all. I do not know one in ten.

President Duffy: I will speak to the secretary, and see what can be done in relation to that.

Secretary Brockway: We have a plan in mind for securing the co-operation of the secretaries this coming year, the secretary of the American Association working among its members who are not members of this association, and vice versa, but the idea I had in mind was to strike while the iron was hot and while we had them right here, subject to personal influence.

On motion the convention adjourned until 10 o'clock Thursday morning.

THURSDAY OCTOBER 18TH.

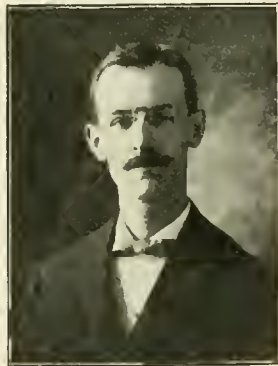
President Duffy called the meeting to order at 10:40 a. m. and at once announced the first paper.

DEPARTMENTAL ACCOUNTS.

By H. L. Wilson, Auditor Boston Elevated Railway Co., Boston, Mass.

In an unguarded moment I yielded to the request of our worthy president and agreed to prepare a paper on what he has seen fit to call Departmental Accounting. Three weeks ago the task was taken up for the first time, and it at once occurred to me that it was too broad a subject to attempt to cover in the limited time that should be devoted to a convention paper, and I so informed him and begged to be allowed to change it, but while he acknowledged it would be a difficult matter to digest, and as he put it, could be extended to the "length of the Holy Bible" he still insisted on my sticking to this title. If I was only sure that a book of this kind would have as large a circulation as the one he mentioned, I would give up accounting and go into the publishing business.

I will try, however, to give simply a rough outline of the system that we have adopted as the best method of handling labor and material accounts so as to have the maximum amount of quickly available information with the minimum amount of clerical help and expense, and trust that the members present will ask any



H. L. WILSON.

questions that may suggest themselves and in that way bring out any important points that may have been overlooked, as this is not submitted as any pet scheme but simply as the best method that experience has suggested up to the present time.

In the first place I am strongly in favor of having all accounting so far as possible, done in the main office of the auditor, rather than at the shops or department headquarters. There are several reasons for this, prominent among which are: That there must always be a responsible head to properly direct the efforts of others, and if it is all done in one place a really bright chief clerk may be employed, to whom a proper salary may be paid, who can have a supervision of all details, and any questions that arise can at once be referred to the auditor for his personal attention. Again there are times when the entire force can be put on some special and important piece of work that it is necessary to have completed at once; there are other times during the month when the pressure of work is such that some of the clerks can be engaged in collecting together the less important matters that have been allowed to accumulate during the busy time.

Another and very important reason is that there may be instances where estimates have been given of what certain work would cost, where the expenditures have greatly exceeded the estimate, and where it might be thought advisable by the head of the department to make transfers to other and improper accounts in order to substantiate the original figures.

When information is desired a question can as well be asked in one place as another and certainly a more prompt and probably a more intelligent answer can be obtained from the place where all accounting is done than it would be possible to get by consulting several separate departments.

If, as is the case of the Boston Elevated Railway Co., there are several departments, any one of which may do certain work properly chargeable to another, it simplifies the accounting to be able to post the details to the proper account direct, and avoid the trouble of making charges and credits back and forth which would be necessary if the accounting of the departments was done at separate places.

The four departments into which the Construction, Equipment and Maintenance forces are divided are as follows:

Department of Motive Power and Machinery.

Department of Wires and Conduits.

Department of Buildings.

Department of Maintenance of Way.

No claim is made that the system as it is at present arranged is applicable as a whole to all companies, but the fundamental principle which is the order number system can certainly be applied to any road.

The method of issuing order numbers varies somewhat in the different departments.

In the shops the method is to have the superintendent or foreman give each class, and in many instances each piece of work performed, an individual number. The first order is numbered one and then they run along consecutively for two or three years or until there is no chance that by beginning over again the numbers will in any way conflict.

When an order is issued a copy of it is sent to the Bureau of Audit so that the auditor may determine from the nature of the work the account to which it should be charged, entry is then made upon cards provided for this purpose which have headings for the Order Number, Account Charged, Date Issued, Date Completed and Description of the work. Below are printed spaces for the Month, for Labor, for Material and Invoices, for Shop Expense and for a Total of the above charges.

These cards are made double or folded over at the top, so that by using a small carbon sheet a duplicate can be made with only the labor of one entry. The advantage of this system, is that by separating the card when the order is completed you have an opportunity of making any number of separate and complete lists without in any way interfering with the original files which can still be kept in their numerical order.

If you want to know what the charges have been to any account, what kind of work has been done for any department, an alphabetical list of all work or anything of this kind, it only requires a new deal of this extra pack, to have the information in such shape that it can be quickly utilized.

The labor is reported weekly on sheets which have a heading for the Name, for the Date, for the Rate of Pay and for the Occupation; below are provided columns for the Order Number, for the Days of the Week, for the Total Hours and for the Amount. This sheet has some 35 lines and provides in this way for a man who may work on 35 different order numbers during any one week.

The pay roll of course can be made by simply taking the total hours from the bottom of the sheet, while the charges to the order numbers are made by taking the amounts from the Amount column. These labor charges are abstracted on sheets of the same size as the time blanks and all are then bound together in book form with these abstract sheets as the front pages, and the entries made upon the cards from this form. The advantage of this is at once plain; you have the card which shows you the date and you can quickly refer to the abstract and if necessary by referring to the following pages you can at once tell the names of the men who worked upon the order as well as the days of the week and the hours each day that they devoted to this particular order.

The material used each month is reported on a sheet which has provision made in the printed heading to put in the Order Number, and below spaces for Quantity, Kind of Material, Price and Amount. These sheets are abstracted and bound in the same manner as the time sheets mentioned above.

We require all parties of whom we purchase supplies to use bill heads which we provide. These have spaces at the bottom in which to place all approvals and a space for a notation of the account to which the goods should be charged. Before adopting this idea, bills frequently reached my office in such a condition that it was difficult to read them, they being pretty well covered with rubber stamp impressions and signatures.

When charges apply to any department the bill is entered upon

an invoice book which has spaces in which to make a copy of the invoice and enter the total amount, and separate spaces headed with the name of each department. These last spaces are subdivided into columns for Amount and Account to Charge.

By abstracting each of these columns you have all the information necessary to make your entries to the proper accounts and the totals of all will prove the total of the invoice book.

Any general expenses of the shops are charged to an account called shop expense and this is divided each month among the different order numbers under which work is being done.

The Department of Motive Power and Machinery has several subdivisions such as Machine Shop, Car Equipment Shops, Car Repair Shops, Armature and Field Winding Shops, seven Power Stations and has also charge of small maintenance crews in each of the 30 car houses.

I have explained the system of reporting all labor, material, etc., consumed at the shops, and the methods of making returns from the other places are so similar that I will not occupy your time with a description of the minor differences.

Blanks vary somewhat in the headings but the idea that we have attempted to carry out, is to have them all of a nearly uniform size so that they may be bound in the little booklets before referred to.

A large number of them are arranged in manifold books so that there is always an exact copy of what has been sent to the main office and as each blank is numbered we at once know that something has gone astray if they do not run along consecutively.

By having a large cabinet with drawers arranged for each kind of report, ready reference can be made to any or all original time or material sheets.

In order to make a monthly report of the expenditures it is of course necessary to compile the information you have on all these abstracts.

This is done on separate sheets for each shop, power station, etc. By having these sheets graduated in size so that the upper one is the narrowest and each succeeding sheet just one column wider, you have all the totals together in a horizontal line and a grand total is easily and quickly obtained by simply adding across. The widest or bottom sheet has on the right hand side a sufficient space for the Names of the Accounts and a place for the ledger folio. In this manner the necessity of writing the title more than once is obviated and all necessity of journalizing is done away with, as these sheets bound together make a more complete and readily accessible journal than is possible to have by any other method.

For the Department of Wires and Conduits a different system of order numbers is used. It might be well to here call the attention to the fact that the company with which I am connected owns no surface tracks or their equipment, yet has in its immediate control, and operates all the surface lines in the city of Boston and near by suburbs under a lease for a term of years from the West End Street Railway Co.

This lease stipulated that the Elevated company should build no surface lines of its own, but that all additions to the surface lines or their equipment should be charged to and become the property of the West End Street Railway Co. and that credit should be given to the latter for any removals that were made.

It was therefore necessary to have a very complete and exhaustive record of all property, that could be quickly referred to and easily handled, and books of all kinds were considered but none of them seemed to cover both of the above desirable elements.

Cards were then taken under consideration and the great elasticity of this system at once recommended itself.

First index cards were prepared having for headings the names of each street, car house, bridge, etc. on the entire system.

The Electric Line Equipment had always been divided under five general headings: These were Poles and Setting, Overhead Feeder Lines, Overhead Trolley Lines, Underground Cables and Conduits, and Submarine Cables.

Cards were next provided for each separate kind of line equipment, and it was found that to give a complete analysis of the above five accounts would require the use of forty different forms of cards, and for quick reference it was decided to use several colors as well as number each card on a small tab or projection from the top.

For Poles and Setting 13 buff cards were used which are num-

bered from 1 to 13 consecutively. The first 4 are used only for the 4 sizes of iron poles which are the sole property of the West End company. The next 6 are used for wooden poles which are owned jointly by the West End company, and some other company. No. 11 is used for wooden poles owned exclusively by the company, No. 12 for special poles and bases, and No. 13, for span attachments to buildings.

For Overhead Feeder Lines 8 cards were provided: they are blue in color with tabs numbered from 14 to 21.

The first 5 of these cards are used to designate the amount and size of different kinds of feed and return wire. No. 19 is used for feed taps, No. 20, for switch boxes and No. 21, for track connections.

For Overhead Trolley Lines 3 cards are used, being salmon in color, numbered, 22 which is used for bracket construction, 23 which is used for insulating joints and 24 which is used for trolley wire.

For Underground Cables and Conduits 8 cards were provided: they are buff in color and are numbered from 31 to 38.

The first 2 numbers are used for Feeder Cables, the next 3 for Return Cables, the next for Feeder Cable Connection, the next for record of Conduit and Manholes, and the last for Conduit Connections.

The next 8 cards are used for records of Submarine cable for return wires; the first 4 numbered from 51 up are used for the Feeder Cables, the next 4 are used for Return Cables, and the last for Cable Houses, Switch Boxes, etc.

In order that the Wire and Conduit Department should report its expenditures in such a way that the Accounting Department could make the charges to the proper locations, a system of order numbers was devised to be used whenever additions to or removals from existing construction were made.

First each kind of equipment called for by the cards was given a number which corresponds with that on the tab of the card, and each Street, Car House and Bridge on the entire system was given an individual number commencing with 100. By preceding the number designating the street by the number designating the kind of equipment you at once have all the information necessary to tell to what location and to what account the labor and material should be charged.

This method furnishes many thousands outstanding order numbers any one of which can be readily selected from the printed list containing less than 600 numbers.

The labor is reported on the same form as that previously mentioned for shops, but the material sheet is somewhat different.

It is impossible for a foreman to always know exactly how much material will be used on any one job, and frequently he is called upon to do work on several locations without going back to the stock room, and thus it is necessary to provide some form by which he can draw stock and report what he uses.

This is provided by a manifest on the face of which is entered the material drawn. The back of this sheet provides for a report of the material used and a report of the Material Returned. The "Note" printed on the front side of the sheet reads as follows, and explains its use:

"NOTE:—This manifest is to be retained by the person responsible for the material issued upon it until every article is accounted for on the opposite side of this form.

"All material issued upon this manifest which is unused on the last day of the month must be returned to the Storekeeper for inspection. The Storekeeper will receipt for it, re-manifest it or stamp this manifest 'Inspected' as occasion requires."

These manifests are made in duplicate by the manifold system, and a correct copy of the original issue of stock is always in the keeping of the storekeeper.

At the end of the month the reports of the Material Used are abstracted on the same form mentioned for shop orders and are bound in the same manner.

The Department of Buildings is chiefly occupied with the repairs and renewals of buildings and in order to answer all questions propounded by the management and by the Bureau of Real Estate a system of order numbers was gotten up for its use. The principle here employed is similar to that of the Department of Wires and Conduits each kind of work has a classification number and each building has one or more numbers which designate the building and in some instances the different portions of the building. The

method of reporting labor and material is the same as that used for the shops.

The Department of Maintenance of Way as its name implies, has charge of the repair maintenance, inspection and construction of track and paving.

Order numbers are issued for any new work or for any extensive renewal or repairs by the Civil Engineer, who sends a notice to the head of the Department and also to the Bureau of Audit.

The department is divided into eight Divisions, called sections, and each carries a supply of the material they are continually using.

Each section's stock is carried under the following 13 accounts:

- Gravel
- Paving Stone and Flagging
- Lumber and Ties
- Nails and Spikes
- Rail Fastenings
- Tie Rods and Buttons
- New Rail
- Old Rail
- Special Track Work, Frogs and Switches
- Miscellaneous Material
- Track Welding Material
- Scrap Material and
- Track Wiring Material.

When material is received at a section which is to be included in any of the above stock accounts, the person in charge immediately enters upon a form provided for that purpose, the date, the firm's name or section from which it is received, and the quantity and kind of material.

These reports are numbered consecutively, and are sent to the Bureau of Audit where all bills are entered on an invoice book which is abstracted each month, and from this abstract charges are made to stock accounts or to jobs direct.

When material is used or sent away, entry is made on a form which gives the Date, Where Used or to Whom Sent, Quantity and Kind of Material, Price, Amount, Account to Charge and Account to Credit.

These sheets are abstracted twice, once to get totals for the charges and once to get totals for the credits, and are bound and filed away in the usual manner.

When material is received from track taken up, or is returned from any work, it is entered upon a sheet which provides for the Date, Where From, Quantity and Kind of Material, Price, Amount, Account to Credit and Account to Charge. These are abstracted and bound in the same manner as the Material Sent Away sheets.

All labor is reported on a form which has the usual heading, and provides below for a separation of Maintenance and New Construction charges, as well as the location where the work was done and the particular kind of labor that was performed. These are also abstracted and bound.

We will now suppose we have four kinds of bound books from which we are to make up our monthly report for the department.

We take a report blank and head it with the name of the section. This blank has columns provided for Approved Entries, for Each Kind of Material, for Approved Bills, for Labor, for Total Charges and Credits and for Net Charges and Credits; and down the right hand side has accounts to which charges and credits are to be made.

We then take the abstract of the invoice book and enter with red ink on the first line opposite the headings Approved Bills Charged to Stock the total charge to each kind of material; next we enter with black ink in the Approved Bill column, all other items on the abstract putting each one on the line opposite to the account to which it is to be charged.

Next we take the Material Used or Sent Away abstracts, and under the proper material headings and opposite the proper accounts, we enter in black ink these items.

Next we take the Material Taken Up or Returned abstract, and with red ink enter under the proper material heading and opposite the proper account, all these items.

Next we take the labor abstract and enter in red ink under the proper material headings the charges for labor on account of each stock account, and then enter in black ink in the column headed Labor and opposite the proper account, all other charges.

There is one other column on the report sheet of which no mention has yet been made; this is the first one on the left hand side, and is headed Approved Entries. This was provided to take care of journal entries, as the use of this report obviates the use of the customary journal.

Any entries necessary to transfer one account to another are made on journal blanks, and these are dated, numbered, bound together and abstracted, and from this abstract entry is made upon the report sheet.

By now footing these sheets across, you get the total charges and credits to each account, the black figures being debits and the red figures credits, and by footing the columns of material up and down you get all the debits and all the credits to each kind of material account; in this instance, however, the red figures are debits and the black figures credits.

Only one section has the accounts printed down the right hand side of the sheets; the others all leave off with the column headed Total Charges and Credits, and by placing these sheets side by side you have all debits and credits from all sections opposite the account, and the net debit or credit can at once be ascertained by adding these amounts together, and by carrying the net result into the column headed Net Charge or Credit you have only one amount for each account.

All items appearing in this column are then posted to their ledger accounts, and the footings of all material columns are debited and credited to their proper ledger accounts, and the sheets are the most complete and compact journal it is possible to have, as you can tell at a glance every item that went to make up the total of any account and what section furnished the labor or material.

When any work of this kind is completed the Superintendent of Tracks sends a report to the Auditor giving the date that the track was finished.

A detailed statement of all labor and material charged is then made up and this is sent to the Civil Engineer who can at once tell from this report whether or not the proper amount of material has been charged, and he reports back in such a form that the information can at once be distributed on the cards provided for a report of the track mileage.

These cards number some 17. The first 4 are used to designate the different kinds of rail and have spaces provided for the Date, Kind of Paving, Remarks, Added, Removed and Amount.

The last 3 are used for a record of the three kinds of special track work namely Girder, T and Tram, and have additional columns in which to record the name of the maker and the type of work.

These cards together with those provided for the electric line equipment are filed in a cabinet back of the proper index cards giving the name of the street or car house.

If at any time you wish to verify the records of any street it is a simple matter to take all the cards for that location, put them in your pocket and check them on the spot.

In closing I would say that I have a set of blanks with me which I will be glad to show and explain to any member who wishes to look them over and if it is thought advisable to publish this paper in the report of this convention it will give me great pleasure to arrange them in such a way that they can readily be referred to.

Mr. Hibbs: I would like to ask Mr. Wilson what clerical force he employs. It is rather an elaborate system.

Mr. Wilson: We have fourteen men. It is the system that makes it possible to handle it with that number of men. You avoid a great deal of work that it is customary to do. It might be interesting to know that in that office, with these 14 men, with the order numbers and the records, are over 60,000 accounts, all of which, are liable to be active at any time.

Mr. F. E. Smith: You file these away from month to month, don't you; what you might call the journals?

Mr. Wilson: Yes.

Mr. Smith: Suppose you do some more work in the following month on the same job. Is there any reference made on the first entry that it is continued in another month?

Mr. Wilson: No. You would take it from your cards, and your cards would show what month it was charged in. All you have to refer to is the report of that particular month. The same order number applies in different months. The order number is fixed like an account number.

Mr. Tripp: I would like to ask Mr. Wilson if he makes two postings, one to the cards and one to the expense ledger. I assumed that he keeps an expense ledger as distinct from the cards.

Mr. Wilson: That comes from this report. As I say, it is made up; you make one posting from that, of details. The details are posted from the cards, the details of your expense ledger.

Mr. Moore: I would like to ask Mr. Wilson, in the case of the storekeeper issuing materials on these manifests, what record or account does he charge that to in his record so as to keep tab of it as it goes out and comes back.

Mr. Wilson: That is done in the manifold book. It is to all intents and purposes in his stock until it is reported consumed or returned.

President Duffy: You spoke of 60,000 accounts, and said each order number had a standing account. Now I would understand that account No. 1, for instance, maintenance of track and roadway, had a certain number of subdivisions. You spoke of some six or seven. Then there is a second number of order numbers in each one of those subdivisions, like the paving, the rails, and so on. Isn't that the way it operates?

Mr. Wilson: No. Any maintenance charges would be charged direct to the operating expense number, unless it was a very large track job, where the street was being relaid or something of that kind, and then the engineer would give it an order number. For the ordinary matters we do not have the order number.

Mr. Tripp: Mr. Wilson, if a street was numbered 100 and the figure 1 represented track maintenance would 1100 mean track work on a certain street?

Mr. Wilson: Yes, the Maintenance of Way Department; we do not use those numbers except for extraordinary work, but number 1100 would mean that it was No. 1 pole on a certain street. If it was 2100 it would mean it was a No. 2 pole on the same street. We have about 100 operating expense accounts. We have no subdivisions of those accounts whatever, but by this system I speak of, by reference to the monthly reports of the department, you at once know every labor item and every material item, or any entry, by referring to the report. If you wish any further information you go to the drawer, pull out this little booklet I referred to, and then, if it is a question of labor, you can tell the men's names, the day of the week and how many hours of each day they worked on it, because it is all there together. In the same way, if you wanted to know the material, you could tell with the minutest detail what the material was.

President Duffy: You have your expenses divided into 100 accounts, where the classification has only 38.

Mr. Wilson: Yes. The Boston Elevated Ry. has not adopted the standard system of street railway accounting because the railroad commissioners of Massachusetts are the only ones in the United States that have not adopted it.

President Duffy: The reading of this paper and the important paper that is to follow suggest something to me that was discussed with us today by a gentleman very prominent in the other association. That is the practice of some associations of printing their papers in advance and sending a printed copy to each member, so that before they come to the association meeting they can digest the papers and can select from them particular things that they want to be informed upon, and can bring up points for discussion. This practice in associations of a similar character to this one has proved to be a wise one, and I think it would be well worth the consideration of those who are to direct the affairs of the Association next year as to whether we should take up this practice.

The next paper is:

MATERIAL AND SUPPLIES ACCOUNT.

By W. M. Barnaby, Accountant, Brooklyn Rapid Transit Co.

I wish at the outset to state just what I am going to try and explain, and also to give the explanation with sufficient clearness to be understood.

Material and Supplies Account is but a branch of the bookkeeping of any concern and the method of keeping is to be determined by the results looked for. Some one has said that "bookkeeping was but common sense properly applied." I trust that I can prove the truth of this saying as applied to the keeping of

Material and Supplies Account. In the first place what are the results to be obtained?

A correct record of all material and supplies received, showing kinds, quantities, price and from whom bought. A correct record of how used, showing the quantities and values as applied to operation, maintenance or construction as the case may be.

A record which will show at any time, the quantity of any particular stock on hand. A record that will show the various kinds of materials and their value charged to any particular expense or account.

These I think are the main results looked for in keeping Material and Supplies Account. As a basis for accounting in this department of bookkeeping the Stock Ledger is the first consideration. This book should contain the record of all receipts and all expenditures of Material and Supplies and when inventory time comes around gives the value to material and supplies on hand. A Stock Ledger laid out with three accounts on a page is suggested, a book of 800 pages giving some 2400 accounts. This should be opened with the accounts running alphabetically for convenience in locating. This is made so as to give each month practically a separate record. A trial balance can be taken monthly if desired.

The postings to this book are made from the record of materials received and from the consumption sheets which I will explain further on.

After the Stock Ledger, comes the book containing the record of materials received, which for convenience, we will call Book No. 2, the Stock Ledger being No. 1.

This book gives a complete record of all stock received, showing from whom received, quantity, price, kind, value, order num-



W. M. BARNABY.

ber, Reg. No., how shipped, etc., in fact a complete record of each invoice. From this book the postings to the Stock Ledger are made. This book is made on the loose leaf plan, which permits a page, when filled up, to be taken out, allowing the posting to the Stock Ledger without interfering with the work of the receiving department.

We now come to the taking out of stock, and the method of changing to the proper expense or construction account.

All materials and supplies drawn from the stockroom should be drawn by order on the stock clerk, properly signed by those authorized to do so. The form of order is in duplicate, so that each department has a record of what materials or supplies it has used during the month. The order must also state for what purpose drawn. By taking the classification of Expense Accounts, as adopted by the Street Railway Accountants' Association of America, and giving the numbers and letters, the accounting part becomes very simple.

Any special expense or construction account can be kept by the mere giving of some special number or letter to indicate it. In this connection, it should be remembered that labor charges should be similarly treated to have uniformity of accounting.

Orders on the stock clerk are charged daily on the Consumption Blotter, which is made up of a number of sheets properly ruled. The Consumption Blotter is the record of quantities and values of materials and supplies used daily, the name of the materials or supplies being written in the margin and the quantity

and the expense account being indicated. The unit of value is also given, being taken from the Stock Ledger.

After orders on the stock clerk have been posted on the Consumption Blotter the amounts thus charged are analyzed; first, as to the amount charged to each expense account; secondly, as to the value of each kind of material charged. The first result is, in turn, posted on blanks which are the final accounting as to expense or construction charged. The various accounts to be charged are written in at the top and the result of the analysis of the Consumption Blotter is set down daily under the proper heading. At the end of the month the footings of these sheets give the cost of materials and supplies charged to each expense or construction account. The second analysis of the Consumption Blotter is transferred to other blanks for the record of amount used daily of each kind of materials or supplies and from this the postings to the Stock Ledger are made, the value of the materials used balancing with the total amount charged to expense or construction accounts. This form has an additional value, in that it shows just the quantity of each material or supply used monthly, which is a good help to the stockkeeper in determining how large a quantity he should carry, and also enables him to make out his requisitions on the purchasing agent, with intelligence. When more than one stock account is kept and goods are being transferred from one store-room to another a proper transfer order should be used which will indicate the kind, quantity and value of stock so transferred, and also indicate from and to what stock account transferred. These orders which should be numbered are treated by the stock clerk the same as any invoice and should be posted in the record of materials and supplies account and charged out in the regular course.

On the question of putting through material and supplies account bills covering large items chargeable to construction such as car bodies, trucks, motors, generators, etc., I think the method of direct charging preferable. At the end of each month the stock clerk should report to the auditor the amount of materials and supplies received giving a list in detail of bills passing through his record of materials received, also the value of materials and supplies received through transfer from other stock-rooms. This blank gives the quantity on hand on the first of the month, shows all debits and all credits to Materials and Supplies Account, and enables the auditor to check the Materials and Supplies Account as shown by the stock clerk with the general books of the company.

In connection with the Stock Ledger a card system is recommended. Each kind of stock having a card showing the quantity on hand also stating the number of the bin, shelf or drawer in which it is kept. As the orders are filled by the stock clerk the cards are credited with the quantity taken out so that the quantity on hand at any time can be ascertained. Some may say that the time involved would not warrant the keeping of such a system of cards, but I can state that a system covering between 5,000 and 6,000 different stock items can be posted in three hours. The value of knowing that a certain article is needed is obvious to any one familiar with the keeping in repair of car and motor equipments. By such knowledge an emergency order for the particular material or supply needed can be given and a "multitude of friction" thus covered. On this card in addition to showing quantity on hand, a provision is made to show the quantity of such materials and supplies ordered, but not received, which provides against duplicate ordering.

In the matter of manufactured articles such as commutator bars field coils, etc., where the amount made up in a month might be sufficient for a much longer period and it is desired to charge to the expense account only the amount used, the stock clerk would have to set a value upon the product, debit his Material and Supplies Account, the same as for any purchased material or supplies, and set it upon his Stock Ledger and reduce by a like amount his report of such expense accounts for the month. The custom is, I think to charge direct to expense, all material taken out of supplies for such manufacture as though actually used during the month. Only a few of the larger companies do any manufacturing.

I think I have covered the principal features of Material and Supplies Account. It may be that some of the minor details have escaped in condensing this into such a short article, but if there be any particular point not touched upon which someone is interested in, I trust he will not fail to make it known.

In any system of accounting, accuracy is the keystone, and that particular feature should never be lost sight of.

Mr. F. E. Smith: I would like to ask Mr. Barnaby if the material charged out in any one month is charged out at the average prices of the material on hand at the first of the month.

Mr. Barnaby: The unit of value of stock is determined by bringing down what you have on hand at the end of every month, and you establish probably a new unit of value. Of course, in taking up what we call the consumption sheet, we use a certain quantity of any article, which, at the unit of value, gives a figure for the expense, and we bring down the balance in the bin or shelf, and get a value of stock on hand. If it happens to be bolts or gears we know what we have up above, and at a glance can tell whether the price which the unit gives the results, is a fictitious one or not; and it can be adjusted and checked. Practically the unit of value is reset every month, on the first of every month.

Mr. Smith: You might have had a lot of material, say, on the 5th, and used it on the 15th, and that may have changed the price, the average price of what you have on hand. Now if it was used on the 15th, would you charge it out at the average price of the 1st or as of the date that you used it?

Mr. Barnaby: By the use of this consumption blotter, if we had 1,000 on hand at 10 cents, we would charge out the first 1,000 at 10 cents, and just as soon as we got into the next lot we have our price indicated.

Mr. Smith: You charge them off then at two different prices, not as an average?

Mr. Barnaby: We would, then, yes.

Mr. J. A. Harder: Our store-room accounts are not conducted on a very thorough system. We aim to charge out material at an average price and let it go at that, and take an inventory occasionally to see whether we are running short or over and adjust it from that on. We do not keep a very elaborate set of books.

Mr. Stone (Worcester, Mass.): I can say very little to add to the information that is desired on that subject. The road that I represent is a comparatively small one. Our system is accordingly a small one. It is accurate so far as it is carried out. It is a very simple system and would not apply to the larger roads. We charge directly every purchase to the particular account for which it is bought. We take an inventory at the end of each month whereby the stock on hand at the first of the month is given. Added to that is the purchase which has been charged up to the particular account, which is set down, and an inventory is taken at the end of the month both by a book record and by an actual record. At the end of each month we have practically an inventory that covers the maintenance items and the construction items, separated each month and credited back to the several maintenance accounts and the several construction accounts, which ever they may be, and we charge to supplies and credit to operating expenses or construction accounts whatever material remains in hand; charge up each month again and start over. It is very simple and at the same time it is a system that can be applied to a small road so as to arrive at very accurate results. I am quite interested in hearing these papers, particularly the paper that has just been read, because a different system of accounts may be applied to our road later on, and that which applies to the larger roads is what I am particularly interested in.

Mr. Frank J. Suda (St. Louis): All the material that comes into our storeroom is given a lot number and we use the card system. On this card we place the lot number, the name of the article, from whom purchased, the date received, the quantity received, the valuation, which is taken from what I call the receiving sheet, which is kept by the storeroom keeper. When the article is given out it is given out by the lot number, and in that way I get the quantity and the valuation. At the same time I get the account in which the material is charged. Every man that comes into the storeroom gives his individual receipt for the material that he gets, and must state for what this material is used. These little slips are then taken up twice a month, on the 15th and on the 31st, and are entered on what we call our maintenance sheets, which are properly headed with the accounts to which these various items are charged. That also applies to castings. Every casting receives a number. No pattern is made without a number being given it, and when it is charged up or given out, it is given out by this lot number. I lot everything except screws, bolts of all kinds, cotter keys and such minor things as those, and at the

end of stock-taking time, I offset one way or the other. So I think on the matter of lotting the articles and the castings I offset at the actual valuation both ways every time. If by some means or other the entry clerk makes a mistake in charging out, if he charges out \$10 too little, when he comes to balance out that particular lot he knows exactly whether he has been charging it properly, on the right valuation, and he can also check the storekeepers at any time by referring to his cards and asking the storekeeper how much material he has of this particular lot, and he knows whether the storekeeper has let any of this material slip through his fingers without getting a charge for it. Our system is not exactly as I would like to have it, and I am looking for some improvement if I can get it.

Mr. P. V. Burlington (Columbus, O.): We do not run a supply house account. We take care of all the purchases and use of material and supplies through general ledger accounts. The larger purchases, such as rails, ties, wheels, poles, perhaps all together 15 or 20 such accounts, we hold in what we term an open account, and we charge out approximately each month what would naturally belong to that month, and so far we have been very successful in approximating and have kept our operating expenses per cent at a very regular figure. We have had no difficulty whatever. Of course we do maintain in our shop our supply account, but it does not come into the audit office. It is simply as a matter of record for the shop department. All other materials, track, overhead, etc., are taken care of as I stated.

Mr. Mitchell (Pittsburg): We run our shop accounts, material and supplies, in about the same way. We find it works very satisfactorily. We take an inventory about once a year.

Mr. W. G. McDole (Cleveland): I would like to ask Mr. Barnaby what he does with his freight and cartage and handling of materials?

Mr. Barnaby: All the trucking we do we run it through a department and they have a card system there, and all the expenses of that department are charged to a trucking account. The cards are analyzed and the value of the truck per day is set down at a sum per day. The cards are charged out, as the cards indicate what work they perform, and it is set up as an expense item, charged to the account, and the trucking is credited. Of course at the end of the month, or a period of months we get a slight debit or credit which we adjust by taking off a slight percentage of the charges. The bigger trucking charges go through the trucking department; there is very little of that trucking that we get, as our purchasing agent makes it a rule to purchase everything f. o. b. dock, and the handing of supplies from the shops to any minor jobs we charge to a shop expense account direct.

J. M. Smith (Toronto): Our system of material and supply is somewhat similar to some which have been explained here. I run what we call a material order book in which every requisition for material is first entered, and as the goods are received they are reported to me on a daily sheet, all the materials received. I might say, first, that I control all of the clerical work in connection with it in my department, that I got this daily sheet of all goods received, fully explaining it, giving them a number, etc., and they are checked and entered as against the requisitions, in the material book, so that we have the requisition entered as filled. Then, for any freight, duty, or any charges like that I have separate columns, and that is added to the cost of the goods to give me the price of that material. The material is summed up at the end of the month, and then I have a sheet that is sent to me daily of all materials delivered out of the stores, giving the classification and accounts that these are to be charged to. That is then kept track of in a subsidiary book until the end of the month, and then posted to this material order book and subtracted. That, you will see, leaves me the balance of material that is there in hand and can be taken off, as I do, giving the full detail of all the materials on hand at the end of the month, practically an inventory of the goods. I have found that it was very satisfactory, and I have a pretty good check on the storekeeper, because if he is making any charges that are not correct he will find himself short at the end of the month. I am always open for suggestion and I appreciate this paper read this morning very much.

Mr. Hibbs: I would like to ask Mr. Smith under whose direction or supervision the storekeeper comes. I understand from

Mr. Smith that the requisitions go direct to him. Is that as it ought to be?

Mr. Smith: The storekeeper is practically under my own control. All requisitions are made out and then a copy is sent to me; the requisition is forwarded to the merchant and a tissue copy is sent to me and entered.

Mr. Ehrhardt: We charge everything direct as it is purchased and ordered, probably the same as you do, or used to. Of course, we have a storeroom and keep a stock on hand but we make no charges nor entries from that storeroom. Everything is charged as it is purchased.

Mr. Burlington: It seems to me from inquiries made when this paper was brought up that it might be a valuable work for this association to appoint a committee to formulate a uniform system in this particular line. It is a vital question and I realize that the property with which I am connected is getting a little too unwieldy for the plan on which we have been operating our material and supply account, and I am very glad to have the privilege of listening to this discussion, because it is coming right in the line that I desire. I would like to hear some expressions on that. It seems to me that it is a valuable work that this association might take up. We have to have something to further perfect our system of accounting, and would it not be proper and wise to give this matter some attention?

Mr. Mackay: I would suggest that we might take up in each meeting a few of the necessary blanks and forms, and establish those few. We could standardize a few of the forms, and in that way gradually get the whole thing in shape.

As far as our storeroom accounts are concerned, I think I explained at the last meeting that we charge out all reconstruction work direct, the items not passing through the storeroom account at all. In all expense accounts most of the items pass through the storehouse, but where an item is purchased and sent direct to the work, for instance, oils or material for power plant, it is charged direct to the plant. We always make it a point to charge it out. Anything that goes through the storehouse is charged out at a figure which exceeds the cost sufficiently to take care of the cost of handling and to take care of the breakage or depreciation in the value. In that way at the end of the year our inventory always runs in excess of the ledger account.

Mr. Tinglan: I think however that on the intake I can give you a little light. Our requisitions are all made in duplicate. On the back of the duplicate requisition there are ruled columns for the date of the receipt of the material, the quantity, price, and if it comes in car load lots there is a place for the car initial, number and weights and a complete record up to the date of the receipt of the invoice. We use our own invoice form, which is in duplicate, the duplicate remaining in the city railroad office, the original returning to my office. On the face of that is a place for freight charges, the initials of the man who receives the goods, the certification that they are correct as to quantity and quality and the approval of the superintendent and the account to which it is to be charged. All our purchase orders are issued in triplicate. On the back of the triplicate purchasing order is a ruling identical with that on the back of the duplicate requisition. We take the bill which is returned to our office, and keep a duplicate record of the receipt of the material and all the details that go on the back of the original. The storeroom ledger is kept in the subsidiary office. We keep a storeroom account on our general ledger for that particular office in my office. These two ledgers must balance at the end of the month. On each job the foreman gets from the superintendent what our boys call a green goods order. It is a duplicate order numbered consecutively, but in front of the number is a place left for a letter designating the class of accounts, "a" being for track, "b" for ties, and so on. When a man comes to the storeroom with this order, the letter is put in front of it, he gives that up and receives a material sheet on which is entered all the material drawn from the storeroom. There is a place for a credit back if he returns any and a place for this order number. That is all he knows. He does not know anything about the account. He is given a number and a letter by the superintendent, and that is placed on his storeroom order. When his material is returned the proper credit is given him at the storeroom for any return, and that sheet is at once sent to the office. If it is a running job we have what we call standing orders for the track repair man and the overhead repair man, but

any special job is returned as soon as it is completed. At the end of the month these are formulated and on the report which comes to my office is a charge from the storeroom for each bit of material, giving the quantity and price. From that we check up our storeroom account on our ledger. That is, in substance, the way we keep it. My record in my storehouse, I am frank to confess, is a little bit lame, and I came here with the hope that I would get some information.

Mr. Wilson: I would like to ask Mr. Barnaby one question. He said it took about three hours to post on the cards the material that was issued during the day. I thought it was your road that had the cards upon the bins.

Mr. Barnaby: That has been discontinued. It has been decided that it was easier for a man to have the cards, and get a better result than to go upon a ladder and try to post that card on the bin, more apt to get correct posting.

Mr. Wilson: Do you attempt to find all the issues of one stock and make one posting on the card, or do you make as many as may be necessary?

Mr. Barnaby: No. In analyzing the consumption blotter where it is first entered you get the entire quantity used that day.

Mr. Wilson: From this blotter, you cannot analyze your stock, but you put it down in such a way that you know what the charges are to be from the blotter.

Mr. Barnaby: On the consumption blotter is indicated the value charged to any expense account. As the orders are analyzed they are entered twice. That is, the first analysis is as to the charge that the goods are to be put to. That is indicated as the samples show there, (referring to exhibits accompanying Mr. Barnaby's paper.) the job number and the value. That is then tabulated to get the quantity of any particular material put on this consumption sheet as against that material. From that the cards are posted, so that with the quantity of goods set up on the card and the daily postings, from this analysis of the consumption blotter one can tell at a glance, as soon as these cards are posted, what is still left on hand of those particular goods.

Mr. Wilson: Then you practically analyze it twice?

Mr. Barnaby: It has to be analyzed twice practically, once for the charge and once for the quantity of goods.

Mr. Ham: I would like to ask Mr. Barnaby whether the clerks who do this storeroom accounting are subordinate to the storekeeper.

Mr. Barnaby: They are subordinate to the storekeeper and now the storekeeper is subordinate to the auditor. That is something, that, when you were there Mr. Ham, was not so.

Mr. Ham: The point is whether there is any scheme yet devised which is a check upon the storekeeper, or whether we still have to rely upon the honesty of the storekeeper. That is one of the objects of the storeroom accounts; and I am quite strongly of the opinion that it is a physical impossibility to check the storekeeper.

Mr. Barnaby: In that regard I refer to Mr. Wilson's paper. As I take it, his orders that he receives direct from his storekeepers must be certified by someone in charge. Of course, honesty in accounting finally resolves itself into whether it is the clerk who is the honest man or the auditor. At some point the honesty has got to be determined. The signing of the order under Mr. Wilson's plan is the point where the honesty has to be determined, and if he knows that that man is honest, his accounting is honest, for he takes his result, and it is a final accounting.

Mr. Ham: That is only one-half of it. The other half is the receipt of the material.

Mr. Barnaby: You have the same thing in reference to the receipt for the goods? Someone is in authority to receipt the voucher as to the goods received.

Mr. Ham: I am not criticizing the method at all. But I wish to know it is possible to check the storeroom keeper with any system of accounts. I have found that possibly we thought we were doing this but were succeeding very poorly, and I am satisfied to give it up. I do not think it is practicable, for the same reason that we see an immense department store with very little of that kind of accounting; as I understand it, none at all. But we are attempting, as Mr. Suda of St. Louis, said, to keep track of all of these items, and he says that if there is a mistake on the part of his storekeeper he can locate it on the particular account; but after he has located it the question is what good it has done. The real point in this that appeals to me is whether it is wise to keep

separate accounts of individual articles. I mean by that, a separate ledger account or separate accounts to show stock on hand of each article. It entails an immense amount of work. Is it necessary or can we get the same results by surrounding the storeroom itself with every safeguard, that is, as to material going in and material going out? Many of us have possibly kept accounts very carefully in storerooms where the storeroom itself was laid out in such a way that anybody could go in and help himself to material. It seems to me that it is the storeroom itself that should be watched. I would like an expression of opinion on this. I am keeping these individual accounts, and if possible I would like to do away with them.

Mr. Wilson: When I started storekeeping a number of years ago I started with the idea that you must keep an account of the different kinds of material, and I continued it for some two or three years, but give it up. At the present time the entire material in our stockroom is simply one lump of stock. Since doing so the results have been very satisfactory indeed. The material is received from the persons from whom we purchase goods and certified to on the bottom of these invoices. If you recall to mind my paper, I stated that we require everybody from whom we purchase goods to use our bill heads and not theirs. There is a place on the bottom of these bill heads for the approval of the person who receives the goods, for the approval of the head of the department who has the requisition for it, of the clerk who has entered it and the purchasing agent, who states that he ordered the goods and that the price is correct. Then all these bills are charged direct to the storekeeper, or to the storeroom. Material that is delivered is never delivered on any order or requisition signed by simply an employe of the company, but it must be by the foreman or person in charge. I think that answers practically Mr. Ham's question as to having a responsible person whom you can hold for the goods which have been issued. By having these original orders and demanding personal requisitions signed by the person in charge of the shop or department, it must be collusion between him and the storekeeper to work any mischief which it would be a difficult thing ever to guard against; or if it was a question of the receipt of goods, between the storekeeper and the person he would receive them from. That would be a safeguard which it would be difficult to provide.

Mr. J. M. Smith: In that regard there is one thing I did not mention. I have a check on the goods received, for the reason that I do not let an invoice go in the storeroom house at all. I said I had a daily report come to me of all goods received. They are given a number, each package just as it comes in on the counter, and are entered on this sheet. The requisition is referred to the merchant whom these goods are received from and then it is sent to my office; so that they do not get the invoice at all. I know that the requisition has been received by myself, and then that invoice is treated in my department, is given its proper number, and forwarded to them to check the prices; the storekeeper being the one who has purchased the goods, knows all about the prices. So that I get a full check and know that everything is received. If an invoice comes in that has not been advised of, I can call him to time, but our record shows it at once.

Mr. Harder: Following up one of the questions Mr. Ham asked of Mr. Barnaby, I would like to know how many companies in this association have the storekeeper under the jurisdiction of the auditor so far as the storeroom accounts are concerned.

A poll showed 18 where he was and 2 where he was not.

Mr. Mackay: I seem to be quite a minority here. In our company the storekeeper is really under the general manager, so that, while in a certain sense the auditor is brought in relation with it, still he is under the general manager.

Mr. Barnaby: I would think that it would be well to ask Mr. Ham and Mr. Tripp who are members of the committee appointed by the association to report on a system of account for lighting, gas and power companies, to report to us next year as to action taken.

Mr. F. E. Smith: I move that a committee be appointed to prepare a uniform set of blanks for the approval of the association on stores, from the purchase to the inventory.

Mr. Mackay seconded the motion which was carried unanimously.

President Duffy: I will appoint on that committee Mr. Burlington, Mr. F. E. Smith and Mr. Tinglay.

There is another important matter here that should be taken care of at once. That is, the proposition to change the by-laws, as to the time and place of meeting.

It was moved and seconded that there be no change. The motion was carried unanimously.

The executive committee reported that it had held two meetings; that it had taken three mail votes, admitting 25 companies to membership; that the books of the treasurer had been audited and found correct.

The report was accepted.

The Committee on Resolutions reported resolutions of thanks to the hosts of the convention in Kansas City, which were unanimously adopted.

Mr. Wilson, of the Nominating Committee submitted the following list:

President, Wm. F. Ham, comptroller Washington Traction & Electric Co., Washington, D. C.

First Vice President, J. A. Harder, auditor Metropolitan Street Railway Co., Kansas City, Mo.

Second Vice-President, J. M. Smith, comptroller Toronto Railway Co., Toronto, Canada.

Third Vice-President, W. G. McDole, auditor Cleveland City Railway Co., Cleveland, Ohio.

Secretary and Treasurer, W. B. Brockway, assistant secretary, New Orleans & Carrollton Ry., New Orleans, La.

Executive Committee: C. N. Duffy, auditor Chicago City Ry.; C. S. Mitchell, auditor United Traction Co., Pittsburg; C. M. Hemingway, cashier Connecticut Lighting & Power Co., New York; D. E. Tripp, auditor Seattle Electric Co., Seattle, Wash.

The gentlemen recommended were elected, the secretary casting the ballot of the association.

Mr. Harder then extended an invitation to the accountants to bring their wives, sweethearts and sisters and go for a trolley ride on Friday.

Mr. Ham was invited to the platform, and President Duffy said: Mr. Ham, permit to turn the chair over to you and to congratulate both the association and yourself.

President-elect Ham: Gentlemen of the Association; I wish to thank you for this honor. I consider that everyone of us should be proud of this Association. Personally, I have devoted some time to it, some hard work, but for every stroke of work that I have put in I have been amply repaid. If I have done anything for the association, it has done ten-fold more for me, and I believe that any man who can come to the conventions of our association will be greatly benefitted, and his company will be benefitted. It is by coming in contact with other men in the same line of work that we are enabled to free ourselves from the dust and cobwebs which accumulate in our craniums, and I think that accountants, bookkeepers, something like school teachers, are very apt to get in ruts. Each one of you can help the association very materially by doing anything in your power toward increasing our membership, in order that it may be a representative membership. We have 98 companies, and I was very sorry that we could not have made it 100 at this convention; but if each member would take a little interest in it to see that his immediate neighbors, or the companies with which he has some influence, or can get some influence in some indirect way—if he can present the matter to them and they can be advised of the work that we are doing, I think no company will care to remain outside of our association.

I am very glad that we have decided to meet at the same time that the American Association meets, as much as anything for the reason that we are brought in contact with the general managers and the general managers are brought in contact with us. I think that the effect of that will be that our work will be more appreciated, that we will come into closer touch with the operating department, be more valuable to the street railroad work, and that the position of accounting officer will become a more dignified and honorable one.

Mr. Moore: Mr. President, it seems to me that inasmuch as the various consolidations of street railway and traction companies have not reduced our membership, as we expected it would a year ago, and as our treasury is fairly full, it would be proper at this moment to recognize in some measure the work of our efficient Secretary. To that end, I make a motion that the salary of the secretary for the incoming year be advanced from \$200 per annum to \$300 as a recognition for his attention to duty.

Mr. Harder: I second the motion.

Mr. F. E. Smith: I would like to amend that. I do not think it is enough. I wouldn't do it for that, and I don't believe there are many here that would. I will move to amend by making it \$500.

Mr. Moore: I will accept the amendment.

President Ham: I understand, then, that the original motion is withdrawn and that the motion now before the house is that the salary of the secretary and treasurer for the present year be \$500.

The president put the question and the motion was carried unanimously.

A resolution of thanks to the association's hosts in Kansas City was passed, it was ordered that the portrait of the ex-president be inserted in the published proceedings, and the convention then adjourned.

DEPARTMENT OF BLANKS AND FORMS.

Like the American Association, the Accountants' devoted Friday to the inspection of exhibits and in their case the display included Secretary Brockway's collection of Blanks and Forms. These blanks have all been properly classified and conveniently arranged



EXHIBIT OF BLANKS AND FORMS.

in 15 large books, which were arranged along the north wall of the roof garden of Convention Hall, over 150 lineal feet of tables being required. Our engraving gives a very good idea of the exhibit of this department.

STANDARD PAINT CO.

The remarkable increase in the business of the Standard Paint Co. during the past year may be taken as a certain indication that the excellence of the P & B products is fully appreciated by the trade. The demand has grown to such an extent that within the year the company's plant has been increased to almost three times its former capacity. The principal manufactures are the "P & B" preservative and roof paints, insulating compounds, insulating and sheathing papers, insulating tape, ruberoid, ruberoid roofing, motor cloth and car roofing, and armature and field coil varnish. These are made at both the American and European factories.

The company is always well represented at important industrial expositions and has never failed to receive proper recognition for its exhibits. At Paris, in addition to exhibits in the American section and the Civil Engineering and Transportation Department, it erected a pavilion composed entirely of ruberoid, which was occupied by the Paris municipal customs officers. At the American Street Railway convention in Kansas City there was a full line of the company's materials, and Messrs. J. C. Shainwald and J. F. Hicks were in attendance.

A tramway is to be built from Ymir, B. C., to the Tamarack mine, at a cost of \$10,000. The contract has been awarded and the work will be finished within two months.

LONDON LETTER.

(From Our Own Special Correspondent.)

London, Oct. 22, 1900.

The problem of rapid transit in the heart of London appears to have been solved. The colossal success of the Central London Ry. shows that the citizens of this, the first city of the world, have found what they have long been looking for. Although strictly speaking, the Central London is not a street railway—since it is underground—the traffic it deals with is purely that of the streets, and its *raison d'être* is simply the relief of the traffic in one of our most congested thoroughfares, under which it runs for its whole length. Owing to the enormous rush of traffic which it is called upon to deal with, the 3½ minutes' service with which it was started, has already been altered to a 2½ minutes' service. Mr. Stevens, the chief engineer of the line, told me the other day, that they could well do with another double track, the full length of the line.

A stranger in London during August, must have thought that the "tuppenny tube," as it is affectionately termed, had a most enterprising advertising agent. Every paper in London contained paragraphs about it, and the most influential journals sang its praises in their editorial columns. But the cause of this was not advertisement, the Londoners were pleased with their new toy, and the newspaper men knew it, and so naturally led them up with tit-bits of information about it, until their imaginations ran dry.

The latest electric traction scheme in London is the Charing Cross-Hampstead railway, the rights of which have been acquired by the Yerkes syndicate. In the course of an interview the other day, Mr. H. C. Davis, of New York, who is vice-chairman of the syndicate, stated that none of the necessary capital—between \$15,000,000 and \$20,000,000—would be subscribed in England, as the American syndicate was prepared to find the lot. The work is probably to start in February next, and will take about two years to complete.

There will be two sets of line, one starting from Hampstead, the other from the Midland Railway station at Kentish Town. These will meet at Camden Town High St. and run to the Euston Station of the London & North Western Ry., thence under Tottenham Court Road to Oxford St., where they will make connection with the Central London, and thence to Charing Cross. Thus the line will form a connecting link between the Midland, London & North Western, Central London, and South Eastern Rys. It cannot fail to be an enormous financial success.

The power station is to be situated in Highgate Road. The trains are to be worked on the multiple unit system, each car carrying its own motors, so that there will be no locomotives, and nothing to limit the length of the trains. An all night service of trains will be run—the first in London—and during the day time trains will run in each direction every 2½ minutes.

The Margate, Broadstairs & Ramsgate Electric Ry. is nearly completed, and will shortly be opened for traffic. This line consists of a double track, about seven miles long, connecting up the three towns named, and running round the coast. Margate—as everyone knows—is the Mecca of the cockney "out for a holiday," and the passenger traffic during the summer months is sure to be very heavy. The company is also undertaking the illumination of the principal streets of these three towns, so that the extra demand for current from this source, during the winter months, will tend to largely make up for the loss of traction load during the slack season. This scheme was promoted by Mr. Murphy, the chairman of the Dublin United Tramway Co. and of the Cork Electric Tramways; the capital is found by a syndicate, of which I believe the larger part is Mr. Murphy, but I hear that some American capitalists are negotiating for the purchase of the concern and it is very probable that it will change hands, shortly after it is opened for traffic.

The three-phase plant for the Margate-Ramsgate road has been supplied by the Thompson-Houston Co. So this is yet another monument to American enterprise in England, and to the complete failure of the large English manufacturing firms, to rise to the occasion, and supply the ever increasing demand in their own country for multiphase power distribution plant.

A sad fatality took place on the Central London Ry. on October 6th. A conductor, named Field, wishing to see if a passenger was smoking in a non-smoking compartment, opened the gates at the

side of the platform of the car, and put his head out into the tunnel to look in at the side window of the carriage. His head struck one of the lamps at the side of the tunnel, and he was knocked off the car. He was picked up insensible and suffering from numerous shocking injuries, which proved fatal shortly afterwards.

The authorities of the Prussian State Railways have recently carried out some interesting tests of an electrically driven locomotive, which has been built for them by the Allgemeine Co., and is to be used for shunting in their yard at Eleimtz. The locomotive, which weighs nine tons, is of 3 ft. 11 in. gage; it has four coupled wheels of 43¼ in. diameter, and a wheel base of 4 ft. 11 in., and the motor has a double reduction gear of 1:5 and 1:4½. The duty it has to do is to haul 100 tons at a rate of 1 meter per second on a level track, with the power of running as low as ¾ meter per second and as high as 2 meters per second. It was originally designed to work at a pressure of 220 volts, but as this was found too low, the pressure was raised to 320 volts. When starting with no load, the motors took from 50 to 55 amperes at 310 volts; and when running light at full speed, from 19 to 20 amperes at 310 to 315 volts. When pulling a train of 16 trucks weighing over 100 tons, the starting current was 60 to 80 amperes at 300 volts and when running at full speed, 28 to 35 amperes at 300 volts. The highest speed attained when running light was 11.1 ft. per second and when fully loaded 6.25 ft. per second. The cost of this locomotive was \$2,500, and of the overhead equipment of the yard \$3,500. The total cost of running works out at about 60 per cent less than for a steam locomotive of the same power.

VAUGHAN.

AMERICAN STEEL & WIRE CO. AT PARIS.

The exhibit of American Steel & Wire Co. at the Paris Exposition was one of the most complete and interesting of the entire show. The installation was in the departments of Mines and Metallurgy, and was not placed with the other exhibits from the United States for lack of space.

On the main floor the exhibit occupied a space 50 x 50 ft. It comprised iron ores and coal from the company's mines in Michigan, Minnesota, Wisconsin and Pennsylvania; limestone from its quarries; coke from its ovens; pig iron from its blast furnaces, the quality and nature of the pig iron being illustrated by fractures; ingots, blooms and billets from bessemer and open hearth steel mills were also shown. All of these were compactly grouped near the entrance to the exhibit. In the center was an ornamental bronze pagoda with art glass roof in which pagoda are panels illustrating various manufactured products such as sections of beams, channels, angles and bars; sections of shafting, rail splices and frog fillings, horse shoes, spikes, nails and tacks, barbed wires, bale ties, fine copper wires, music wires, fine spooled wires, all sorts of chains and rivets, coiled, spiral and flat springs, clock springs, wire ropes, insulated wires and cables, sections of submarine cables, etc.

The gallery or auxiliary exhibit consisted of forty large panels, 6 x 5 ft., on which were artistically grouped products of the various departments, while in glass cases beneath the panels additional samples and test pieces were shown, the entire square being surmounted with 50 large photographic reproductions or birds-eye views of the various mines, furnaces, steamships and manufacturing establishments owned and operated by the company.

The entire exhibit was certainly a credit to the American Steel & Wire Co. It was designed and arranged under the personal supervision of Mr. P. W. Moon, 3d vice-president, and Mr. F. H. Daniels, chief engineer. The exhibit was erected at the Worcester works, then taken down, shipped to Paris, and reconstructed.

The company received four grand prizes and two gold medals, and collaborative gold medals were awarded to President Palmer, and to Mr. Daniels. The grand prizes were: Class 26, iron, steel and copper wires. Class 7, music wire. Class 63, ores, iron and coke. Class 64, pig iron, ingots, plates, bars, rods, etc. The gold medals were: Class 39, bicycle and carriage wire. Class 65, general metallurgical class including nails, tacks, barbed wire, chains, springs, woven wire products, etc. A grand prize was voted the company in Class 65, but withdrawn because it had already been awarded grand prizes in Classes 63 and 64, very closely allied to Class 65.

DEATH FROM CONTACT WITH THIRD RAIL.

October 9th an employe of the Brooklyn Rapid Transit Co. fell across the third rail on the elevated structure and when picked up was found to be dead. This is the fourth fatality from this cause in three months and is quite remarkable when we take into consideration the experience on the Chicago elevateds, and on the New York, New Haven & Hartford, where we believe there have not been any fatal accidents, and the employes regard a contact with the live rail as merely an interesting experience to be avoided in the future

CRANE CO. AT PARIS.

One of the exhibits at the Paris Exposition which attracted wide attention was that of Crane Co., of Chicago. This exhibit occupied a desirable position in the Palace of Machinery and Electricity, on the Champs de Mars, and comprised brass and iron valves and

B. J. ARNOLD'S EUROPEAN TRIP.

Mr. Bion J. Arnold, president of the Arnold Power Station Co., Chicago, was one of the delegates representing the American Institute of Electrical Engineers at the electrical congresses held in connection with the Paris Exposition, and while abroad he took occasion to visit and inspect many of the most interesting electric railway installations in Europe. His itinerary included Liverpool, London, Paris, Zurich, Basel, Lucerne, Berne, Geneva, Chamouny, Interlaeken, Milan, Rome, Naples, Venice, Munich, Vienna, Budapest, Prague, Berlin, Amsterdam, Rotterdam and Brussel.

Mr. Arnold states that from what he could learn the various three-phase electric lines in Switzerland are eminently successful in their practical operation. On the Burgdorf-Thun line a speed of 25 miles per hour is maintained. The engineers say that no practical difficulty has arisen because of the small air gap that is necessary if a good efficiency is expected of the three-phase motors, and the apparatus has proved to be reliable either when

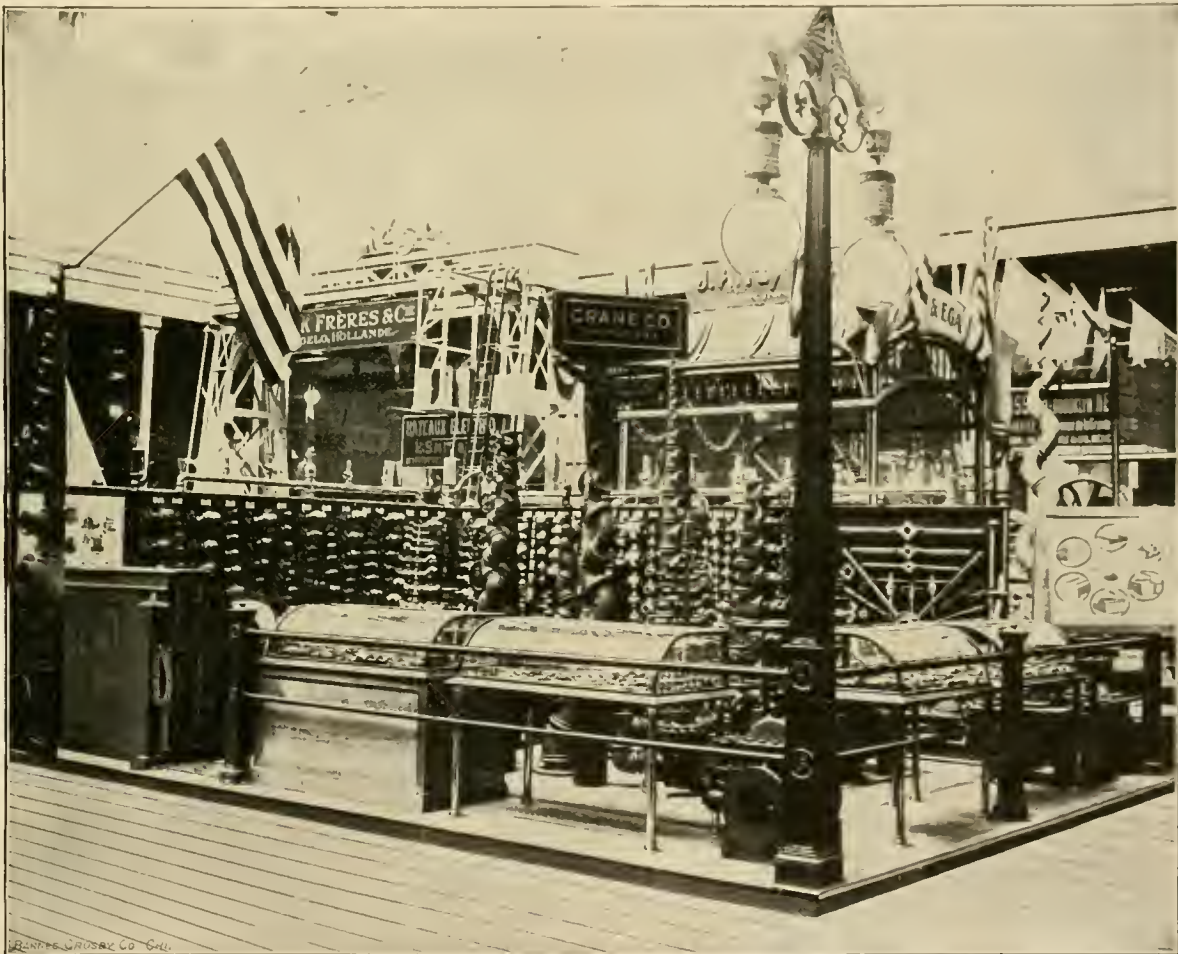


EXHIBIT OF CRANE CO. AT PARIS.

cocks for all pressures, brass and iron fittings, steam specialties, engineers' supplies, and steam and gas fitters' tools. The exhibit was tastefully arranged, and gave an especially good opportunity to visitors to study approved modern methods of piping, flanged work, etc., for power plants—a branch of the business of this company which has become very important. The Crane Co., which is, we believe the largest makers of valves and fittings in the world, was the only exhibitor of this class to receive a gold medal.

A new engine built by the E. P. Allis Co. for the Aurora & Geneva Ry. at Aurora, Ill., began operating on October 23d.

Three-cent fares are to have a trial in Sedalia, Mo., the receiver of the Sedalia Electric & Railway Co. having determined to issue books of 100 tickets for \$3.00, passengers using these tickets not being entitled to free transfers. If the result is satisfactory the low rate will be made permanent.

acting as a motor or as an electric brake when the car is descending steep grades. The overhead work, especially at crossings and switches, is more complicated for the three-phase lines, but it presents no very serious difficulty. He heard but little concerning interference with telephone wires.

Mr. Arnold considers the principal objections to alternating current motors for railway work to be the limitations as to speed and the low efficiency at starting. The low efficiency at starting, due to losses in the resistances and also to losses in the motor windings, would perhaps make these motors impracticable for use on lines where there are many stops.

There is much activity in Europe in building light railways, what we call interurbans, and a great market for steam and electrical machinery. The British and Continental makers are beginning to realize how serious American competition is liable to become, in fact has already become, but Mr. Arnold thinks that our people have the very decided advantages of cheaper materials, more efficient workmen and better shop organization and methods.

NEW CONTACT SPRING FOR TROLLEY HARPS.

The illustration herewith shows a new electrical contact spring for trolley harps, a patent upon which has recently been granted to C. S. McMahan, formerly western manager of the Street Railway Journal, 1520 Monadnock Block, Chicago. The invention comprises a spring of conducting material pivoted centrally on the pin of the harp and adapted to press against the inner side of the harp arm and with three or more curved radial arms which bear against the trolley wheel near its periphery at points equally spaced about the wheel. The usual washer is inserted between the spring and the harp arm. The ends of the spring arms remain fixed at given points on the periphery of the wheel and revolve with it; the friction due to the rotation of the wheel and spring occurs between the spring and the washer which is inserted between the spring and the harp arm.

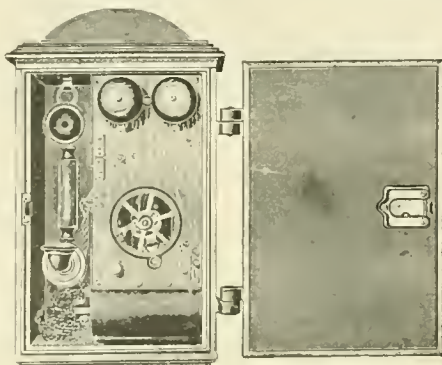
To replace a spring a rod is used which is of the same diameter as the harp pin, the rod gradually tapering to a point. Springs, washers and wheel are first placed approximately in position between the harp arms and the pointed tapering rod passed through to bring all parts to a common center when the harp pin will pass through without obstruction. The spring is applicable to any of the existing forms of trolley harps.

The chief advantages claimed for the device are that it requires no riveting to the harp; that it can be replaced in a moment without the necessity of removing the harp from the trolley pole; that it will prevent wobbling of the trolley wheel; that it will wear longer than the old form, and with its three or more points of connection with the trolley wheel largely increase the contact surface between the wheel and the pole, a feature which is especially desirable on large cars using heavy currents.

IRON BOX TELEPHONES FOR RAILWAY USE.

In describing the street railways of Portland, Me., in our September issue, mention was made of the telephone despatching system used, and the following description of the apparatus will be interesting.

These telephones are usually located at turnouts along the line and sometimes at intermediate points as may be necessary in



COUCH & SEELEY TELEPHONE.

order to permit communication from any point along the line to the power house, or offices without a considerable delay in obtaining the connection.

The instrument shown in the illustration is contained in a heavy iron box which is weather proof, and damage proof so far as it is possible to make it. All of these instruments are equipped with heavy 4-bar generators, and there are lines in use where upwards of 50 telephones are connected on one circuit. By means

of a special device the telephone is cut out of the circuit when the door of the box is closed, thus preventing damage from electric storms or by reason of the telephone wires coming in contact with other electric wires carrying high tension currents.

The operator's set consists of a hand micro telephone which in itself is a distinct feature, this being so arranged that when the receiver is placed to the ear the mouthpiece comes into proper position for talking and so close to the mouth that even if used in a very strong wind or where there is a great deal of noise, the sounds of speech will still be transmitted perfectly. Another desirable feature is that this combination of transmitter and receiver connected to the instrument by means of a flexible cord places the transmitter always in the proper position for securing the best efficiency regardless of whether the person using it is tall or short, and further, so long as the receiver is held to the ear it is impossible to get away from the transmitter. This is held in one hand, leaving the other free to make memoranda when required.

Dry batteries are used and are guaranteed to last one year under ordinary conditions of operation, and can generally be depended upon to last from 18 to 24 months without replenishing.

This instrument as well as other types of telephone equipment adapted to street railway uses, is made by the Couch & Seeley Co., of Boston, Mass. It is guaranteed for a period of one year. The company states that if there is any weak point in the instrument it will develop within that period of time, and refers to the large number of street railways already equipped with this apparatus as the best argument for its high efficiency and durability. The company will be glad to submit quotations for street railway equipment, including portable sets for use on snow plows, work cars, etc., also for standard wall and desk sets adapted to use in power houses, offices, waiting rooms, etc.

ROEBLING'S CO. AT PARIS.

The John A. Roebling's Sons Co., of Trenton, N. J., received two Grand Prix and two gold medals for its display at the Paris Exposition. The company had two exhibits, one showing the product of the electrical department, and the other giving a comprehensive idea of all the Roebling products other than the electrical.

The principal feature of the electrical exhibit was a full size model of an underground conduit street railway track. In addition there were telephone wires and cables, shown connected and mounted, and beautiful samples of every kind of wire used in electrical work.

In the second exhibit was a model of the Brooklyn Bridge, made at the express request of the U. S. Commission. The first model of the bridge that was built for the Exposition was lost with the unfortunate "Paulliac" which was reported near her destination some six days after sailing and was never heard from afterward. The Roebling company, however, built a second model in six weeks and had it in its place about a month after the Exposition opened. The bridge was entirely built at the Roebling plant and is very graceful and pleasing to the eye. It surmounts the exhibit proper.

The company has exhibited at all the prominent expositions for a number of years and possesses many awards conferred, including gold and other medals. At the Centennial, at the World's Fair in Chicago, and at the Philadelphia Export Exposition, the excellence of its manufactures was generously acknowledged.

TUNNEL BETWEEN NEW YORK AND BROOKLYN.

October 18th the Rapid Transit Commission announced its plan for a tunnel under East River. The Brooklyn-Manhattan road now proposed will, from a point near the intersection of Whitehall and South Sts., in Manhattan, proceed under the East River to Joralemon St., in Brooklyn; thence under Joralemon St. to Fulton St., near Borough Hall; thence under Fulton St. to Flatbush Ave. and under Flatbush Ave. to Atlantic Ave., near the station of the Long Island Railroad. The cost, as the Board is advised, will not exceed \$8,000,000.

The Milwaukee Electric Railway & Light Co. is considering building a more direct line to Kenosha.

FOREIGN FACTS.

The electric tramways in Bunley, Eng., are to be reconstructed.

A new system of electric tramways will be constructed in Chester, Eng.

Street cars in Southport, Eng., are to be fitted with patent seats which are always dry.

An extensive system of electric tramways is projected for Lowestoft, in Norfolk, Eng.

Matanzas, Cuba, is advertising for bids for street railway and electric lighting franchises.

The Bournbrook electric tramway at Birmingham, Eng., is being equipped with the overhead trolley system.

The railway from Athens to Pire, Greece, is required by its charter to adopt electric traction within three years.

Traffic will soon be resumed on Bologna-San Felice Ry., in Italy which is being equipped as an electric road.

Traffic on the new Dudley-Gradley Heath electric tramway, near Stourbridge, Eng., has been temporarily suspended.

In Melbourne the cable railways may be supplemented by a system of electric lines, to be built between all the suburbs.

An electric power station will be built at Greenhill, near Oldham, Eng., to supply current for local tramways, and lighting plants.

The British Electric Traction Co. has installed a new schedule, an improved service on its street railway in South Staffordshire.

The Urban Electric Supply Co. will construct the proposed electric tramways through the city of Glossop, in Gloucestershire, Eng.

The council of Eccles, near Bradford, Eng., is promoting a bill authorizing the alteration of existing tramways and the construction of new lines in that city.

An electric tramway will be built to connect Redcar, in Yorkshire, Eng., and Saltburn. The road will probably be owned and operated by the municipality of Redcar.

The application of the United Electric Light & Traction Co. for electric tramway rights through Stratford-on-Avon, Eng., is meeting with the opposition of the local authorities.

Messrs. Massey & Allpress, of Westminster, Eng., consulting engineers, have been engaged to complete the preliminary work on the proposed street railways in Colchester.

A street railway strike is in progress in Kingston, Jamaica, the conductors and motormen demanding an increase of wages of from 3 to 6d. All lines in the city are reported tied up.

A 14-mile electric line to connect Blackburn (Eng.), Rishton, Whalley and Burnley. C. Chadwell of Blackburn represents the promoters. The road is estimated to cost £154,000.

The project to equip the street cars operating in Portsmouth, Eng., with electric brakes has been abandoned. The safety brake at present in use has been declared sufficient.

At Blackpool, Eng., the arrangements have been made by which the Corporation tramways will obtain electric power from the Blackpool & Fleetwood Tramroad Co. at 2d per kw. h.

An electric tramway is projected in Folkestone, Kent, Eng., to be built at a cost of £93,000. The conduit system will be employed in the down town district, and the overhead system through the suburbs.

The electric tramway in the city of Seoul, in Corea, is being operated with great success. Seoul has now the largest electric plant in the far east with the exception of that at Tokio, Japan.

Fifty miles of street car lines in Adelaide, Australia, are to be equipped for electric traction if the bill presented to Parliament by Messrs. Callenders and the Westinghouse Companies be passed.

An improved mail service has been installed in Frankfort, Germany, the tramway company having recently adopted seven automobile cars and seven trailer cars to the street railway mail service.

The old steam tramways of Sydney, Australia, are being replaced by electric lines. The opening of the new electric line to Cook's River, was celebrated by the Electrical Association of New South Wales, recently.

Dissatisfaction with the cable system may occasion the promoters of the proposed line between Edinburgh, Musselburgh and Joppa to equip that road for electric instead of cable traction as was at first projected.

The municipal council of Pietermaritzburg, South Africa, will build a system of electric tramways, obtaining the power for their operation from the electric light department. Eight wheeled double deck cars will be put in service.

A number of important tramway extensions are to be made in Glasgow. The Lorain Steel Co. has the contract for special track work and McCartney, McElroy & Co. will proceed at once with the installation of the overhead equipment.

The council of Devonport, Devonshire, Eng., will lease the lines of the Devonport & District Tramway Co. for a term of years. Mr. C. Chadwell has secured an extension of time in which to build the proposed St. Budeaux tramway which will center in Devonport.

Early in October the city of Wellington, New Zealand, acquired possession of the tramway system. No action will be taken on the proposition to adopt electric traction until the return in December of Mr. W. Ferguson who has been making investigations in America and Europe. Tenders will be invited from American and English firms.

The Paraguay Development Co., incorporated with \$500,000 capital under the laws of the State of New Jersey and having headquarters in Philadelphia, has been granted by the Paraguayan Government a concession to light the city of Asuncion and to run tram cars by electric power. The concession is for twenty-five years, and the light and traction service must be open to the public within two years from Aug. 30, 1900. The representative of the company in Paraguay is Mr. Carlos R. Santos, late delegate to the Philadelphia Museum exposition.

The installation of a system of electric traction over a canal about 47 miles long, between Bethune and the Scheldt, Holland, has been undertaken by the Societe de Traction Electrique Sur Voies Navigables and will result in a great reduction in the cost of transportation over this route. Six locks are comprised on the route and the former price, by steam or horse traction, was 0045 franc per ton kilometer. This tariff has been reduced since the installation of electric traction over a portion of the route, to 003 franc. Two stations have been put in operation furnishing a total of 400 h. p. The continuous current at 500 volts is produced by eight generators of 30 kw. capacity.

Within about a year the Chicago Union Traction Co. has settled over 1,000 damage suits, many of which were of long standing in the courts.

A Wisconsin judge has held that under the statute requiring suits against street railways to be begun within one year, the provision withholding the operation of the statute of limitations does not apply to infants.

PERSONAL.

MR. EDWIN DUFFY was appointed receiver of the Cortland (N. Y.) & Homer Traction Co. on October 16th.

MR. W. A. HELLAR, it is reported, will probably become superintendent of the Dayton & Xenia Traction Co.

MR. GEORGE R. THOMPSON, of Elgin, has been appointed superintendent of the Lincoln (Ill.) Electric Street Railway Co.

MR. D. H. LOUDERBACK sailed for London on November 9th; he will have an active part in the construction of Mr. Yerkes' London road.

MR. C. H. SMITH, formerly superintendent of the Troy division of the United Traction Co., of Albany, N. Y., has been reappointed to that position.

MR. A. K. WARREN, mechanical and electrical engineer, has associated himself with Mr. A. B. Herrick with offices at 120 Liberty St., New York.

MR. B. FRANK HIRE, superintendent of the Bridgeton (N. J.) & Millville Traction Co., was seriously injured recently in a runaway at Newport.

MR. W. W. SARGENT, superintendent of the Fitchburg (Mass.) & Leominster Street Railway Co., was on October 16th chosen a director of the company.

MR. D. F. CARVER, formerly engineer in charge of buildings for the Brooklyn Rapid Transit Co., has been appointed chief engineer of the Cleveland Electric Ry.

MR. LEE D. FISHER, mechanical engineer of the Columbus, London & Springfield Electric Ry., was on November 27th married to Miss Lillian Udell of St. Louis.

MR. THOMAS H. McLEAN, general manager of the Toledo Traction Co., called on the "Review" when in Chicago last month. He had been making a two weeks trip in the West.

INVITATIONS are out for the wedding of Mr. Samuel McClintock Hamill to Miss Marie Woodward Baldwin, which will take place at Grace Church, Baltimore, Tuesday, November 27th.

MR. T. W. SHELTON, formerly connected with the Indianapolis (Ind.) Street Railway Co., has succeeded Mr. David W. Pell as electrical engineer of the Northern Ohio Traction Co. at Akron.

MR. C. DENSMORE WYMAN, Boston, was a "Review" caller last week. Mr. Wyman is returning from an inspection trip which has lasted three months and taken him from the Atlantic to the Pacific coast, and from northern Michigan to the Gulf.

MR. C. B. BUCHANAN informs us that he and other stockholders in the Meridian (Miss.) Street Railway & Power Co. have transferred that property to Mr. John Kamper, of Enterprise, Miss. Mr. Buchanan has resigned as general manager of the road.

MR. R. D. BLACK, one of the promoters and a large stockholder of the Indianapolis (Ind.) & Greenfield Electric Ry., was killed while attempting to board one of the company's cars. He mounted on the wrong side and was struck by a center pole.

MR. J. SHIRLEY EATON, statistician of the Lehigh Valley Railroad Co., has been engaged to give a course of lectures during January before the students of the Tuck School of Dartmouth College upon the "Theory and Practice of Railroad Statistics."

MR. E. D. SMITH, of the Blanchester, O., bank, has been made president of the Dayton & Maysville Electric Railway Co.,

which has been reincorporated, and its charter made to include a branch line from South Lebanon to Cincinnati. The main line is projected from Dayton through Lebanon, Morrow, Blanchester, Georgetown and Ripley to Maysville, Ky.

MR. JOHN M. ROACH, president of the Union Traction Co., Chicago, has just returned from a two weeks' trip to his island in the Gulf of Mexico. Mr. Roach has one of the most beautiful and unique winter homes to be found anywhere in the United States.

MR. GEORGE E. TRACY, Newark, N. J., has been appointed superintendent of the Camden, Gloucester & Woodbury Traction Co. to succeed Mr. William H. Wilson who has been transferred to the superintendency of the Camden Electric Lighting Works.

MR. SAMUEL C. MOREHOUSE, of New Haven, Conn., treasurer of the Ohio Central Traction Co., at Galion, O., will, it is reported, be chosen to succeed the late Israel A. Kelsey as president of that road. Mr. Morehouse recently made a trip of inspection over the lines of the Ohio Central Traction Co.

MR. A. B. SOUTHARD, superintendent of the San Francisco & San Mateo Electric Ry., San Francisco, is making a trip east inspecting interurban lines, after having spent several days in Chicago. He reports an enormous increase in traffic during the past year and on his return will lay 20 miles of track to double track a present line, and while away will also place orders for new cars and other material.

MR. BRET HARTER, formerly superintendent of the Detroit, Rochester, Romeo & Lake Orion Ry., has been appointed mechanical and electrical engineer for the various roads built and projected by the Winter, Law & Andrews syndicate. These include the Detroit, Rochester, Romeo & Lake Orion Ry., the Grand Rapids & Holland Electric Ry. and the Saugatuck, Douglas & Lake Shore Ry.

MR. EDWARD C. SPRING has recently been appointed superintendent of the Newton & Boston Street Ry., succeeding Mr. L. H. McLain. Mr. Spring was formerly superintendent of the Norfolk Suburban Street Ry., and later had a similar position with the Norfolk Western Street Ry. and the Medfield & Medway Street Ry., which he resigned to go with Newton & Boston. On leaving, the employes presented him with a handsome gold watch.

MR. W. CARYL ELY, president of the International Traction Co., of Buffalo, is in Paris promoting a project for a number of European excursions to the Pan-American Exposition. Through Mr. Ely's efforts interest in the great exposition to be held in Buffalo next year has been heightened, not only in the French capital but in all the countries on the continent, and as a result many thousands of foreigners will view the wonders of the empire state in July.

MR. C. S. McMAHAN, who for several years has been the western representative of the Street Railway Journal, with headquarters in Chicago, has resigned and taken the position of business manager of The Engineer, published in Cleveland. Although a competitor and a strong one, he has conducted his work along lines to command our esteem and respect, and we join with his many friends in the railway field in predicting and wishing for him in his enlarged opportunity the success which his efforts deserve and his ability insures.

MR. A. F. HAAS, secretary and general manager of the Seattle City Railway Co., accompanied by his wife, is visiting friends in Chicago. He will visit eastern cities before returning home. Mr. Haas is taking his first vacation since 1873, and has earned a place among the foremost managers on the Pacific coast which entitles him to a well deserved rest. He reports his city as growing rapidly, to which both the Klondike and our new Western possessions are contributing to a large extent. His company has been steadily improved physically during the past few years.

MR. W. R. MORRISON, in charge of the track work of the Wichita (Kan.) Electric Railway & Light Co., was married recently to Miss Alice O'Neil, of Bay City.

MR. GORDON CAMPBELL, for seven years past the purchasing agent of the North Jersey Street Railway Co., has been appointed general superintendent of the Union Railroad Co., Providence, R. I.

MR. SIMEON W. CANTRIL, formerly superintendent of the Denver Cable Ry. and since last December division superintendent of the Denver City Tramway Co., has been appointed superintendent of the latter company, succeeding Mr. C. K. Durbin.

ELECTIONS.

THE TRI-CITY RAILWAY CO., Davenport, Ia., has re-elected its officers as follows: E. E. Cook, president; F. C. A. Denkmann, vice-president, and James F. Lardner, secretary and treasurer.

THE ROANOKE (VA.) RAILWAY & ELECTRIC CO. has elected the following officers: J. B. Fishburne, president; James F. Heyward, vice president; J. W. Hancock, secretary and Edward L. Stone, treasurer.

THE WORCESTER (MASS.) & WEBSTER STREET RAILWAY CO. has elected the following officers: Edgar S. Hill, of Webster, president; Fred Thayer, of Pawtucket, R. I., vice-president; W. A. Bailey, of Worcester, treasurer, and Edmund Parker, of Worcester, auditor.

THE ENFIELD & LONG MEADOW ELECTRIC RAILWAY CO., Thompsonville, Conn., has re-elected C. E. Graham, president; George T. Mathewson, vice-president; and Lyman A. Upson, secretary and treasurer. The following directors were also elected: C. E. Graham, L. A. Upson, J. J. Lawton, S. H. Wagner, G. T. Mathewson, C. H. Briscoe, and J. W. Johnson.

NEW PUBLICATIONS.

WESTINGHOUSE RAILWAY MOTORS is a recent publication of the Westinghouse Electric & Manufacturing Co., and illustrates the standard railway motors made by the company and also a few typical Westinghouse railway power stations. Attention is called to recent improvements in design which enable the motors to meet the severer demands of modern service.

STEEL PLATE FANS. Issued by the B. F. Sturtevant Co., Boston, Mass. This is the third edition of Catalog No. 96 published by the company and comprises 132 pages illustrating and describing the various types of fans and blowers for which this company is so well and favorably known. A smaller publication is devoted to a description of the Sturtevant system of heating, ventilating and moistening textile manufactories.

WE HAVE RECEIVED a copy of the Album di Elettricisti, published at Milan by the editors of L'Elettricita. The album contains some 200 portraits of prominent electricians from nearly every country in the world, and should certainly be a valuable acquisition to the library of all who are interested in electrical industries. Among the portraits we noted with especial interest those of B. J. Arnold and G. W. Knox. The book measures 12 x 9 in., contains 52 pages, and is most attractively bound in buff cloth, embellished with gold.

"THE ELECTRICIAN" ELECTRICAL TRADES' DIRECTORY & HANDBOOK for 1901. Published by the Electrician, Salisbury Court, Fleet St., London, England.—The editors of Electricity announce that the 19th annual edition of this directory is soon to be published. Copy must be received by Dec. 20, 1900; for later corrections particulars must be received by Jan. 16, 1901. One entry in both alphabetical and classified trades sections is given free; other entries are charged for at the rates of 1s. to

2s. 6d. per entry, according to the type used. It is earnestly requested that all persons and firms in the electrical trades will communicate with the editors of the "Big Blue Book," as this directory is known, at once.

STREET PAVEMENTS AND PAVING MATERIALS. A Manual of City Pavements; the Methods and Materials of Their Construction. By George W. Tillson, C. E., Mem. Am. Soc. C. E., Principal Assistant Engineer, Department of Highways, Brooklyn, N. Y. Published by John Wiley & Sons, New York. Octavo; 544 pages; cloth, \$4.00. The author has been actively engaged in the construction of municipal public works for over twenty years and in this book answers some of the questions presented to him in the course of his experience, and which could be solved only by actual trial. An idea of the scope can best be given by enumerating the chapter headings which are: History and Development of Pavements; Stone, Asphalt, Brick-clays and the Manufacture of Paving Brick; Cement, Cement Mortar and Concrete; The Theory of Pavements; Cobble and Stone-block Pavements; Asphalt Pavements; Brick Pavements; Wood Pavements; Broken-stone Pavements; Plans and Specifications; The Construction of Street-car Tracks in Paved Streets; Width of Streets and Roadways, Curbs, Sidewalks, etc.; Asphalt Plants. In the chapter on "Construction of Street-car Tracks" is a convenient resume of the paving requirements in various cities, and of the practice of the street railways in track construction.

POOR'S MANUAL OF RAILROADS. Published by H. V. and H. W. Poor, 44 Broad St., New York; 33d Annual Number; price, \$10.—The Manual for 1900, which has just been issued, covers 1,954 pages, of which 987 pages are devoted to the presentation of the statements of 2,026 steam railroad companies; 209 pages to the statements of 1,132 street railroad and traction companies; 84 pages to the statements of 166 leading industrial corporations, and 132 pages are taken up with the Department of State, City and County Debts, covering the affairs of 367 corporations. The editor, John P. Meany, presents in pages xvii to cvi of the introduction "A Study in Railway Statistics" which is an exhaustive analytical review of railroad affairs during the past twenty years, and brings to the surface many points of information that would be hidden to the ordinary inquirer after such facts. The sub-headings to certain sections of the "Study" are (1) "Railroad Consolidations"; (2) "Formation of Railway Systems," which contains a table showing the growth of 53 railroad companies from 59,429 miles in 1880 to 131,798 miles, Jan. 1, 1899; (3) "Statistics of Trunk Lines, 1870-1899"; (4) "Railroad Capitalization and Return Thereon"; (5) "Investigation into Productive and Non-Productive Stocks and Bonds"; (6) "Detailed Review of Receiverships and Foreclosure Sales, 1884-1899"; and (7) "Relation of Fixed Charges to Capitalization."

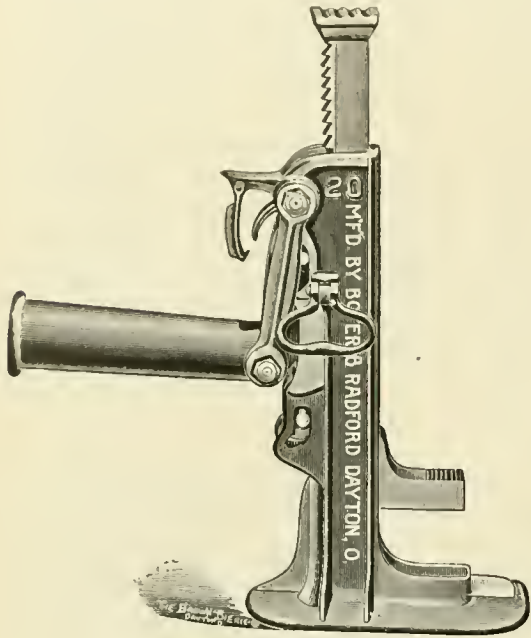
The most important new feature introduced into the Manual in recent years is one first presented in this year's edition and is entitled a "Ready Reference Bond List" and covers 86 pages of the Manual—from 1,296 to 1,381 inclusive. Its distinctive features are (1) showing amount of annual charge on each issue; (2) arrangement of dates of interest payments, which in addition to giving for each separate road the usual data, enables a bond clerk to run down any column, say that headed "J.J." and ascertain at once all railroad coupons that fall due on the first of January or July; (3) "Property Covered," giving the terminal points and mileage of the lines covered by each separate mortgage together with the average amount (in dollars) of bonds outstanding per mile of railroad, and (4) the names and addresses of the trustees for each mortgage.

Our readers are naturally most interested in the Department of Street Railways. This covers over 1,100 companies in the United States and Canada, giving data as to history, capitalization, equipment, financial results, officers, etc., conveniently arranged according to states and towns. There is also a table giving the dividends paid by 137 of the leading street railway companies for the last eight years, and a table showing the close of fiscal year, date of annual meeting, date of closing transfer books, place of meeting, registrar of stock and transfer agent for 500 street railway companies.

The price of the Manual has been increased to \$10, which the publishers explain has been necessary because of the greater volume of the work and the advance in cost of paper, materials and labor.

BOYER & RADFORD DROP TRACK JACK.

Our illustration shows the 20-ton drop track jack made for electric, cable and horse railways by Boyer & Radford of Dayton, O. This jack was designed by practical roadmasters, who thoroughly understood the requirements, and it has been tested in service with entire satisfaction. The No. 20 has a rise of 11½ in., weighs 50 lb., and has a capacity of 10 tons. The bar has 7-16-in. teeth and can be raised or lowered one or two notches at a time. The floating



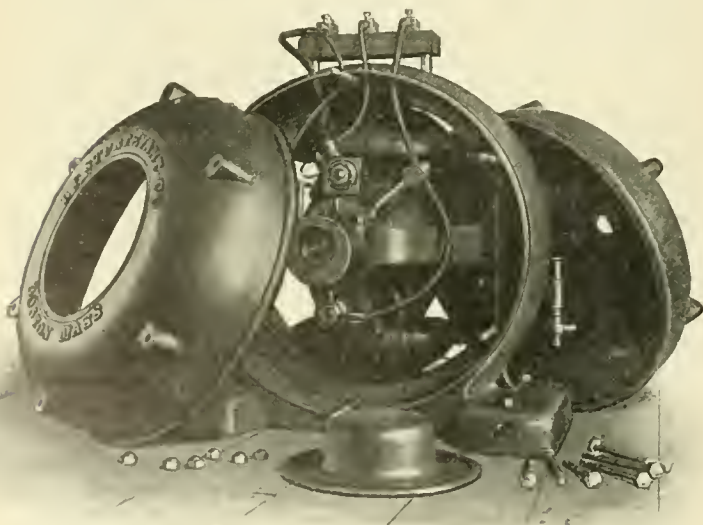
NO. 20 DROP TRACK JACK.

hook attached to the upper pawl is for the purpose of holding this retaining pawl out of position by pushing it down and in so that it will fasten the floating hook and the operator can then step back out of danger, and raise the lever the least bit which releases the lower pawl and the bar drops easily, making a perfect sure drop track jack that can be relied upon in any emergency.

Boyer & Radford control the Maxon patents on lever and ratchet screw lifting jacks for all kinds of lifting.

THE STURTEVANT ENCLOSED ELECTRIC MOTOR.

The bipolar type of enclosed motor the internal construction of which is illustrated in the accompanying engraving, is made both as a motor directly connected to a propeller fan and as an inde-



STURTEVANT ENCLOSED MOTOR.

pendent machine. For the former purpose it is used on all sizes of fans up to and including the 54-in. For larger sizes the four and eight-pole types are employed.

The motor is entirely enclosed, and thereby protected from dust, a most important element in a machine used under these conditions. In order to avoid the excessive temperature which is incident to the operation of most enclosed motors, this type has been very carefully designed, so that a low temperature rise can be maintained without greatly increasing the size and weight above that of the ordinary open type.

This machine is capable of continuous operation for 10 hours, with a maximum temperature rise not exceeding 60° F. Yokes extending out from the field ring support the armature shaft. The end casings are entirely independent and can be instantly removed to give access to the entire interior. The bearings and brushes can be reached by simply removing the caps in the center of the casings.

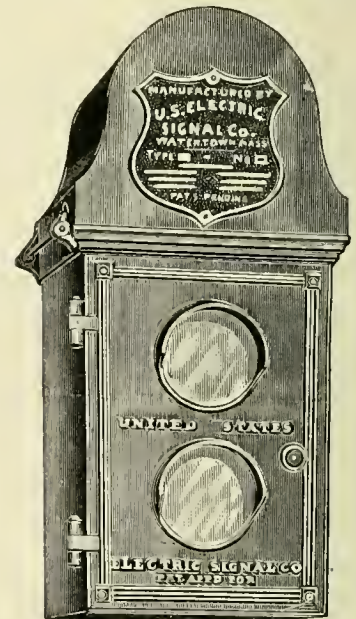
The brushes are of hard carbon, in holders of a modified reaction type, which allows of easy adjustment when it becomes necessary to reverse the direction of rotation of the motor. The bearings are self-oiling and self-aligning, and fitted with composition sleeves, which are removable from the outer ends of the boxes. These motors, in sizes from 1-6 to 5 h. p., are built by the B. F. Sturtevant Co., Boston, Mass.

NEW AUTOMATIC BLOCK SIGNAL.

An automatic block signal system for electric railways, designed to show, without the possibility of mistake, whether the section

to the next turnout is free or occupied by another car, has recently been put on the market, and is attracting favorable comment for the simplicity and accuracy of its operation. The signal proper consists of a cast iron box conveniently located near the turnout and electrically connected with the signals at the next turnouts. Each signal has two operating magnets, five or six times more powerful than necessary for the operation of the signal, thus giving a good margin for safety.

Each box is fitted with two windows, one covered by a red glass and the other by a white or green glass, and behind the windows are placed two incandescent lamps. When the car approaches the block section, one series of signals is operated by the contact of the trolley wheel with an automatic switch on the trolley wire, and displays a white or green light at the entering point and a red light at the other end. The armature of the lighting magnet is mechanically locked in place until the car has reached the other end of the section, and in the same manner a signal set for the opposite direction is mechanically locked out of service. The red lamp at one end is in series with the white or green lamp at the other end and it is thus impossible to set one signal without also setting the corresponding signal. The motorman, entering the block and seeing the white or green light, knows that the red signal at the other end is displayed. The lights can be permanently extinguished only when the car has reached the end of the section and operated the put-out magnet, and should they be extinguished through failure of current will immediately be relighted when the current returns. This system has been perfected after years of study, and has the advantage of economy. It can be applied to existing roads with small expense. It is the invention of J. J. Ruddick and is made by the United States Electric Signal Co., of Watertown, Mass.



The Dayton (O.) & Western Traction Co. is issuing 1,000-mile tickets at the rate of one cent per mile.

McGUIRE COMPANY AT KANSAS CITY.

One of the best exhibits seen at the Kansas City convention was that of the McGuire Manufacturing Co., of Chicago. The first thing that caught the attention of the visitor was the McGuire sweeper, which occupied a position directly in front of the main entrance to Convention Hall. This sweeper was one of 15 sold to the Metropolitan Street Railway Co., of Kansas City, and was very generally examined and favorably commented upon by all who saw it. It was the only exhibit of this kind on the ground. The long distance and the great cost of handling a ma-

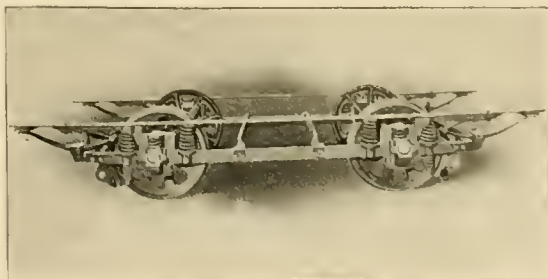


COMBINED SNOW PLOW AND SWEEPER

chine of this kind that weighs 24,000 lb., make it an expensive exhibit. There are over 500 of these machines in service throughout the country, and it is acknowledged to be a thoroughly up-to-date and practical sweeper.

In the Westinghouse exhibit was shown the McGuire A1 suspension truck (Pittsburgh type), equipped with the Pittsburgh standard motor. This exhibit was very carefully examined by a great many people on account of the record of this entire equipment. There are over 800 of this type in use in Pittsburgh alone. It is the standard also in Havana, Cuba, and in many other places. It may be mentioned here that the service in Pittsburgh is very severe because of the many heavy grades in that city. On some of the hills there are 12 per cent grades, calling for the most efficient brake arrangement and general stability of construction.

The company's main exhibit was under the galleries. The first truck was the No. 39, and was one of the hundred now being built for the Chicago Union Traction Co., where it is the standard, as it is in many other important places throughout the coun-

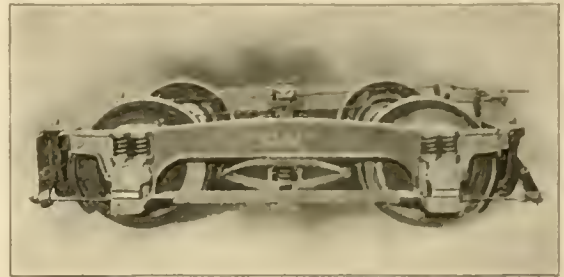


SOLID STEEL COLUMBIAN TRUCK.

try. This truck is the standard of the Indiana Railway Co., of South Bend, where they are required to make a schedule speed of 40 miles per hour, sometimes reaching 50 miles per hour. This truck has cast steel sides and bolsters and is built as nearly on Master Car Builders' lines as it is possible for an electric truck, the motors being hung outside of the axles. Its short wheel base

—4 ft. 4 in., or 4 ft. 4 in.—permits it to swing inside of the sills, bringing the car body within 26 in. of the rail, necessitating but one step.

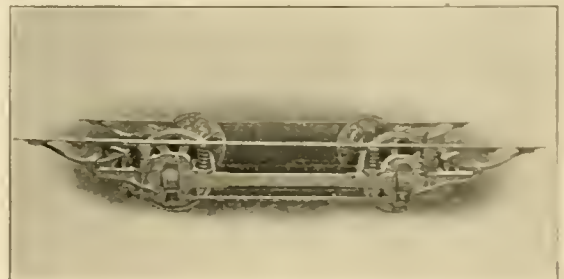
The next truck in the exhibit was the maximum traction truck. This truck is also made of cast steel with swing bolster and of the adjustable traction type. It is so constructed that as much as 75 per cent of the load may be put on the driving wheels if



NO. 35 DOUBLE TRUCK

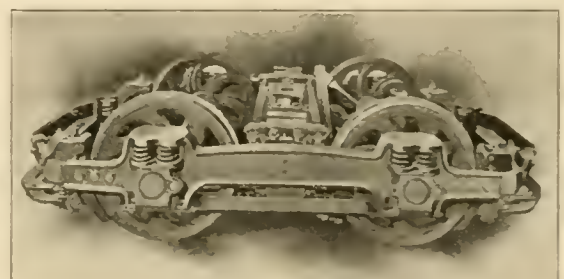
desired, with a cam and roller attachment which shifts a part of the load to the rear wheels on curves, completely overcoming the objection to most of the maximum traction trucks.

The company also exhibited one of its solid steel "Columbian" trucks, which is the standard on so many of the railroads throughout the country. The McGuire Manufacturing Co. claims to be the first to build solid steel frame trucks, which have been imitated by all the truck makers who have acquired any standing. This



A 1 SUSPENSION TRUCK—PITTSBURGH TYPE.

truck is so designed and constructed that its carrying capacity can be adjusted to any required load. The frame consists of solid steel sides of any required wheel base and has eight spiral and four three-quarter elliptic springs. The pedestal, spring cups, and spring caps are all cast in one piece, forming the end of each side frame, and is welded to rolled steel pieces 2 x 4 in., by which the length of the wheel base is regulated. The minimizing of parts is carried to its fullest extreme in the construction of this truck frame.



NO. 39 MOTOR TRUCK.

All these different trucks are equipped with standard brakes, which include the McGuire "Elastic" brake hanger, which is a very popular feature of the trucks, and absolutely prevents kicking, chattering, or rattling of brakes, and automatically takes up its own wear and lost motion.

The "Royal Flush" fender came in for a very generous inspec-

tion, as nearly every railroad man is very much interested in this subject. This fender seems to do everything that the more expensive types will do, and has the advantage of being a simple and low-priced fender, which is a taking feature. Mr. McGuire christened the fender the "Royal Flush," because he says he thinks it is hard to beat.

There were also exhibited the latest types of "Columbia" car heaters, one of which sets over the seat and the other in the seat. This is a very handsome piece of car furniture and is being very generally used throughout the country. In Chicago alone there are over 900 of them in service. In connection with the fender exhibit was a section of platform showing the spring guard, which is now being used by many roads. The North and West Side roads of Chicago have them on all their equipment. Several of the lines in Dayton and other places are using them and report most favorably upon their use. The exhibit also included brake handles. Take it all in all, the company had one of the most creditable exhibits at the convention. It was represented by Mr. W. J. Cooke, vice-president of the company, and Mr. T. J. Callinan. Mr. Cooke reports that they made many sales of sweepers, trucks, fenders, and stoves, an unusual occurrence at a convention.

MONTREAL STREET RAILWAY REPORT.

The report of President L. J. Forget to the directors of the Montreal Street Railway Co. for the fiscal year ending Sept. 30, 1900, shows a very satisfactory condition of the property. During the year a new car shed has been built, and a fireproof addition made to the William St. power house. Fifty-six closed motor cars, 45 open motor cars, 1 stores car, 7 supply cars, 80 trucks, 128 motors and 83 controllers have been added to the equipment.

The company's capital stock is \$5,497,055 and its bonded debt \$973,333. Four 2½ per cent dividends were paid during the year. Payments to the city were: Tax on earnings and other taxes, \$84,423.71; on account of snow cleaning, \$84,256.22; total, \$168,679.93. The table shows further comparative data.

	1900	1899	1898	1897	1896	1895	1894	1893	1892
Gross Receipts	\$1,269,912.24	\$1,467,371.93	\$1,451,813.50	\$1,711,257.78	\$1,762,895.35	\$1,192,227.31	\$194,999.89	\$195,231.24	\$181,494
Increase 1900 over 1899	196,139.56								
Operating Expenses	962,910.81	81,839.94	784,814.35	756,428.80	718,154.79	625,811.74	627,891.14	662,041.21	656,612.10
Increase 1900 over 1899	79,876.13								
Operating Expenses	40.31	53.01	56.43	56.98	56.40	55.59	71.18	79.00	82.45
Per cent of Car Mileage									
Net Earnings	276,979.67	147,326.37	167,063.39	208,529.13	234,023.56	416,362.13	519,472.72	197,710.07	41,261.79
Increase 1900 over 1899	86,143.95								
Net Income per cent of Capital	19.00	13.19	19.00	19.41	19.90	10.91	9.60	9.17	
Passengers Carried	43,278,793	46,316,093	38,452,000	32,940,317	39,395,474	25,127,254	16,510,813	17,312,702	11,411,366
Increase 1900 over 1899	6,173,794								
Transfers	13,381,071	13,960,817	1,266,583	8,712,953	8,211,200	7,654,870	6,554,852	5,999,119	

ELECTRICITY FOR METROPOLITAN RY., LONDON.

London dispatches of November 8th state that the Metropolitan District Railway Co., operating the old underground road, will on December 1st award contracts for the rebuilding of 50 miles of track and its equipment for electrical operation. The total expenditure is estimated at £5,000,000. Among the competitors are the Westinghouse, the General Electric and the Thomson-Houston companies, Mather & Platt, the Brush (British) Electric Co., Crompton & Co., Thomas Parker & Co., Dick, Kerr & Co., Allgemeine Electricitaets Gesellschaft, Siemens Bros., Schulkert & Co., Bregguet Electric Co., Hontin & Leblanc.

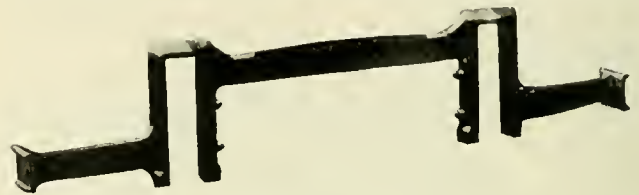
Sir William Preece is the consulting engineer for the railway.

A collision between a street car and a hose wagon in Milwaukee, recently, came near resulting fatally to several firemen. Chief Foley of the Board of Fire and Police Commissioners will hold an investigation to decide whether or not the company was at fault.

COMPLEX FORGED TRUCK SIDE.

The accompanying engraving was made from a photograph of a new solid forged wrought iron truck side of one piece made by the J. G. Brill Co. for its No. 27 G truck. Heretofore complex truck sides of this pattern have been made of steel. For a long time there has been a desire both on the part of the maker and street railway men to obtain solid forgings in the place of steel. It is generally recognized that forgings for all ordinary sizes have considerable advantages over steel, and can be made lighter and much more shapely. The great expense of forgings, however, has in most cases prevented their use for such complex work as the No. 27 G side.

It will be noticed that the truck ends are dropped down very low upon the jaws; this is for the purpose of enabling the truck



FORGED TRUCK SIDE.

to turn under open cars and to bring the truck side so low as to clear the steps. The forgings are very smooth and have repeatedly been mistaken for castings on account of their accuracy and the absence of hammer marks. Each jaw is fitted with a gib or wearing piece. This enables the jaws to be renewed to their original size with little difficulty and expense. Just inside of the jaw on the main bar are seen the seats for the links; these come so near the center line of the jaws that the weight of the body is carried but a very short distance through the frame, practically less than 12 in. The strains, therefore, in this important member of the truck frame are reduced to a minimum.

Considered as a piece of blacksmith work this forging is quite remarkable and will command attention wherever it is seen by experts in the handling of wrought iron. The fact that so complicated a piece of work can be produced at anywhere near the price of steel makes it even more worthy of notice.

CANADIAN NOTES.

The Montreal Street Railway Co. is reconstructing a portion of its line on one of the principal streets with 83-lb. rails secured to steel ties imbedded in concrete. This is the first use of steel ties in Canada and if they prove satisfactory they will be used in all new construction. The company has about half its line cast-welded.

The citizens of Hamilton, Ont., will vote on a by-law, in the near future, to decide whether or no they will pay the Hamilton, Guelph & Galt Electric Railway Co. a bonus of \$90,000, in return for the construction of an extension to the present line. It is confidently expected that the bonus will be granted, and that the work will be pushed to completion in the early spring.

A serious strike is in progress in Kingston, Jamaica, where the employes of the street railway company have struck for higher wages and shorter hours. The company made an effort to run the cars as usual, but the new men were assaulted and roughly handled, and traffic is practically at a standstill. A few cars are running under police protection, and a strong force has been called out to protect the workers from assault.

Mr. F. P. Brothers, formerly manager of the construction for the Montreal Street Railway Co., has left for Havana, Cuba, to superintend the construction of about 600 miles of steam road for the Cuban company. Mr. Brothers is well known in the street railway world, for in addition to his connection with the Montreal road he has had control of the building of electric railways in St. John, N. B., Kingston, Jamaica, and Georgetown, Demerara. Railroad contractors who are idle during the winter months may

benefit by communicating with Mr. Roberts, as he is letting a great deal of work in Cuba by contract, and contemplates commencing operations immediately.

The shareholders of the Hamilton, Grimsby & Beamsville Electric Railway Co. are applying to the Ontario Legislature to have the special act of the company amended by giving it power to continue its line of railway to St. Catharines, Niagara, and Niagara-on-the-Lake, to issue bonds of the company not exceeding in amount \$10,000 per mile of the whole line, and to give instructions to the directors as to the construction of said extension.

Mr. James Ross, vice-president and managing director of the Montreal Street Railway Co., has just returned from Birmingham, England, where he has been arranging for the installation of an electric trolley road. The existing street railway system in Birmingham has been controlled by Mr. Ross and some Canadian associates for some years past, but they have only now succeeded in convincing the municipal authorities that the electric trolley system was the best adapted for the wants of that great center. Reconstruction of the present system is now in full swing, and Mr. Ross expects to have a portion of the line open for traffic by the first of the new year.

A serious accident, by which a number of people were more or less severely injured, occurred in Montreal the afternoon of Sunday, November 4th. As a heavily loaded car on one of the mountain lines was on its way up the hill, the trolley wheel jumped the wire, and before the brake could be applied the car started to run backward down the steep incline. The passengers, seeing another car close behind, and fearing collision, rushed into the forward end of the car, and crowding around the motorman, made it impossible for him to regain control of his car. The cars following the runaway up the hill reversed as soon as it was seen what the trouble was, but were overtaken, and three cars were more or less damaged. The passengers had become panic stricken in the crash down the hill, and jumped, and it was in this manner that most of the injuries were sustained, as the employes, who stuck to their posts, were unscathed, and had it not been for the interference of the passengers in their first mad rush for safety, there is little doubt but that the motorman would have been able to have controlled the car, as the brakes, upon investigation, were found to be in perfect order.

IMPROVEMENTS IN LOS ANGELES.

Since the owners of the Los Angeles (Cal.) Ry. acquired the Mt. Lowe railroad property their engineers have been preparing plans for the improvement and extension of that unique line. The intention now is to straighten the line from Altadena to the base of Echo Mountain, lay heavy rails and make the road practicable for heavy cars. Mr. C. W. Smith, general manager of the Los Angeles Ry. says: "Ultimately a trolley road from the top of Echo Mountain to the Alpine Tavern will be extended across the ridge and up to Wilson's peak. We have found it is perfectly feasible to carry this road to the summit by way of Martin's camp, and it will surely be done."

SEMI-WEEKLY TOURIST SLEEPERS CHICAGO TO BOSTON.

The Wabash Road now operates a line of tourist sleepers between these cities, leaving Chicago Mondays and Thursdays at 9:25 a. m., and arriving in Boston 5:20 p. m. next day. New York passengers can occupy these cars as far as Rotterdam Junction, N. Y. (where the train arrives at 11 a. m.), reaching New York at 3:15 p. m. No excess fare required. Write for reservations. Ticket office, 97 Adams St., Chicago.

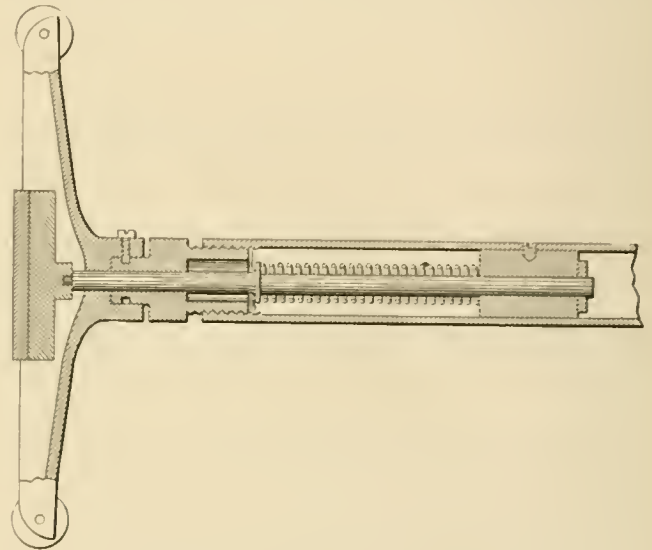
The ordinance regulating the speed of street cars and limiting the number of passengers to be carried, recently passed by the council of Tacoma, Wash., has been vetoed by the mayor on the ground that its enforcement "would work great inconvenience to the public and cause no end of trouble to the officials of the street car company and its patrons and to the city officials, without corresponding benefit or protection to the public."

BARGAINS IN ELECTRICAL APPARATUS.

The Gregory Electric Co., 54 62 S. Clinton St., Chicago, has recently purchased the entire stock of completed machines, instruments and supplies of the Siemens & Halske Electric Co. of America, and also the entire stock of completed machines of the Gibbs Electric Manufacturing Co., of Milwaukee, and these additions to the regular stock of machines enable the Gregory company to offer some exceptionally good bargains to intending purchasers.

IMPROVED CURTAIN FIXTURE.

The sectional drawing herewith shows the construction of an improved curtain fixture on which a patent has recently been granted to James W. Patterson, 4100 N. Ashland Boulevard, Chicago. The important feature of this fixture which makes it superior to those heretofore used is the rigid position of the heads on the curtain rod; there is no end play to the rod so that it is not pulled from the grooves in the window jamb and the rod is at right angles to the joints. A hollow rod, or a solid rod with tubular ends is used. The head of the fixture has projecting arms



PATTERSON CURTAIN FIXTURE.

with rollers at each end, and this head is secured to the end of a milled screw, so that the latter is free to turn. The screw fits the interior of the hollow curtain rod and is thus easily adjusted to the jamb; the curtain itself covers the head of the screw and prevents meddling by passengers, and if desired a lock nut could also be used. The friction feet are held in the heads and mounted on rods passing through the milled nuts mentioned and are pressed against the window jamb by springs contained in the tubular rod; the tension of these springs can of course be anything desired.

THE MILFORD (MASS.), HOLLISTON & FRAMINGHAM STREET RAILWAY CO. has elected the following directors: John T. Manson, J. Willis Downs, H. C. Fuller and Charles E. Graham, all of New Haven, Conn.; Sidney Harwood, of Boston, James E. Walker, of Milford, and Arthur R. Tait, of Uxbridge. At a subsequent meeting the following officers were elected: John T. Manson, president; Sidney Harwood, vice-president; James E. Walker, auditor; Wendell Williams, clerk; E. W. Goss, treasurer and general manager, and Maxham E. Nash, superintendent.

ANNOUNCEMENT.

The Southern Pacific Co. announces that Sunset Limited service to California for the season was resumed November 8th, and will be tri-weekly, leaving New Orleans 10:45 a. m. Mondays, Thursdays and Saturdays.

Detailed information at the company's offices, 238 Clark St., Chicago. W. G. Neimyer, G. W. A.

HALF FARES.

Burlington, Ia., has a street railway mail service.

Talk of building an electric line between Richmond, Va., and Petersburg has been revived.

The Decatur (Ill.) Traction & Electric Co. has bought two new 250-kw. General Electric generators.

The Ohio Southern Traction Co. recently suffered the loss of 406 ft. of trolley wire taken by thieves.

A new car house at Watertown, now building by the Boston Elevated Ry., will be completed in the spring.

The Tacoma (Wash.) Railway & Power Co. has reduced fares on its Tacoma and Puyallup line from one-fourth to one-third.

The St. Louis Transit Co. and the St. Louis & Suburban Railway Co. have together subscribed \$250,000 to the World's Fair fund.

The city of Kalamazoo, Mich., has been successful in a suit brought to compel the Michigan Traction Co. to lay grooved rails.

The City Electric Railway Co., of Port Huron, Mich., is about to purchase property for a park which will be fitted up for a summer resort.

Raymond & Co. and the First National Bank have obtained judgments against the Suburban Street Railway Co., Austin, Tex., for \$50,000.

The American Express Co. has closed its office at Cuyahoga Falls, O., the contract with the Northern Ohio Traction Co. having expired.

The Holyoke (Mass.) Northampton Electric Ry., which was recently opened, furnishes through service between Springfield and Northampton.

Those interested in the interurban electric roads entering Indianapolis, Ind., are considering the establishment of a union depot for trolley freight.

Four persons were injured in a collision between a freight car and an electric car, at the Hocking Valley crossing in Columbus, O., October 30th.

It is announced that the Milwaukee Electric Railway & Light Co. will soon let contracts for a four story car house and office building to cost \$500,000.

Work on the water power plant of the Lake Superior Power Co. at Sault Ste. Marie is progressing quite rapidly, the foundations being nearly completed.

Mr. Wilmer H. Shields, of Natchez, Miss., is reported to represent local and foreign capitalists who propose building an extensive electric railway in Natchez.

It is announced that the Denver City Tramway Co. has acceded to the request of its motormen and conductors for an advance in their wages of 3 cents per hour.

On October 20th John B. McDonald received a check of \$265,000 as the first installment of money in payment for the work on the New York Rapid Transit tunnel.

An improved system of street railway mail service between the cities in Hudson County, N. J., with the exception of West Hudson, went into effect October 15th.

The Board of Public Works of Columbus, O., has taken a determined stand that none but grooved or "Trilby" rails will be allowed on the Mt. Vernon Ave. extension of the Columbus Railway Co.

Thomas L. Childs, of Akron, O., states that the rights of way for the proposed Akron-Canton line have nearly all been secured. This road is to be completed by June 1, 1901.

The Indiana Railway Co. has installed an express service between South Bend and Goshen. The service is received with enthusiasm by the merchants along the line.

The ordinance to compel the street railway companies in New Orleans to operate separate cars for the colored people was defeated in the council by a vote of 12 to 4.

The Brooklyn Rapid Transit Co. has changed its organization, dividing the lines into six divisions, each in charge of a division superintendent, instead of two as formerly.

Autumn leaves on the rails, by preventing a quick stop, caused a rear end collision on the Bay View line at Milwaukee, October 21st. Several persons were slightly injured.

The Milwaukee Electric Railway & Light Co. recently installed a 2,000-h. p. generator in its power house, which will increase the capacity of the plant from 4,000 to 6,000 h. p.

The Worcester (Mass.) Consolidated Street Railway Co. has made a new contract with the post office department under which letter carriers in uniform need not pay fare.

The Palmer (Mass.) & Monson Street Railway Co. has reduced the fare between Palmer and Ware from 15 to 10 cents. Five cents will be charged from Palmer to Forest Lake.

The Syracuse (N. Y.) Rapid Transit Railway Co. is equipping its cars with vestibules, sand boxes and transparent signs in preparation for the winter's inclement weather.

The Toledo (O.) Traction Co. has received four of the eight new double truck cars which were ordered from the east. The cars will be put in service on the Cherry St. line.

The Nunnery Hill Street Railway Co., Pittsburg, is suing the United Traction Co.; the former seeks to use the tracks of the latter in certain streets and also to make crossings.

Thomas H. Regan, of Philadelphia, who has the contract to build a street railway in Greenville, S. C., has announced that cars will be running on the proposed line by December 15th.

The street railway mail service on the electric line between Los Angeles, Cal., Ocean Park and Pasadena has been increased by a new postal car which was put on the line October 25th.

The Fitchburg (Mass.) & Suburban Street Railway Co. and the Fitchburg & Leominster Street Railway Co. have paid \$12,500 toward the expense of abolishing grade crossings in that city.

October 16th a passenger car on the Columbia and Renton line of the Seattle Street Ry. collided with a freight car and a number of persons were more or less injured, none fatally, however.

Experiments have been made in transmitting power current a distance of 154 miles over the lines of the Snoqualmie Mills Power Co., between Seattle and Tacoma and Snoqualmie Falls, Wash.

Work of construction on the Grand Rapids, Holland & Lake Michigan road was begun October 29th. Mr. B. S. Hanchett, Jr., vice-president of the company, lifted the first spadeful of earth.

General Manager Crawford, of the Hartford (Conn.) Street Railway Co., has invited a committee of the city council to visit New York and Boston with him and investigate the question of rails.

The question has arisen in Seattle, Wash., whether a dog, whose fare on the street railway is paid by his master, is entitled to a transfer on connecting lines. A suit yet pending settlement has been brought by a man who was denied a transfer for his dog, under such circumstances.

The proposed electric line through Woodbury, Conn., of which Judge Warner of that city is the principal promoter, will be built by a company of New Haven, Boston and New York capitalists.

The Dayton (O.) & Xenia Traction Co. has been sued for \$20,000 by a young lady of Dayton, who claims that in an accident occurring on that line July 30th her beauty was permanently marred.

Dead leaves falling on the street railway tracks in Cincinnati, O., have occasioned the motormen considerable difficulty. The leaves when once ground by the car wheels make the rails very slippery.

The street railways in Galveston, Tex., have resumed service on Market St., West Broadway and Center St., power being furnished from the Brush Co. The car motors destroyed by the storm have been replaced.

The club house erected by the Cincinnati Street Railway Co. on Eastern Ave. for the use of its employees was completed last month. The plans for this building were published in the "Review" for June, page 345.

The Birmingham (Ala.) Railway & Electric Co., the Birmingham Traction Co., and the Birmingham, Powderly & Bessemer Railroad Co. have been consolidated as the Birmingham Railway, Light & Power Co.

On November 14th the power house of the Ohio River Electric Ry. was opened. Mr. John Blair MacAfee, of the Railways Company General and the American Engineering Co., issued invitations for the occasion.

The site for the new power house of the Findlay, Fostoria & Toledo Electric Ry. has been selected at Fostoria and work on the new structure will be begun at once. The grading on this line is progressing nicely.

Joe Murphy, colored, who sued the Atlanta (Ga.) Railway & Power Co. for \$2,500 has been awarded damages to the amount of \$90. Murphy was put off the car for tendering a Columbian half dollar in payment of his fare.

For the year ending June 30, 1900, the Lewiston (Me.), Brunswick & Bath Street Railway Co. reports gross income from operation, \$222,364; operating expenses, \$167,599; passengers carried, 3,416,141; number of employes, 195.

A company proposing to build a very elaborate electric railway system to connect Buffalo, N. Y., with points along the Canadian shore of Lake Erie, as far north as Crystal Beach, has been incorporated under the laws of Delaware.

The International Traction Co.'s tunnel at Newfane, N. Y., has been completed, and cars are running direct from Lockport to Olcott without change. The through route from Buffalo to Olcott will be opened in the early spring.

We are advised that the work of building the Kenosha (Wis.) Street Ry., which was suspended on October 3d, will be resumed as soon as the necessary men can be secured. The line when completed will be a link in the Chicago-Milwaukee road.

The Grand Rapids (Mich.) Street Railway Co. is building a new car house and shop, 220 x 235 ft. The portion to be used for car storage will have a capacity for 80 cars; the other half of the building is divided into carpenter, machine and paint shops.

The stockholders of the proposed line between Chillicothe and Hillsboro, O., have employed an engineer to make the profile and location surveys. There are two or three routes in contemplation out of Chillicothe and those interested desire to know which in every way is the better.

Mr. W. A. Foote, who is chiefly interested in the proposed line between Jackson, Mich., and Kalamazoo, has announced that the

road will be in operation between Jackson, Michigan Center, Wolf Lake and Grass Lake by May 1, 1901. Rapid progress is being made in the grading of the roadbed.

The Bay Cities Consolidated Railway Co., Bay City, Mich., will put tenders on its cars in both Bay City and West Bay City, in accordance with a resolution passed by the council.

On October 27th Judge Johnson refused to make permanent the injunctions preventing the Swarthmore & Philadelphia and the Media, Middletown & Aston Electric Railway Co. from building their lines in the city of Media, Pa. Injunctions granted to property owners restraining these companies were dismissed.

The opening of the Houghton County Street Railway Co.'s electric line through the copper belt of Michigan was celebrated in Hancock, Mich., October 27th with great enthusiasm by all citizens. The entire town was gayly decorated with flags, and thousands of people cheered the first car as it passed over the new road.

Rapid progress is being made on the Grand Rapids, Grand Haven & Muskegon Ry., a large force of men and over 30 teams being at work along the proposed route. J. M. Walker, general superintendent, representing Westinghouse, Church, Kerr & Co., contractors, has secured offices in the Houseman Building, Grand Rapids.

A resolution has been passed unanimously by the Connecticut state board of trade to the effect that hereafter the state board of railroad commissioners should have supervision of electric as well as steam roads throughout Connecticut. The resolution will be presented by committee at the next session of the state legislature.

The trade unions at Marion, Ind., on October 16th, ordered a boycott of the Union Traction Co., with the idea of forcing the recognition of a street railway union. Hacks were run for the accommodation of union men, but these were not patronized, and on November 5th their use was discontinued. The boycott was a failure.

The strike of the employes of the Terre Haute (Ind.) Electric Co., begun October 11th, was settled by arbitration on the 17th. The motormen and conductors had demanded an increase of from 2½ to 7½ cents per hour, and the arbitrators recommended an advance of 1 cent per hour; linemen are to receive an advance of 2½ cents.

Since the opening of the new electric underground railway in London, Eng., restaurant keepers in the vicinity of the Stock Exchange have experienced a considerable falling off in business. Rapid service on the new "underground" makes it possible for the brokers to patronize the fashionable West End restaurants during lunch hour.

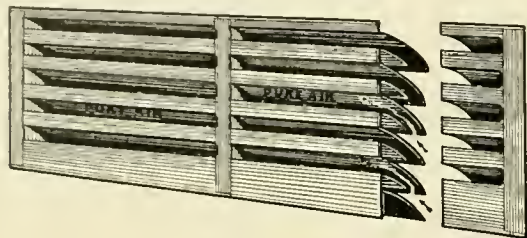
The Fox River Valley Electric Railway Co. has acquired the street railway and lighting plants at Appleton, Wis., and it is announced will build a temporary power house to replace the one burned in July last. A permanent power plant will be erected next season; it will be of sufficient capacity to operate the Appleton and Neenah line also.

Pres. James D. Hawks of the Detroit, Ypsilanti & Ann Arbor Ry. and of the proposed Ann Arbor & Jackson Electric Ry. has awarded Barney & Smith of Dayton, O., the contract to supply 10 cars for the latter line. Westinghouse, Church, Kerr & Co. will furnish the electrical equipment, and cars will be running over the line by June 1, 1901.

The Mill Creek Valley Electric Railway Co., of Cincinnati, will make extensive improvements along its line. The line between the Cincinnati "Zoo" and Mitchell Ave. will be entirely reconstructed, 200 men now being engaged on the work. Waiting rooms will be built at Lockland, Mitchell Ave., and an elegant large depot will be constructed at Glendale.

IMPROVED VENTILATOR.

The Perry ventilator, which is the recent invention of E. S. Perry, of New Bedford, Mass., is being introduced on the street railways throughout the eastern states with the most satisfactory results, the street car companies finding, as had been promised, that the Perry ventilator refused to leak in stormy weather and possessed all the other desirable qualities claimed for it. The ventilator is so constructed that all dust raised by the car is drawn under the deflector and out through the ends of the ventilator, thus rendering whisk brooms on street cars superfluous. A strong outward draft removes all impurities, and through the same ventilator a current of fresh air is constantly poured into the car's interior. On smokers, especially, the ventilator has been found most effective in keeping the atmosphere clear and pure, all smoke as well as dust



INSIDE VIEW OF VENTILATOR.

being carried away by the outward draft which performs the office of scavenger while the impouring current affords a fresh supply of air to passengers. Less scrubbing and cleaning are required on cars equipped with the Perry ventilator than on others. It should be stated, moreover, that though the in-coming and out-going currents of air are entirely effective for their purpose, they are also so regulated as to be imperceptible to the passengers.

The American Car & Foundry Co., of Buffalo, N. Y., is building 50 new cars which are to be equipped with the Perry ventilator; the Albany & Hudson R. R. has equipped all its new cars, which were described in the October "Review" with these ventilators, and numerous other orders from steam and electric railway managers have been received.

A TRIP TO CALIFORNIA

For the winter has become the common thing for those who enjoy perpetual summer. In returning from there there is one route that combines far more advantages than any other—the Shasta-Northern Pacific route. The scenic features between San Francisco and Portland are unequalled in the United States. Winding along the upper Sacramento River, and passing over the Siskiyou Mountains one goes wild. Castle Crags form a never to be forgotten panorama. After Castella and Castle Crags are reached frequent glimpses of white robed Shasta are to be had, and ere long the grand mountain is in continuous sight until the Siskiyou are crossed. Black Butte, south of the Siskiyou range, and Rogue River Valley to the north of it also challenge one's admiration. At Portland the Columbia River and Mounts Hood and St. Helens are reached. Beyond, lies the Puget Sound country and Tacoma and Seattle; then comes the passage of the Cascades with Mounts Rainier and Adams mantled in white, standing bold and high. The Spokane country and the Clark Fork region with Lake Pend d'Oreille and the Mission and main Rocky ranges form another great scenic panorama with Helena and Butte added. At Livingston comes the tour through the great Wonderland—Yellowstone National Park, touched only by this line. This is a side trip unequalled anywhere. Then the Yellowstone River and Valley, with the boundless plains of Montana and North Dakota; the picturesque Pyramid Park, the wheat growing Red River Valley and the Minnesota lake region follow in swift succession and your train is at Minneapolis and St. Paul, the giant cities of the great Northwest. Pullman equipment and dining cars are with you the entire distance. Note this all down and see that your return ticket reads via the Shasta-Northern Pacific, and in the meantime send six cents for Wonderland 1900 to Chas. S. Fee, G. P. A., Northern Pacific Ry., St. Paul, Minn. The book is a beauty and describes the whole region and the route.

CALCULATING FEEDERS.

Boston, Mass., Nov. 9, 1900.

Editor "Review": What size feeders would be required for the operation of four or five cars on a suburban line with 30 miles of single track operated as a loop, allowing for not less than 475 volts at the point farthest from the power house which is at one end of the loop? What is copper equivalent of a 50-lb. rail?

L. J. GORDON.

965 Washington St.

(The station capacity in watts required per car may be taken as $100 \times W \times S$, where W is the weight of the car in tons and S the schedule speed in miles per hour. Thus if there be two 27 h. p. motors which will drive a 12-ton car at 23 miles per hour on level track, the schedule speed could be assumed at 12 miles per hour and the station capacity per car would be $100 \times 12 \times 12$ or 14,400 watts. With a station voltage of 550 this would give 26 amperes per car.

The ordinary practice on such a line as that mentioned would be to run three feeders, one to the far end of the loop, and one to the half-way point on each side. Up to the half-way point the trolley wire (assumed to be No. 0, which has an area of 105,000 c. m.) could be counted as part of the feeder capacity; but for the far end of the loop the feeder should be designed to carry the entire current.

For the long feeder we may assume a drop of 75 volts and the area of the feeder would be determined from the formula $\text{Current} = \text{Drop in voltage} \div \text{Resistance}$. The current we have taken to be 26 amperes, and the drop in pressure to be 75 volts. The resistance per mil-mile of copper is 57,850 ohms, so that the resistance of the feeder will be the length in miles times 57,850, divided by the area of the feeder in circular mils. The resistance of the track return may be taken as one-half that of the feeder, so we have the total resistance equal to $1.5 \times 15 \times 57,850 \div (\text{area in c. m.})$. Substituting this value in the formula $\text{Current} = \text{Drop} \div \text{Resistance}$ and solving for the area of the feeder cross-section, we get.

$$\text{c. m.} = (26 \times 1.5 \times 15 \times 57,850) \div 75 = 451,230.$$

For the copper running to the half-way points the formula gives (assuming a drop of 50 volts)

$$\text{c. m.} = (26 \times 1.5 \times 7.5 \times 57,850) \div 50 = 338,423;$$

subtracting the area of a No. 0 wire, 105,000 c. m. gives as the area of each of these feeders, 233,000 c. m. A No. 0000 wire has a cross section of about 212,000 c. m.

A 50-lb. rail has an area of 5 sq. in. equal to 6,350,400 c. m. Iron has about 17 per cent of the electrical conductivity of copper and hence a 50-lb. rail is equivalent to about 1,080,000 c. m. of copper.)

IMPORTANT, IF TRUE.

The St. Louis papers are full of rumors of the contemplated resignation of President Whitaker of the St. Louis Transit Co., to become president of the Boatmen's Bank, of that city; also the resignation of General Manager Baumhoff, of the same company, to be succeeded by Captain McCullough, now general manager of the Chicago City Ry. All three officials, however, positively deny any truth in the rumor.

The New York papers are reporting the probability of John M. Roach, president of the Chicago Union Traction Co., resigning, to become president of the Brooklyn Rapid Transit Co. Mr. Roach states he has no idea of leaving Chicago at present.

THE BETHLEHEM STEEL CO. has again opened an office in St. Louis, and will be represented there by Mr. S. E. Freeman, 930 N. Main St.

THE GARTON-DANIELS CO., of Keokuk, Ia., is highly gratified to find an increase of one-third in its business, over last year, which was double any previous year. The adoption of the company's lightning arresters on many of the prominent new installations of the year is indicative of their high merit. This company expects to place some new specialties on the market in the near future, with which it has been experimenting for the past year.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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Our annual index, which is published with this issue, is arranged alphabetically according to subjects and if an article has dealt with more than one topic it has been indexed under all the subjects treated. Descriptions of street railway systems will be found under the city where the company has its principal office. All legal matters, decisions, notices of suits, etc., are indexed under the heading "Law."

We wish to add in this connection a word in reference to the value of saving and binding the numbers of the "Review" for future reference. Many inquiries come to this office asking for information on subjects that have been treated in these columns. We are more than glad to receive these inquiries and always make every endeavor to answer them as fully as possible, but subscribers can save themselves considerable inconvenience and avoid delays by filing each number of the "Review" as it is received and binding them into one or two volumes at the end of the year. With the aid of the index managers will generally be able to turn to an article that will give them just the information they are seeking.

At Indianapolis and Kansas City certain aldermen are trying to get city legislation for half fare in one case and a free ride in the other for standing passengers. The companies might experiment on a seatless car for the Hoosiers and one in which standing was impossible for the hill city riders.

If all the strange and unexpected causes which are made the basis of claims against street railways for alleged damages were compiled, the result would make a very entertaining list. The latest comes from Ohio, where a father sues for \$5,000 on account of a car barn having fallen upon his son, a minor.

Do the undertakers in Atlanta, Ga., think they see their finish in the proposed electric line to the leading cemetery? At all events they have united in a public protest against the construction of the proposed road. Most people are under the impression

that undertakers would be more than amply profit even if they got the present take off on the body.

The city council of Alameda, Cal., passed an ordinance restricting the speed of electric cars to not more than five miles an hour. It did not say how much cost, and the interurban line which passed through the town now moves its cars at a snail's pace while inside the city limits. A might be expected the citizens are up in arms and after the council chamber for a repeal.

Virginia proposed to settle the separate car question by legislative action, and this reflects the civic and local interests of what has of late become a vexing problem. The street railway companies are reported as not in favor of the new law, but there is little prospect that their wishes in the matter will receive much consideration, and in all probability the bill will become a law.

We have a somewhat indistinct recollection that there was a time, which must have been years ago, when the riding public was complaining in the daily papers about refrigerator cars and other Arctic conditions of travel. Evidently the pendulum has swung too far the other way, for a New York daily has a long article on overheated cars, and seats so hot passengers preferred to stand. The electric heater is evidently a warm subject.

The award of six cents in damages in a personal injury suit in a case brought against the Third Avenue road, New York, caused the presiding judge to set aside the verdict. The court held that the amount awarded was inconsequential, and that if any damage whatever was proved it was an amount greater than the six cents. A new trial was ordered.

It has been the understanding by managers generally that a verdict for a few cents was a great victory inasmuch as it prevented or at least discouraged the plaintiff from bringing suit a second time, and the payment of the small sum closed the incident.

It is not so very long ago when an interurban line 15 miles in length was considered quite a remarkable affair. Now they are stretching out indefinitely and it will not be a great while before 100-mile roads will be numerous. In many cases these lines follow old post or government highways. There is a road now building in Indiana which will be 73 miles long and the half-way stop will be made at a point where stands an old fashioned tavern which was the glory of stage drivers 50 years ago. When the road is in operation the old tavern will be rebuilt and travellers will again stop for meals as they did half a century ago.

The hack drivers of Detroit seriously object to the operation by the Detroit street railways of the special car "Yolande," which enables visitors to make a delightful trip all over the city for 25 cents. The corporation counsel has rendered an opinion holding that it is illegal for the street railway to charge more than 5 cents for a ride over any established route but that if the passengers voluntarily pay 25 cents the company is within its rights. The ruling is doubtless very satisfactory to the street railways, and if some passengers declined to pay the fare the roads might easily establish five separate routes over which to run the special car.

We commend the article on "Oil on Highways" to the managers of railways who find the dust nuisance to be serious. The cost of oiling the roadbeds of steam railways in the East is given at \$15 per mile per annum, and Mr. Longden states the average cost of oiling highways in southern California is less than \$150 per annum per mile for strips from 12 to 18 ft. wide. Assuming that water for sprinkling is available, which is not always the case, the cost of keeping down dust with water is probably not much less than \$16 per month per mile of street, the width sprinkled being 18 to 20 ft., where the company's barns and stables are conveniently situated. The difference, therefore, between water and oil is not a very serious one, and if the oil has the superiority claimed for it, it would be cheaper in the long run to use it.

Steam roads have frequently been dictators where some town attempted to take advantage of supposed necessities and try a hold-up game. The remedy has usually been to divert the line to some

opposition town where decent treatment was assured. Many a town has not yet recovered from some such policy of 20 years or more ago, and some never will recover the lost prestige.

It is now probable that the electric interurbans may have occasion to use the same tactics. A certain town in Michigan aspiring to become something of a port, is treating an interurban line which had selected it as a terminal, with anything but fairness, and the promoters of the road threaten to make the terminus at a nearby smaller town which offers to help out, build wharves, etc., and which has an equally good harbor.

The average passenger who does his riding during the rush hours morning and evening would scarcely believe that a whole, able bodied franchise could be put up at auction in a city of any size and not be bid up over one dollar. And yet that was precisely the amount of the highest bid, and the figure at which the franchise for a branch line in Syracuse, N. Y., was knocked down. It was the first franchise ever sold at auction in that city. The commissioner of public works conducted the sale, and an interesting fact in connection therewith is that the city spent \$504 in advertising the sale. A St. Louis paper commenting on this says: "It is only what might have been expected. Franchises are not like corner lots or draught horses. They are desired only by companies expressly organized for the purpose of using them, and such companies cannot be created for the occasion."

The Supreme Court of Missouri has rendered an important decision in the case of a newsboy injured while jumping from a car in motion after offering his papers on the car. The plaintiff claimed he was a passenger because he intended to pay fare "if the conductor asked him." The court rules this alleged intention does not make him a passenger; that the primary object in boarding the car was to sell papers and not to obtain transportation. Hence "a newsboy who hops on a car while at full speed, tries to sell papers, and then hops off again while the car is in rapid motion, is in no sense, either in fact or intention or law, a passenger."

The court rightly reasons that if a newsboy is a passenger he could demand the stopping of the car both to board and to leave it, and if the cars were so stopped for all the newsboys who want to sell papers on the cars the operation of cars would be practically at their mercy, and the company and the public greatly inconvenienced.

The announcement elsewhere in this issue that the Consolidated Traction Co., of Pittsburg, would at the beginning of the year decorate its employes with service stripes, a blue stripe for one year's and a gold stripe for five years' service, calls to mind the unfortunate lack of uniformity in the service stripe regulations of different companies. Thus on the Cincinnati Street Railway a light blue stripe indicates 2 years' service; a light blue stripe with scarlet edging, 4 years; a gold stripe, 5 years; gold with scarlet edging, 10 years; gold with orange edging, 15 years' service. On the Boston Elevated Railway each stripe indicates five years' service, but the stripes are of silver for motormen, gold for conductors, scarlet for linemen, and green for switchmen and watchmen.

The principal object of such decorations is to bestow on the faithful employe a badge that will inform the general public with whom he comes in contact, of his honorable service. Stripes on the sleeve which certify 5, 10, or 15 years of service with a street railway company are also a certificate of honesty, sobriety, industry and competence, and cannot fail to impress the passenger and influence his mental attitude and conduct towards the employe. But by reason of the want of uniformity in the stripes as prescribed in different cities, a passenger riding on a street railway other than in his own city gets no information from service stripes. What Boston man visiting Cincinnati would suppose that the orange border on the gold stripe meant the same thing as three gold stripes at home, or what Cincinnati man in Boston would think that four green stripes meant 20 years' service.

We think that what may be called the transient or visiting traffic is quite large enough to make uniformity in this matter desirable, and believe that this is one of the things that should be settled by the American Street Railway Association. There are no questions of policy or local conditions involved and esthetic preferences for different colors are not very important, so that there

should be no difficulty in a committee of the American Association deciding upon a scheme of service stripes that could be accepted by all members.

The question of making change does not seem to be a troublesome one except where street railway conductors are concerned. Though it is undoubtedly the duty of a purchaser to tender the exact sum due in payment, persons who have goods to sell are always sufficiently anxious to dispose of their wares to waive their rights. The merchant can always find time to go to his neighbors or to a bank and get a bill of large denomination changed; it is the purchaser who is subjected to annoyance because he has to wait. When the passenger on a street car offers the conductor a \$20 bill he feels much aggrieved if the latter cannot change it. There have been several decisions in the courts to the effect that the common rule of furnishing change to the amount of \$2 only is a reasonable one, but occasionally a passenger with a large bill who has been ejected wishes to try the matter again. At Seattle, Wash., recently a suit against the Consolidated Street Railway Co., brought by a man who had been ejected because he persisted in offering the conductor \$10 in payment of his fare, was decided in favor of the company; the court held that the \$5 change rule of the company was reasonable. The general manager has since promulgated a new rule, and hereafter conductors are to accept a large bill when offered, give a receipt, and direct the passenger to call at the office of the company to get his change. This should prove an easy and effective quietus on the large bill fiend.

We fear that Dr. Franklin would not rest easy in his grave could he read some of the alleged scientific essays that now appear in the Saturday Evening Post (founded by Benjamin Franklin in 1728). On the editorial page of a recent issue of that paper was an article, signed by John Habberton, on "Running the World Without Coal." Some extracts are as follows:

"Reports continue to come from the Paris Exposition that a cheap and convenient means has been devised for separating common air into its component gases so that the oxygen may be burned to create light and heat. * * * The 'decomposer' of air for lighting is said to be so small in proportion to the service done by it that one no larger than an egg will light a room brilliantly for hours; hitherto this effect has required the consumption of a cubic foot of coal or a quart of oil or a lot of naphtha, or some other of the ill-smelling things that are used by the gas companies. * * * The source of fuel, instead of being in widely separated forests and mines, will be within reach anywhere and everywhere, so battleships and cruisers will no longer be 'tied to a coal-heap,' all steamers of the mercantile marine can be fast yet not lessen their freight capacity by setting aside hundreds of cubic yards of space for coal bunkers, and locomotives will never be obliged to slow or stop to 'coal up.' * * * Also within the general understanding is a fact almost as cheering; without coal or the demand for coal there can be no more miners' strikes, to take food from the mouths of women and children, array class against class, and stimulate the latent meanness and brutality of both classes, give demagogues a chance to make money and political capital out of the conflicting interests while widening the breach between them, and lessening respect for human nature in all spectators of the contest."

If the editor has a mission other than that of filling the columns of his paper each publication day, we suggest that the space taken by Mr. Habberton might have been used to better advantage by pointing out that even if oxygen is to be used as "fuel," "steamers and locomotives" would have to carry something to combine with it, which something would probably be carbon in the form of coal.

The "Review" has from time to time made mention of street railway funerals at various cities, including among others, Milwaukee, St. Louis, Oshkosh, Wis., Chicago, Mexico City, Hartford, Detroit and Cleveland, and in this issue we describe a funeral car in Baltimore. We believe the electric railway is soon to find a broadening sphere of usefulness in this direction. And why not?

It has well been said that funeral customs and prevailing modes of treating the dead may be taken as evidence of the modes of thinking and the degree of civilization of a people. History points out that as nations have risen above the plane of superstition and

ignorance they have laid aside something of the elaborate ceremonies surrounding the burial of the bodies of departed ones, and have been willing to mold their funeral customs more in accordance with common sense and a due regard for the comfort and convenience of the living. The funeral pyre and open bier have given way to embalming and the sealed germ-proof casket.

In this country for many years relatives and friends of the deceased followed the body on foot in couples, the body being carried on a bier on the shoulders of men. The first funeral in Salem where a hearse was used occurred in 1817. Coaches were not employed until 1830, and even for some time after that date it was considered an unfeeling and indecorous custom to ride to the grave of a friend.

But as this sentiment in time disappeared, we believe also that any lingering disapproval of the funeral by trolley, that may be manifested now, will be overcome as soon as the advantages are more generally known. For instance, why should a funeral party be subjected to all the jolting and discomforts of a long ride in uncomfortable, unheated and ill-ventilated coaches, often over the worst kinds of roads, when it is possible to take a clean, well-heated funeral car at the door and ride in one-half the time to the gate of the cemetery. And when it is considered a car built as the one in Baltimore, described in this issue, will accommodate 32 persons in addition to the casket, or a capacity equivalent to eight carriages and a hearse, another potent argument is introduced, for the car costs but \$20 to \$25, and the carriages for the same occasion would cost \$50 to \$75. And after all why should there be any more sentiment against carrying a body to the grave on an electric car than in sending it in the baggage car of a railroad train?

We believe managers can take up this question of providing funeral facilities with profit to themselves and with real benefit to the community.

SPECIAL SCHOOL RATES PROPOSED FOR SAN FRANCISCO.

The Board of Supervisors of San Francisco has been making determined efforts to enact legislation of some sort that will effect a reduction in street car fares. Some time ago the program was to have cheap fares for wage-earners going to or returning from work. More recently a bill providing that only half-fare should be charged for standing room, was proposed. Both of these ordinances failed, the street railways being able to satisfy the Board that the roads could not afford the reduction in their incomes that would follow. Now the proposition is to give low fares to school children.

INTERURBANS ENTERING COLUMBUS, O.

The number of street railway companies proposing to make Columbus, O., the center of operations for extensive interurban lines, or trying to effect an entrance into Columbus has increased during the past year until now there are 16 such companies. The latest of these are the Columbus, Lima & Northwestern Railway Co., recently incorporated to extend the Columbus, Lima & Milwaukee, a steam road, to Columbus and Lake View, 21 miles; the Columbus, Winchester & Lancaster Traction Co., which will expend \$700,000 for the construction of a line to Lancaster, and is being promoted by Howard C. Park and David Beggs; the Columbus, Mount Sterling & Washington C. H. Electric Railway Co., which was recently incorporated by C. P. West and D. T. Worthington; the Columbus & Portsmouth Electric Ry., which will run through Shadeville, Lockbourne and Chillicothe to Portsmouth; and the Columbus Suburban Electric Railway, the Columbus & Southern Electric Railway, the Columbus & Xenia Traction, and the Urbana, Mechanicsburg & Columbus Electric Railway Cos. Other interurban roads seeking entrance into Columbus have been noted in the "Review" during the current year in chronological order. They are: The Columbus, London & Springfield Ry.; the Columbus & Lancaster Traction; the Grove City & Green Lawn Street Ry.; the Columbus, New Albany & Johnstown Traction; the Columbus, Buckeye Lake & Newark Traction; the Chillicothe, Clarksburg & Columbus Ry.; the Worthington, Clintonville

& Columbus Street Ry., and the Chillicothe, Mount Sterling & Columbus Ry. Such of these roads as will effect an entrance into the capital over the lines of the Columbus Railway Co. will operate under what is known as the "Dayton plan," by which the Columbus company will provide the tracks and power, receiving as compensation 3 cents for each passenger carried over the city lines on the interurban cars.

Satisfactory progress is being made by most of the interurbans in obtaining necessary rights, and the construction of many of them is well under way. When they shall be completed and in operation Columbus will be the equal of any of the larger cities in the matter of extensive interurban street railway service.

TRIAL TRIP ON MANHATTAN ELEVATED.

Experimental trips over the Manhattan Elevated Railway, New York, were made on November 19th, 20th and 21st, with an electric train of six cars, and the equipment was found to work with perfect satisfaction. The two end cars are each equipped with four 150-h. p. motors, giving a total of 1,200 h. p. for the train, and both motor cars are controlled from one end on the General Electric Co's. multiple unit system. The two motor cars weighed 66,000 lb. each, and the four intermediate cars about 29,000 lb. each. The couplers used were the Van Dorn No. 3 and No. 4, and it is reported that they worked so smoothly that the train was like a single car; these couplers were illustrated in our October issue.

Among those present on the trial trips were: W. E. Baker, general superintendent of electrical construction for the Manhattan; President Vreeland, of the Metropolitan Street Ry.; President Rositter, of the Brooklyn Rapid Transit Co.; J. S. Doyle, master mechanic of the Metropolitan; W. A. Potter, of the General Electric Co.; W. T. Van Dorn.

STREET RAILWAYS ARE CORPORATIONS FOR PECUNIARY PROFIT.

The general incorporation law of Illinois provides for the incorporation of societies "not for pecuniary profit," and an attempt was made by C. L. Bonney, of the Chicago General Railway Co.; Lyman M. Paine and Emil A. Bazner to incorporate as the Citizens' Street Railway Association. The secretary of state refused to grant the license, and application was made to the Supreme Court for leave to file a petition for a writ of mandamus against the secretary of state.

December 5th the Supreme Court denied the motion, saying that a street railway or a heat and power company cannot be organized and put in operation without the expenditure of a large amount of money, and that the difference between a corporation organized for profit and one not for profit seems to be that if the corporation is organized for the purpose of gain upon the investment, then it is a corporation for profit.

ELECTRICAL GARDEN OF EDEN.

Dwellers in the Southland are justly proud of what Mother Nature has done for them, but it has remained for Mr. Geo. H. Conklin, claim agent of the Augusta (Ga.) Railway & Electric Co., to discover that the Garden of Eden is now located in his city. He writes:

"We have an odd pair of names in our armature room. There are but two winders; they came to the shop at different times, and were placed in that department entirely by accident, and they had been there several months before attention was called to the significance of their being together. One is John H. Adam, and the other is O. B. Eve."

The City & Suburban Railway Co., Portland, Ore., has placed in operation on its Mount Tabor line four new cars, made in the shops of the railway company.

The managers of the Milwaukee Electric Railway & Light Co. and of the Higgins street railway system, at Manitowoc, are contemplating a number of extensions which will ultimately place Milwaukee in direct electric railway communication with Sturgeon Bay, over a route 125 miles long.

The New Jersey & Hudson River Railway & Ferry Co.

The railway of the New Jersey & Hudson River Railway & Ferry Co. is locally known as "The Hudson River Line," and it is claimed by the managers that a trip over their lines presents the most picturesque trolley ride to be found in America. Be that as it may, it is certainly a very interesting system, both from scenic and engineering standpoints. Starting from the New York side at 130th St., the passenger after leaving the 125th St. or Boulevard cars of the Third Avenue R. R., passes under the new viaduct of the Riverside Drive, and arrives at Fort Lee Ferry on the Hudson. This ferry is owned and operated by the railway company, and is the only ferry crossing the Hudson River above 42d St. The boats are large and are of about the same type as those operated by other New York ferry companies. The landing at Edgewater on the New Jersey shore is directly under the bluff of the Palisades, that strange formation of trap rock which is one of the principal natural features that make the shores of the Hudson famous. From the deck of the ferry-boat, in crossing, one gets an extended view of the river, up and down, including the most interesting portions of the Palisades. The ferry house on the Jersey shore is a commodious structure with a single slip, and in a portion of the building is the office of the superintendents of the railway and of the ferry. There is also a storeroom for street railway supplies. The tracks are directly in front of the ferry house, and here the cars are always in waiting on the arrival of

East River and a ridge of hills on Long Island are clearly seen. Strangers on making this trip for the first time are charmed with the scenic effects, and are surprised to find that there is a place



NEW YORK TERMINUS.

so wild in its environment so near New York City, and from which so much of the city can be seen.

On reaching the top of the bluff the line passes the border of a new park of seventy acres recently laid out by the railway company, and then plunges into a dense forest and continues through an avenue of trees in a northerly direction parallel with the Hudson two miles to the village of Fort Lee, which is located on the highest point of the Palisades at about half a mile from the river. From Fort Lee the line passes down and across a valley to the heights beyond, and then descends a long 10 per cent grade into the valley of Overpeck Creek, giving to the passenger on the way a most beautiful view across this valley and that of the Hackensack River to the Ramapo mountains, 12 or 15 miles distant. At the foot of the hill near Leonia the main line turns north, and terminates at Englewood, and near the same point from which the turn is made a branch that was constructed during the present season turns west, across the marshes of Overpeck Creek, then over the Teaneck Ridge and across the marshes bordering the Hackensack, and on across the Hackensack River to the town of the same name three miles from the main line. The Englewood branch passes the grounds of the Englewood Golf Club, and past numerous truck farms and cottages, when it enters Englewood, a town of 8,000 inhabitants.

The Hackensack branch crosses by means of trestle bridges, the tracks of the West Shore R. R. and also those of the Northern R. R. The former consists of a steel trestle 500 ft. in length, and



MAP OF HUDSON RIVER LINE.

the boat. Half-hourly trips are usually made, but on Sundays and holidays a 15 minute schedule is maintained.

The cars on leaving the ferry house immediately begin the ascent and pass near the power station and car houses which stand just above the ferry house. A bend is made to the right, then to the left, crossing a small stream, which is alive only in the winter time, and continuing on a 5½ per cent grade along a road-bed cut in the face of the Palisades to a point about half way to the top. Then the track turns on a still wider foundation and continues upwards in the opposite direction to near the top, when it turns west, and reaches the highest point by gradual ascent, the highest point being 260 ft. above the Hudson. The two inclines were, until recently, connected by a switchback arrangement of tracks, but during the present season the rocky face of the bluff at this point has been blasted away and a retaining wall with massive buttresses built, making a shelf about 130 ft. wide or sufficient for a double track loop of 45 ft. inside radius, and leaving a perpendicular rock face of over 50 ft. On the trip up or down the bluff, one gets an extended view of the Hudson and of the New York shore, including the tomb of General Grant, the buildings of Columbia College, the Teachers' College, St. Luke's Hospital and the high arches of the new Cathedral. The view on a clear day extends across and beyond the city, so that boats in the



FERRY HOUSE, EDGEWATER, N. J.

a 70 ft. plate girder span immediately above the tracks of the steam line. The second trestle is also constructed of steel and is 1,150 ft. in length, with a 70-ft. plate girder bridge over the tracks as in

the other case. The foundations of the latter trestle rest on piles with concrete caps, as the structure is through a marsh. The road also crosses the Overpeck Creek on a drawbridge. The feed wires over this draw are supported by poles 55 ft. above the water. This in order to avoid a cable crossing.

The Hackensack River is crossed on what is said to be the largest

are provided at a distance of 50 ft. from each bridge portal and one indicating lamp on the bridge. The signal circuits are closed by the bridge tender just before opening the draw.

The construction of the Hackensack branch included many interesting features, and on a portion of the route it was necessary to cut through a stretch of swamp with a dense growth of timber and



POWER HOUSE, EDGEWATER.



PARK SITE LOOP.

drawbridge designed purely for a street railway line that is to be found in the country. The draw is 160 ft. long, and it is of the riveted truss type. The foundation of the center pier consists of piling on which is a grillage above which is heavy masonry. From the illustration it will be noted that the cross section is spaced for two tracks, the track centers being 11 ft. 1½ in., to provide for the passage of wide cars. The bridge is kept in line by four end rests which are adjustable from above, and the alignment of the track is maintained by means of four shoes at each end, under the end of the rails, and the bridge is locked by the usual spring latches. The draw is so designed that it can be operated by hand or electric power, there being a G. E. 800 motor with a train of gearing, by means of which the draw can be opened and closed in 1½ minutes. Current for operating the motor is taken from a submarine cable which connects the regular feeders with the center pier. The bridge is capable of carrying a 30-ton car on each track. Trestle approaches to the draw are provided on each

underbrush, and over a portion of the way the roadbed was built upon logs and timber work to prevent it sinking into the soft ground. In digging holes for the side poles it was necessary to curb the excavation, and when the pole was in place the curb was filled with concrete, giving a mass sufficiently large and heavy to hold the poles in position. Improvement now being made, and proposed improvements include the double tracking of the line along the bluff, between the ferry and the new park. A large addition is being made to the car houses. An addition will be made to the ferry house on the New Jersey shore, sufficient for a second slip, and a new, commodious, double-slip ferry house is to be built on the New York side.

The new park, which will extend to the very edge of the Palisades, is shaded by a thick growth of trees. It has been graded and laid out in drives and walks, a casino is to be erected, and all the attractions and conveniences to be found in first-class street railway parks will be installed. It is the intention of the manage-



SWITCHBACK WALL.



WEST SIDE R. R. TRESTLE.

side; that on the west side is 915 ft. and the eastern trestle 285 ft. long. The trolley wires are supported by steel latticed work thoroughly braced as shown. By this means and the substantial supports at the shore ends the trolley wires can be kept taut. Safety devices are provided which are located 800 ft. from each end of the bridge, and consist of a cluster of five green lamps furnished with a reflector with a suitable housing. In addition four red lights

ment to make this as good as if not better than any street railway park in the country, so that it may be attractive to the best class of people from New York and the neighboring Jersey villages. A real estate company has recently purchased a large tract of land on the line of the railway on the top of the Palisades and is making improvements with a view of bringing the region into the market as a new settlement. In addition to this, real estate com-

panies are developing additions in the neighborhood of Hackensack, all of which will give added patronage to the line.

Entirely new rolling stock has been purchased for the system during the past year, and among the new cars are 10 double-truck open cars, having a seating capacity for 84 people; these are 41 ft. 6 in. long, and are mounted on Peckham trucks, type 14-B-3, and equipped with G. E. No. 67 motors, and the new type K 6 controllers. The closed cars are five in number of about the same length as the open cars, and will be mounted on the same trucks. These cars are finished in quartered oak, and, as well as the open cars, were built by the American Car Co., of St. Louis. In addition to the ordinary brake equipment, the cars have the Price friction momentum brake, which is said to be giving excellent satisfaction, as the equipments that have been run during the entire summer do not show any wear, and it has not been found necessary to readjust the disks. The cars have Hale & Kilburn seats, are headlights, Van Dorn drawbars, Sterling fenders made by the Sterling-Meaker Co., DeWitt sand boxes, and Wilson trolley catchers which were furnished by the Frank Ridlon Co., of Boston.

The power equipment has also been increased during the past season, two 500-h. p. Heine safety-boilers and a cross compound Hamilton-Corliss engine of 750 h. p. having been added. This engine has been running temporarily belted to a 500-k.w. generator. A direct connected generator, however, is to be put in. The temporary generator is mounted in a novel manner, with the base at an angle of about 45 degrees. As it is located directly over a storage battery which occupies the basement, it was necessary to provide a timber foundation and mount it above the floor to

which gives a panoramic view of Riverside Drive from the top of the Palisades, and also contains a colored map made from the United States Geological Survey, which shows New York City, the Hudson River, the rivers, steam railroads and wagon roads within a radius of 18 miles from the center of population of Manhattan and the Bronx, which from the census of 1900 is said to be



PREPARING THE WAY.

at the intersection of 5th Ave. and 53d St. A reproduction of the Hudson River view mentioned was published in our issue for September, page 535.

The officers of the company are: President, A. M. Taylor; vice-presidents, W. H. Clark and F. R. Ford; secretary and treasurer, W. N. Barrows; ferry superintendent, E. W. Lawson; railway superintendent, F. W. Bacon. The line was built by the engineering firm of Ford, Bacon & Davis, of New York.

HORSE ROADS INCREASING IN VALUE.

Our English contemporary, *Lightning*, in commenting on the tramway situation, says that since it has been demonstrated that to get hold of a horse tramway and convert it to electric working is very near a certainty in the way of profitable business, horse tramways are becoming more difficult to acquire. In addition to the stockholders of the old horse roads, promoters also have to contend with the local authorities, who either decline to grant any concession or drive a hard bargain in the matter of compensation.

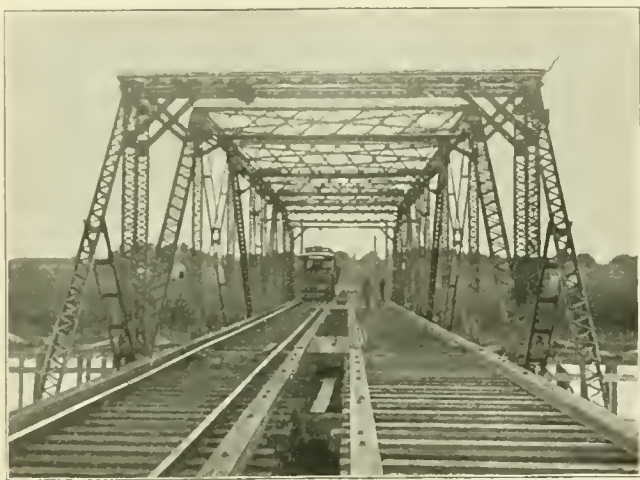
ROAD BETWEEN BEAVER FALLS AND NEW CASTLE, PA.

November 26th a charter was granted to the New Castle (Pa.) & Beaver Falls Street Railway Co., which is to build between the towns named in the title, a distance of 16½ miles. The capital is \$100,000, and the directors are: William S. Foltz, George Greer, J. Norman Martin, New Castle; Theodore P. Simpson, John C. Whitla, Beaver Falls.

The same parties are interested in a proposed line from New Castle to Sharon.

ALLEGED INJURY FROM ELECTROLYSIS.

An action brought by the Manufacturers' Natural Gas Co., of Indianapolis, against the Indianapolis Street Railway Co. to recover \$50,000 damages for deterioration to gas pipes caused by electrolysis is pending in the Superior Court at Indianapolis. The gas company complains that disintegration of the pipes has been caused by the inability of the street railway company's conduits to carry the return current of electricity back to the power house, as a consequence of which employes of the gas company have received shocks and burns when the gas has been ignited by the electricity. It was argued for the defense that the street railway company's rights to the use of the streets were prior to those of the gas company, and that the latter was not entitled to recover because it made no pretense that its property rights had been damaged.



HACKENSACK DRAW BRIDGE.

make room for the belt. The storage battery consists of 258 cells, with a capacity of 300 amperes, and was made by the Electric Storage Battery Co. This battery was installed two years ago, and is quite essential to the operation of this system, in order to take care of the fluctuations in the load, as the power varies from zero to 1,200 h. p. at times. The original equipment of the station consisted of two single E. P. Allis engines, of about 300 h. p. belted to M. P. General Electric 200-kw. generators.

The system includes about 12 miles of track, but the longest distance to which the current is transmitted is eight miles. At the turn-outs block signals are provided, and at each turn-out is a telephone housed in an iron case. At some of the turn-outs and at points along the line board signs are provided which read "Bicycle Station." At these points wheels are taken on and are carried by means of hooks attached to the dashboards at both ends of the cars.

The line enjoys a large shopping patronage from people from Englewood, Hackensack and neighboring towns who patronize the large store, in which is known as the "Harlem District" of New York, the principal stores being located on 125th St. Besides this, the line caters to a large pleasure traffic during the summer, as the wild region on the top of the Palisades has a great attraction for city people. The ferry fare is 5 cents, and two fares are charged to and from Englewood and Hackensack. In connection with the operating department a time table folder is published

HOME-MADE FUNERAL CAR AT BALTIMORE.

The latest street railway to provide funeral facilities is the United Railways & Electric Co., of Baltimore, and this company has probably gone into the business on a more elaborate scale than has before been attempted.

Baltimore has a number of fine suburban cemeteries, all of which are reached by some division of the street railway lines, and the company found that by putting in a few crossovers, it could take a car from any part of the city to any one of the burying grounds

The interior arrangement is shown in Fig. 3. The car is divided into two compartments, the smaller one of which has running its full length another compartment or vault, in which the casket is carried. This receptacle for the coffin is 26½ in. high, 26¼ in. wide and 7 ft. 9 in. long. It is made of cherry paneling lined with zinc so as to be absolutely odor proof, and in addition has a vent pipe running up to the roof of the car to ensure a frequent change of air.

Access is gained to the vault from the outside by means of a heavy plate glass door, running its entire length and hinged to



FIG. 1—FUNERAL CAR OF THE UNITED RAILWAYS & ELECTRIC CO., BALTIMORE

without serious inconvenience. It was therefore decided to try the experiment of offering cars for the transportation of funeral parties, the idea as at first proposed being to use regular cars for this service. The innovation, after a little educational work on the part of the company, soon met with extended popular endorsement, and it was not long before the management became convinced it

swing downward. The vault floor is in reality a sliding shelf, the construction of which will be more readily understood from Fig. 4.

When a casket is to be placed in the car, the shelf is drawn out, the casket lifted upon it, and the shelf is then pushed back into place, carrying the coffin with it. The shelf runs upon rollers and will support 1,200 lb. when drawn out. The casket is anchored firmly in position by means of rubber protected metal pins at the sides and ends, these pins fitting into holes or sockets arranged as shown in Fig. 4, and spaced 3 in. apart. Burial caskets are made in standard sizes as regards inside measurements, but vary greatly in outside dimensions, outlines and weight. It is believed, however, that holes arranged and spaced in this manner will accommodate practically every variety made.

The larger compartment into which the car is divided has 12 cross seats, with center aisle, giving a seating capacity of 24. The



FIG. 2—INTERIOR OF CAR.

could afford to go into the business on a broader scale and make the carrying of funerals a regular operating department.

One of the results of this decision was the special funeral car shown herewith, which was designed under the direction of the mechanical department and built at the company's shops from an ordinary 22-ft. double truck car, mounted on Brill No. 30 trucks.



FIG. 3—PLAN OF CAR

smaller one, in addition to the receptacle for the casket, has four seats, as shown in the plan. By means of heavy black curtains the two pairs of seats may be shut in, making practically two private compartments. These are for the pall-bearers or immediate family of the deceased. The top of the casket vault comes about level with the window sills and upon it the floral contributions are piled, in which position they are visible to the occupants of the car and also through the windows, from the street.

The car is finished inside and out in black enamel with all trimmings, lamp fixtures, etc., of nickel. Seats are upholstered in black imitation leather and heavy black curtains are placed in the windows and at the doors.

A suitable light truck shown in the cross-section in Fig. 1, having pneumatic tire wheels and folding sides, is carried in a box underneath the car for the conveyance of the basket from the car to

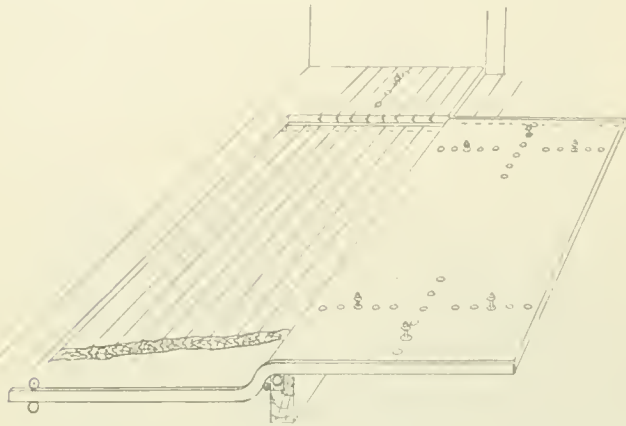


FIG. 4 SLIDING SHELF.

and through the cemetery, or from the residence to the nearest street railway line, if it is desired.

The charges for the use of the car are as follows: From city points to any cemetery in Baltimore, \$20; to Pikesville, Towson or Catonsville, \$22; to Ellicott City or Reisterstown, \$25. The car has been named "Dolores," meaning sorrow.

REPORT OF MANHATTAN ELEVATED.

The annual meeting of the stockholders of the Manhattan (Elevated) Railway Co., New York, was held November 14th. No changes were made in the directory, and the officers were re-elected. The report of President Gould for the year ending Sept. 30, 1900, shows substantial gains in traffic as compared with recent years, the total number carried being 183,788,851, against 177,204,558 in 1899. The number carried last year was in excess of the traffic in any year since 1895. The figure however, is still far below the record year, 1893, when 210,621,000 passengers were carried, or 35,832,000 more than in 1900.

As compared with 1899, gross earnings increased \$625,624; operating expenses, however, were \$90,870 less, so that net earnings were \$716,494 higher for the year. Bond interest was about \$73,000 less, but this was offset in part by an increase of \$45,000 in taxes, so that total net income available for dividends was \$745,139 more than a year ago. Last year's dividends accrued on the full volume of stock now outstanding, \$48,000,000, while in 1899 half of the 4 per cent dividend disbursement was payable on \$30,000,000 of stock. This last accounts for an increase of \$360,000 in dividend payments last year, but, nevertheless, the company is able to report a surplus over all charges and dividends of \$146,779 for 1900, as against a deficit of \$238,360 in 1899.

TRI-CITY COMPANY'S IMPROVEMENTS.

The Tri-City Railway Co., operating between Davenport, Ia., and Rock Island and Moline, Ill., with headquarters at Davenport, in November finished a year's work for the improvement of its system. The company has spent \$200,000 in the reconstruction of eight miles of track and the building of a new four-mile line, and in the reconstruction of about 10 miles of overhead work. In addition to this all switches, curves and crossovers have been renovated or replaced. A 400-ft. steel bridge on the route of the extension to the arsenal shops has been completed.

The Keokuk (Ia.) Electric Street Railway & Power Co. has completed a short extension of its line.

WEIGHT OF STEEL IN BRIDGES FOR ELECTRIC RAILWAYS.

BY H. G. TYRRELL, C. E., NEWTON, MASS.

The accompanying curves give the total weight of steel in single track bridges for electric railways for spans up to 200 ft., according to the new specifications recently adopted by the Board of Railroad Commissioners of Massachusetts. The weight of steel in bridges to carry two tracks of railroad will be about 90 per cent greater than that given for one track. These bridges are designed for railroad traffic only, no floor being provided for carriages and pedestrians. The weight of ordinary street bridges with provisions for car tracks has already been published by the writer in London Engineering, June 8, 1900.

The electric railway bridges described in this article have steel stringers. Weights are given corresponding to live loads of from 1,000 lb. to 2,000 lb. per lineal foot of track. These weights are conveniently expressed by the following formulas where L is the length of span from center to center of bearings. Weights are given in pounds of steel per lineal foot of bridge.

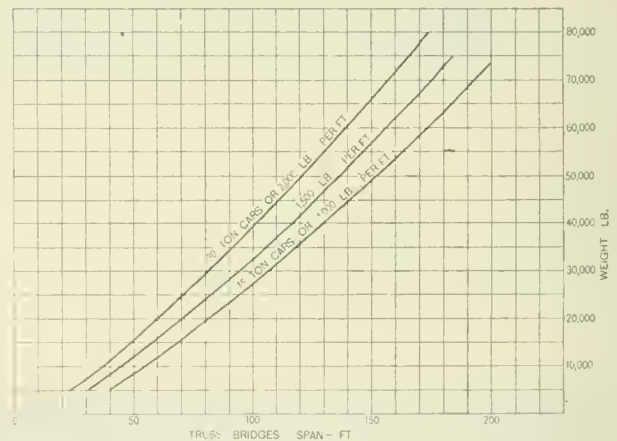
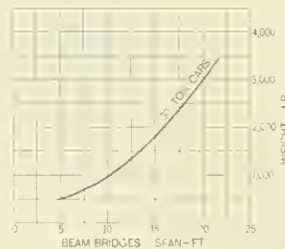
Beam bridges, $50 + 5 L$

Truss bridges for 2,000 lb. live load per ft., $250 + 1.5 L$

Truss bridges for 1,000 lb. live load per ft., $200 + .8 L$

Extracts from the specifications are as follows:

For bridge floors either a 20-ton 4-wheel car with 7-ft. wheel base, or a 30-ton 8-wheel car with 17-ft. total wheel base and 4-ft. truck wheel base. The fibre stresses to be used in the floor are as follows, the material being medium steel, namely: for I-beams 12,000 lb. per sq. in., properly reduced according to the ratio of width



WEIGHTS OF ELECTRIC RAILWAY BRIDGES.

of flange to total length when this ratio exceeds 20. For plates and shapes 12,000 lb. per sq. in., in tension, and 12,000 lb. per sq. in. reduced by the usual formula according to the distance unsupported. Rivets in shearing 10,000 lb. per sq. in. and in bearing 16,000 per sq. in. for shop driven rivets; field driven rivets to be reduced 25 per cent below these figures. No rivets less than 3/4-in. to be used.

For trusses, uniform loads shall be assumed, varying according to the length which is to be covered by live load to produce maximum stresses, from 1,500 lb. per running ft. per track for a loaded length of 100 ft. down to 1,000 lb. per running ft. of track for a loaded length of 300 ft. and proportionately for other lengths. Due account must be taken in the case of pieces which receive concentrated loading from the floor loads.

The factor for trusses may be larger than that for the floor.

The following may be the stresses per sq. in.: for tension 15,000 lb. per sq. in.; for compression 12,000 lb. reduced by the Rankine formula; for rivets, however, the same stresses should be used for the floor.

The question whether street cars should be permitted to operate on Sunday has been hotly contested recently, in West Superior, Wis. A decision in favor of Sunday traffic was finally rendered, the authorities having conceded that street cars were a necessity each day of the week.

Electric Railway for Georgetown, Demerara.

BY S. SWAN AND NORMAN S. RANKIN.

The city of Georgetown, Demerara, British Guiana can now boast of having a most modern electric tramway, and one that for careful and solid construction, and quality of materials used is probably unsurpassed today. A city of over 60,000 people, beside suburban villages, Georgetown occupies an important position amongst the commercial ports along the northern coast of South America, and though perhaps but little heard of by the public generally, is nevertheless slowly and steadily making vast strides in commerce, population and trade. The capital of the colony, the finest town in the West Indies (for although Georgetown is a South American port, it is so nearly identified with the West Indies in every way, as to be classed with them rather than with the former), the point of call for at least five great steamship companies, connecting the colony with England, France, Germany, the United States and Canada, Georgetown may certainly be said to be a go-ahead city.

Up to within a year ago its citizens had been content to jog along tranquilly with their primitive mule cars, but following the example set by Jamaica, and doubtless also owing to its increasing prosperity and importance, the people finally clamored for a more rapid mode of transit, and clamored with such purpose that at length their desire has become a reality. A little more than a year ago Mr. W. B. Chapman of Montreal, who it may be remembered was the promoter of the Kingston, Jamaica, electric system, and who is as much at home amongst the West Indian Islands as he is in Canada, went down and secured the franchise which was at once financed by a Canadian company with Sir William Van Horne at its head. This company immediately took matters in hand, sending down engineers to lay out the proposed lines, and lawyers to arrange business matters. The Georgetown Tramway Co., whose motive power was mules, was bought out as well as the British Guiana Electric & Power Co., and these two united under the style of the Demerara Electric Co., Ltd. Amongst its officers are Sir William Van Horne, B. F. Pearson, of Halifax, W. B. Chapman, Abner Kingman, James Hutchinson and Ernest Alexander, of Montreal. This last named gentleman is the secretary of the company.

No time was lost in beginning construction and in March last Mr. Frank P. Brothers went down to begin operations, and pushed the work with such energy that the close of the month of August saw the construction books practically closed. Mr. Brothers, who is well known throughout Canada in railway circles, and who was manager of construction of the Kingston electric system, was the right man in the right place, his previous tropical experiences serving him in good stead. It was said in Demerara, that never before in the history of the country had the natives been seen to work—nor was it believed they could work—as they did on the construction of this road.

The difficulties of construction in such a country as British Guiana can hardly be estimated, nor can it be thoroughly understood except by those who have had experience of similar works in tropical lands. The intense heat and glare of the sun, so particularly depressing and enervating to a northerner, the difficulty in receiving and landing the heavy material, the slow and uncertain arrival of goods, the heavy tropical rains and storms, the clay formation and frequent visitations of fever and sickness may be mentioned as chief amongst the many difficulties to be contended with.

Georgetown, though, as has been already said, "the finest city in the West Indies," is built upon a thin coating of alluvial clay, directly over a mud-swamp and under the sun, being but six or seven degrees from the equator, so that during the period of the day when the sun is at its highest it may properly be called a "veritable furnace." At full tide it lies in from four to six feet below the level of the ocean which is held in check by a granite wall of massive construction stretching for nearly two miles along the sea shore of the city front. The city and country is drained by a system of canals and dykes which intersect the land in all directions, and flow into one large main canal whose gates are opened at ebb-tide to permit the outflow of drainage and excess water.

In times of extraordinary rains these are helped along by pumping stations of which there are several at different points, but in spite of this the canals are often taxed to their utmost capacity and

overflow their banks inundating the country all about. The extreme difficulty of construction under such circumstances is quite apparent and on days when such extraordinary rains fell, work had to be entirely suspended. At one time during the construction there was not one period of 24 hours passed in 92 days that some time rain did not fall, and so at dryest the country is but a mud-flat its condition may well be imagined. Before resuming work after a cessation of rain, it was necessary to bail the water out of the trenches which had already been cut and prepared for receiving the rails. This occupied no little time.

The streets are very fine and well laid out and are always kept in splendid condition, indeed from the fact Georgetown might well be called a "bicyclist's paradise" and there are probably more wheels in Georgetown for its size than any city in Canada; this, however, I think is but the usual craze that struck our northern cities some years ago when wheeling first came into public favor, and the bicycle will doubtless become less popular as the novelty wears off. Some of the residential streets or avenues are most ornamental, and are beautifully laid out being over a hundred feet in width with central running down the center, and lines of tall foliage shade trees stretching down the drive on either side. Many of these avenues at certain seasons of the year covered with the beautiful Victoria Regia water lily, and present a singularly handsome appearance.

The sanitary condition of the town is almost perfect for which thanks are due to the capable town superintendent, Mr. Luke M. Hill. Mr. Hill who is also the city engineer, has much to occupy his attention having to look after the water works, roads, fire department, sanitary affairs and police. On account of the scarcity and cost of stone which cannot be got within a radius of 75 or 100 miles inland and is brought down the rivers in punts at a cost of \$150 per ton broken, most of the highways are made up of a mixture of burnt clay and sea shell. The former is most largely used, and well beaten in by traffic and rains gives an almost perfect road of a deep red brown color, smooth, hard, and pleasant to the eye. This clay is burnt in kilns about the city and its cost varies, but may be said to be generally in the vicinity of \$160 per cu. yd. Schooners run continually between Georgetown and Barbados, and do a fair trade in supplying the city with shell and other road material. It is estimated that the cost of public road material per mile amounts annually to about \$675.

Owing to the clayey formation of necessity the buildings are of light construction, wood or plaster, and it is believed that in the whole town there is not one house of stone. In the first place the cost of stone is too great, and again should the building be of heavy construction it would have to be so enormously spread out to prevent its settling that it would be impracticable. Although of light construction some of the buildings present a very fine appearance, there being much ornamentation. The finest are the Government Buildings, the Market, the Roman Cathedral, the Law Courts and the Banks.

Nearly everything for construction purposes had to be imported into the colony, and the failure of contractors to ship materials on specified dates greatly hampered the progress of construction. Materials not sent forward on stated occasions had to be over on the wharves until the following ship was ready to sail, and there was on more than one occasion a period of two or three weeks between arrival of a vessel and its departure had to be held back. Steamers not having settlements largely for Demerara were swived off of the return trip, but visiting Georgetown at all.

The climate being extremely hot and trying to a northerner is peculiar and the weather is such. From January to December the thermometer varies but little ranging from 80 to 88 degrees with but little change at night save the absence of the intense glare of the sun. On the coast there is always a strong breeze which renders the houses cool and pleasant even during the hottest part of the day. We are told that the year is divided into two wet and two dry seasons, but the experience of many is that this is very greatly.

In spite of our trials there is rarely a day without sunshine, the sky clearing almost immediately after the showers, and as the

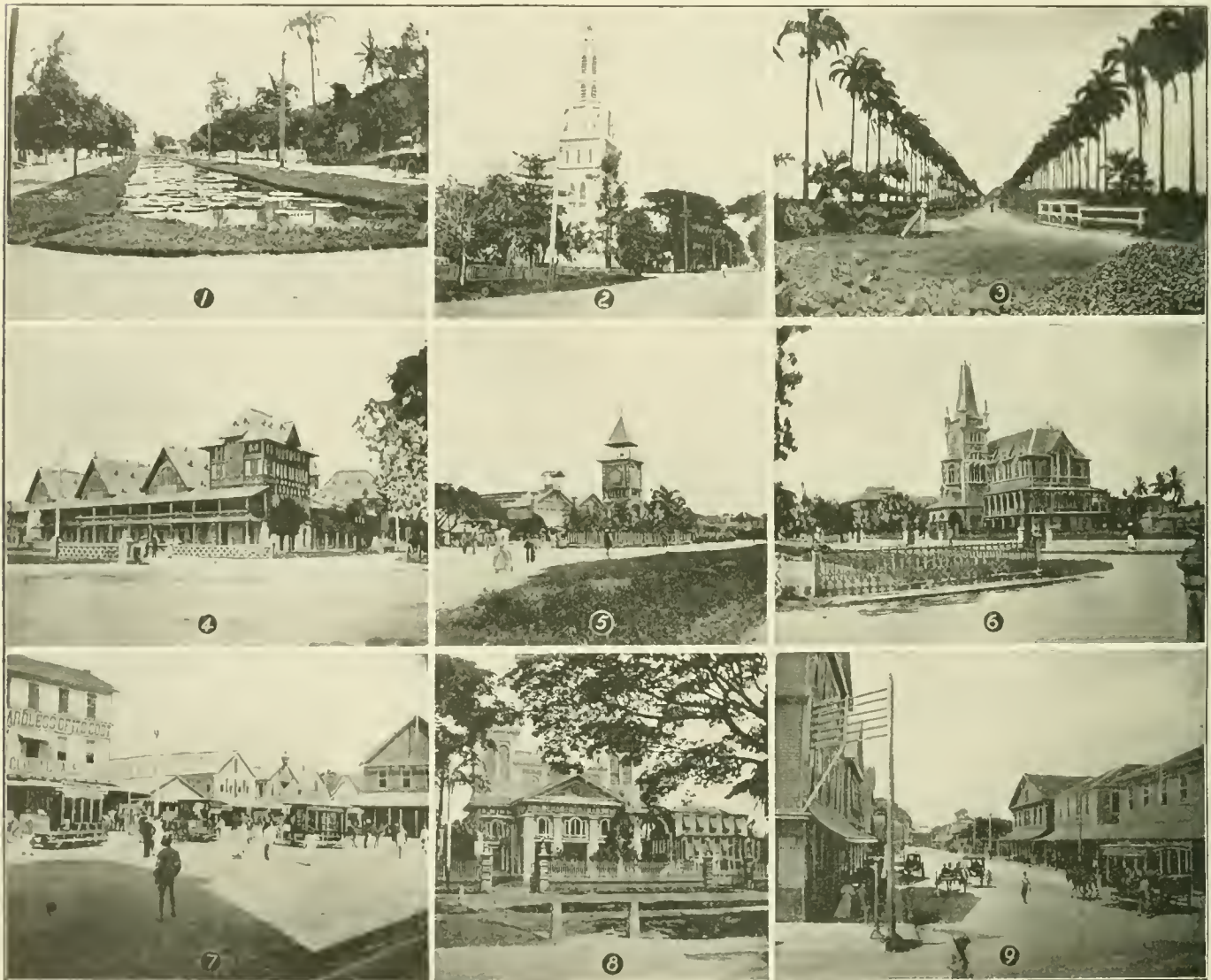
roads are so hard and well-crowned the rain soon runs off them into the trenches, and save in places where the ground is open for repairing or construction purposes, dries up almost at once. On account of the dampness of the atmosphere, the commonest diseases are malaria and low fever, while yellow fever is practically unknown.

The city may well be called a cosmopolitan one, and in a promenade along Water St.—the principal business thoroughfare—on a busy market day one rubs shoulders with all sorts and conditions of men. The Portuguese, who migrated in large numbers from the Island of Maderia and settled in the colony head the list, then come the negroes, the East Indians or coolies, the Europeans (whites), the aboriginal Indians and the Chinese, while quite a

under cultivation have improved their methods of manufacture, enlarged their fields, and reduced the cost of their product. It is therefore evident that while the plantations are now less in number than they were fifty or sixty years ago, their output has increased considerably.

During the season the shipping trade is most brisk. Every vessel that comes either from the United States, Canada, or Europe, after discharging her cargo of flour, meal and groceries, loads up with sugar, rum, molasses, lumber or fish. The bulk of the sugar goes to America.

The gold industry is apparently going ahead, but on account of the difficulty of getting at the precious metal, only those with experience and capital can operate. It is not a case of just bring-



1—Church St.
4—Law Courts.
7—Public Sq.

2—Cathedral.
5—Market Sq.
8—Portuguese Church.

3—Plantation Road.
6—Town Hall.
9—Water St.

SCENES IN GEORGETOWN, DEMERARA.

few Arabs and Syrians may be seen, and we are told that the only race that is not represented is the Polynesian. Of them all the most interesting to a stranger are the East Indians, or coolies as they are commonly called. About 5,000 of them are annually brought out from India by the British Government at considerable expense, and are bound under a five years contract to industrial labor in the colony.

Demerara sugar is too well known to require much comment. There is a large out-put annually, but the heavy cost of drainage, dams and dykes, prevent any but capitalists from carrying on this industry successfully. The result is that during the last half-century, the number of estates has greatly diminished, while those

ing along your spade and washing pan and digging wherever you fancy gold may be found as is done in other places. An expedition must be fitted out with men, boats and tools, while an ample supply of provisions for at least six months or a year is absolutely necessary. Nothing can be bought in the bush save from an occasional passer-by whose supply of stores is sufficiently large to enable him to dispose of some of them. The hardships experienced on the journey up-country are very great and two or three weeks are generally taken to arrive at the destination. The total export of gold from January 1st to about the middle of the month of August amounted to 69,265 ounces, yielding a royalty of \$48,486, which is slightly under the amount taken out the same date last

year. During this period 844 claim licenses were issued. The yield of course varies. The largest nugget ever known to have been found in the colony was discovered in 1891 by the Luckie syndicate on their placer on Conamarook Creek; it weighed 599 ounces containing 274 ounces of gold and 4 ounces of silver and was worth £1,067 7s. 7d. During 1891, 20,000 laborers were registered at the different districts. These served on an average of three months each, so that there were always from 4,000 or 5,000 laborers in the bush. Since then, of course the number has increased considerably. A duty of 90 cents per ounce was formerly imposed by the Government on all gold taken from the mines, but we understand that in July last this was lowered to 70 cents. The rules and regulations governing the gold export are very strict, and the penalty imposed on any one falsifying the return of yield is most severe. Matters are so arranged that all gold passes through the hands of the Government, and is subject to this duty. The latest and most important find in the way of minerals is that of diamonds, and during the last three or four months prospecting parties have brought down over 1,500 stones of rare quality and value. While there has been no actual diamond mining going on, the gems have simply been found in the clay while washing for gold, and doubtless more will be heard of this again.

To return to the tramway; 10.2 miles of track were laid in all. A 62-lb steel T rail was used with girder rails at curves and switches. Both straight track and special work were supplied from the United States. The lines branch out from the Post Office which is in the heart of the city, and bring the outskirts and suburbs within easy reach of the business portions. On account of the town being so small and compact, much special work is used. There are two belt lines, one of 3½ miles, the other of about 5½ miles, another line runs from one point at the Sea Wall through the heart of the city, returning again to the Sea Wall at a different point and along a different route, making a distance of about 4½ miles; another short line runs from the railway station to La Penitence covering about 1¾ miles. The rails are set on concrete stringers 22 in. wide by 10 in. deep, with steel ties 10 ft. apart.

The Sea Wall route is the most important one from a pleasure riding point of view. This wall is broad and flat on the top forming a wide promenade provided with benches and rain shelters. At certain times of the day, and on moonlight nights this promenade is thronged with visitors, and on Saturday afternoon a band concert is held. Here, after five o'clock in the afternoon society gathers to chat and gossip, and meet one another. Here the "Four Hundred" come in their carriages to take the air and hear the music, while a little further down on another part of the promenade the masses congregate. What Central Park is to New York, Hyde Park to London, the Bois to Paris, the Sea Wall is to Georgetown.

The overhead construction is single No. 0 copper with Hecla bronze insulation as supplied by the Albert & J. M. Anderson Co. Iron tubular poles set in concrete support the feeder and trolley wires, and as the company controls both the private and public lighting of the city these wires are also being transferred to the iron poles, and the old wooden ones removed. Both bracket and span wire is used in different portions of the city. Mr. J. W. Morris, of St. John N. S., who has had a large experience in Canadian and American cities, as well as in the tropics, has entire control of this branch of the work.

The company will commence to operate with 14 open cars made by the St. Louis Car Co. These are 8-bench cars with reversible seats, monitor top and bonnets, end bulkheads with glazed sash and double thick glass, revolving signs, etc. They are handsomely painted and decorated, and are fitted with Providence fenders. The electrical equipment consists of a Westinghouse No. 12A, 30-h. p., 500-volt, slow-speed single motor with G. E. controller R-17. As there is hardly a grade in the whole city, cars should be operated at a very small cost.

The existing car sheds, with alterations and additions, have been transformed into first-rate car barns. In accordance with the style of building most in vogue in the tropics, they are open, and have a capacity of 16 cars. Four tracks run into this shed, which has also pits and machine shop. There is additional space for three other tracks when required. A part of this building is devoted to storerooms.

Outside are three tracks on which cars can be run on emergency, or stored there at will.

The power station which has been built for some years and was originally the property of the British Guiana Electric Light & Power Co., has been thoroughly overhauled and reconstructed by the present company, which has also put in two additional engines and generators for railway work, and the supplying of power. The franchise of the company gives it the exclusive right to make and supply electricity for the term of 30 years, with renewals features which make it practically perpetual. The original station comprised a duplicate plant for lighting purposes, consisting of two vertical and three horizontal engines giving a power supply of about 800 h. p. These have batteries of Babcock & Wilcox and Stirling boilers, which are also in duplicate, and suffice to supply steam for the two new engines installed.

These new engines were supplied by the Robb Engine Co., of Amherst, N. S., and comprise one 200-h. p. direct-connected, tandem-compound engine and one 200-h. p. belt connected, tandem-compound engine. The two latter engines and generators suffice also to form a duplicate plant for railway purposes. It is the intention of the company later on to extend the lines into the suburban districts, which are thickly populated and give promise of good traffic.

NEW OHIO-PENNSYLVANIA COMPANY.

The stockholders of the Youngstown & Sharon Railway Co., which will build a road between Youngstown, O., and Sharon, Pa., have arranged for a consolidation of the electric light properties of those two places and the Sharon railways. The companies included are: Youngstown Electric & Gas Co.; Merchants' Heat, Light & Power Co., Youngstown; Valley Electric Railway Co., Sharon; Sharpsville (Pa.) Electric Light Co.; Sharon & Wheatland Electric Railway Co.; Sharon Gas & Water Co.; Sharon Electric Light Co.; Youngstown & Sharon Electric Railway Co.

The Youngstown-Sharon road will be 19 miles long, with steel bridges and standard steam railroad roadbed. Some 4½ miles of the old road will be rebuilt and larger units installed in the power station. Sanderson & Porter, No. 31 Nassau St., New York, will specify all material. Park & Hamilton, Youngstown, O., are the contractors.

It is rumored that the promoters of the consolidation contemplate getting control of the Mahoning Valley line and the Park & Falls Electric Ry., of Youngstown, and also the newly organized New Castle & Beaver Falls road.

CHECKING BOOK TICKETS.

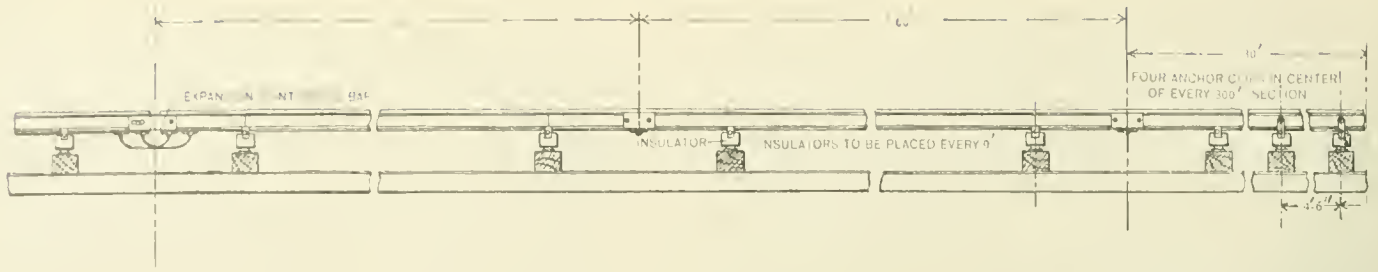
The Galesburg (Ill.) Railway & Power Co. sells individual book tickets containing 25 coupons for one dollar. To determine the exact number outstanding at any time, and particularly to guard against counterfeiting, Mr. Seacord uses a specially ruled book

95100	1	2	3	4	5	6	7	8	9		96	97	98	99
95200	✓		✓	✓		✓		✓			✓	✓	✓	✓
95300	✓	✓	✓			✓	✓	✓			✓	✓	✓	✓
95400	✓	✓	✓	✓			✓		✓		✓	✓	✓	✓

which has 100 spaces to each horizontal line. Each coupon is numbered consecutively, and checked off in its proper space when turned in. The checking requires only one hour daily. The illustration shows the method of ruling and checking.

A NEW INTERURBAN LINE FOR NEW ENGLAND.

The Haverhill, Salem & Hudson Street Ry., running between Nashua, N. H., and Haverhill, Mass., a distance of 22 miles, is nearly completed. Passenger, baggage, mail and express cars will soon be put in operation through a section of the country heretofore without railway service of any kind, affording a more rapid service than any other electric line in New England. This new interurban will shorten the time required to travel from Nashua to the ocean beaches at Salisbury and Hampton by two hours. Express cars on a level grade will be operated at the rate of 40 miles an hour.



CONTACT RAILS ON MANHATTAN ELEVATED.

By courtesy of Mr. W. E. Baker, general superintendent of the electrical construction department of the Manhattan Railway Co., New York, we have received drawings illustrating the contact rails which the company is installing in preparation for electrical opera-

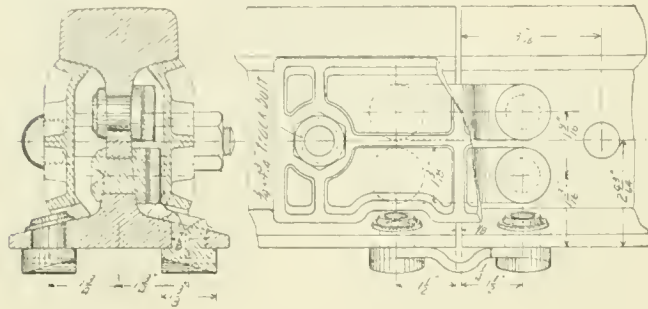


FIG. 2.—JOINT.

tion. The rails are of a T-section, 6 in. high, and weighing 100 lb. per yd.; they were rolled by the Lackawanna Steel Co., and have the following composition, aside from the iron: Carbon, 0.073; manganese, 0.340; sulphur, 0.073; phosphorus, 0.069 per cent. The rails are each 60 ft. long and are erected in sections of 300 ft.; the middle rail of each section is fastened by four anchor clips, spaced 4 ft. 6 in., to prevent longitudinal motion, but elsewhere the rails

The expansion on either side of the anchored rail is taken up at the joints at the ends of the 300-ft. sections; one of these joints is shown in Fig. 3. The distances to be allowed between rail ends

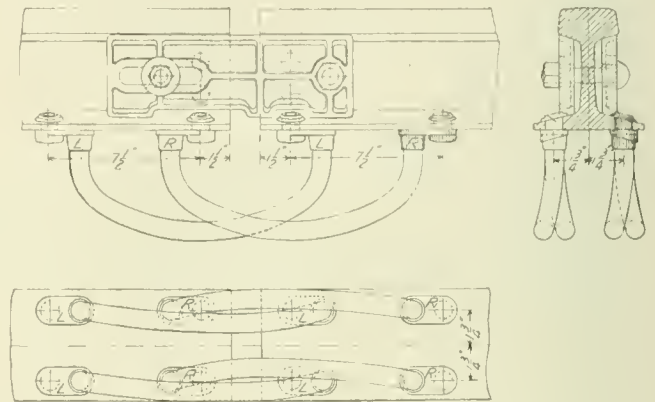


FIG. 3.—EXPANSION JOINT.

at expansion joints when laying the rail are given in the table:

Temperature of rail.	Distance.	Temperature of rail.	Distance.
0°	3 in.	70°	1 1/4 in.
10°	2 3/4 in.	80°	1 in.
20°	2 1/2 in.	90°	3/4 in.
30°	2 1/4 in.	100°	1/2 in.
40°	2 in.	110°	1/4 in.
50°	1 1/4 in.	120°	0 in.
60°	1 1/2 in.		

At these joints four stranded copper bonds 18 in. long between terminals are used. The strands are rope laid and not larger than

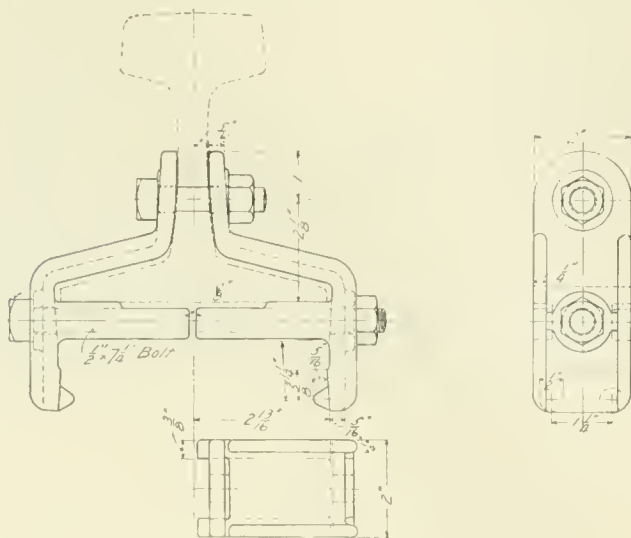


FIG. 4.—ANCHOR CLIP.

are free to slide in the clips on the insulator block. The insulator blocks are placed every 9 ft.; they are made of artificial granite.

The joint that is used between the five 60-ft. rails constituting a section of the contact rail is shown in Fig. 2. For these joints the rails are drilled with five 7/8-in. holes, three through the web and one in each of the lower flanges. Four solid copper bonds are used, two being under the splice bars. The cross section of each bond is .344 sq. in., equivalent to 437.675 c. m. The bonds are riveted in place with hydraulic riveters.

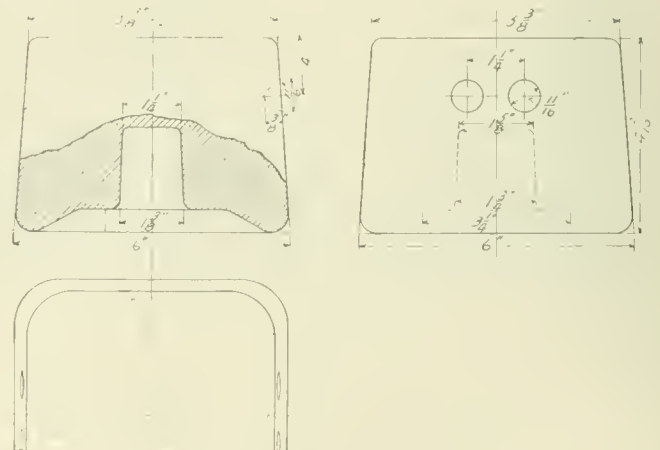
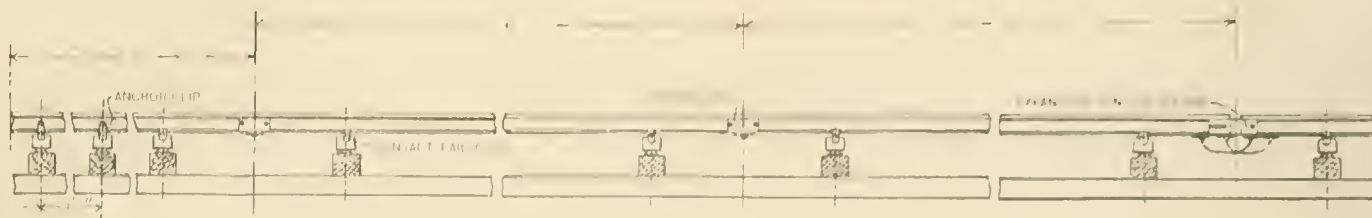


FIG. 5.—INSULATOR.

No. 14 B. & S.; the sectional area of each bond is .353 sq. in. or 450,000 c. m. These bonds are all riveted to the lower rail flanges. The splice bar for expansion joints has a slot at one end, as will be remarked from Fig. 3. Figs. 4 and 5 show the insulator block and the anchor clips.

A petition has been presented Mayor Cabell of Dallas, Tex., signed by 8,000 citizens, demanding a number of street railway reforms in that city.



MANHATTAN RY., NEW YORK.

DEMERBE TRACK CONSTRUCTION.

In September last Mr. William Dawson, deputy engineer of the Bradford (England) Corporation, read a paper before the British Association for the Advancement of Science describing the Demerbe system of street railway track construction. A short section of this was laid in Bradford in 1804 as an experiment, being placed end to end with a similar length of girder construction. Mr. Dawson says of it:

"Both portions have been subjected to a five minutes' service of steam locomotive cars since that time. About three weeks ago (after six years) a Demerbe rail was removed, in the presence of the Tramway Committee, to ascertain its condition. The rail, joint, and gage were found to be in every way perfect, and it was only after repeated blows with heavy hammers that the rail could be detached from the concrete foundation, and when raised it dragged up with it part of the foundation. No money whatever has been spent in repairing this portion of Demerbe tramway, but the adjoining portion of girder rail has been several times repaired during the six years it has been laid down. The setts used alongside the Demerbe rail are splayed to fit the sides of the rail, and laid directly against it, the rail thus serving as a support for the paving; and there is no tendency either for the setts to rise or fall as is the case with the girder rail. There are in Bradford 40½ miles of tramways, of which 36½ miles are laid on the girder system, with rails weighing 105 lb. per yd., and fishplates weighing 80 lb. per pair. There are four miles of Demerbe tramway, constructed of rails weighing 70½ lb. per yd., and fishplates weighing 51½ lb. each, and the corporation has further in course

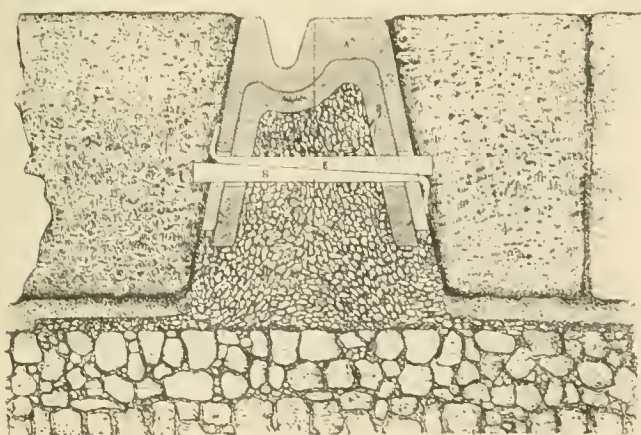


FIG. 1—SECTION THROUGH JOINT.

of construction an additional 10½ miles of tramway, which it is putting down on the Demerbe system."

A cross section through a joint is shown in Fig. 1. The rail, A, is a hollow trough and the fishplate, B, exactly fits its interior contour. When this system was first introduced the fishplate was pressed into the rail by means of bolts, but it was soon found that this was not satisfactory, and cotters, E, were used. As the holes in the fishplates and rails are cut at different depths, when the cotters are driven in the fishplate is forced close up to the underside of the rail. The ends of the cotters are then clinched against the side of the rail, and are thus fixed and prevented by any possibility from working loose. The rail when laid in position in the carriageway is completely filled, by means of specially designed tools, with concrete, composed of four parts of ½ in. unscreened

granite shingle to one part of portland cement. The rails are 33 ft. long and the fishplate about 33 in. long with six pairs of cotters, three in each rail. Crown rail bonds are used.

At intervals of 3 ft. 6 in. there are tie bars of flat bar iron arranged as shown in Fig. 2. To avoid the use of bolts and nut two oblique grooves are cut at each end of the bar, the outer



FIG. 2—TIE BAR.

groove fits onto the rail flange and the other groove is wider and receives a wedge.

In England, as a rule, a concrete foundation is laid the whole width of the carriageway to receive the paving, and when the Demerbe rail is filled with concrete in the manner above described it becomes attached to the concrete foundation, and is practically part and parcel of the carriageway.

The detailed cost per yard of single track on the two systems, based on the price of materials delivered at Bradford, is as follows:

Demerbe System.		s.	d.
Rails	100 yds. of 70½ lb. per yd.	10	7 9
Fishplates	100 yds. of 51½ lb. each	0	9 4
Tiebars	100 yds. of 3 in. x ½ in.	1	0 8
Wedges	100 yds. of 1 in. x 1 in.	0	1 4
Cotters	100 yds. of 1 in. x 1 in.	0	7 1
Track labor, including curving		2	6 0
Rails, etc., carting		0	1 1
Packing rails (labor)		0	11 1
Half-inch unscreened granite shingle		1	0 0
Cement		0	11 5
Team labor		0	3 2
		19	5 4
Girder System.		s.	d.
Rails	100 yds. of 105 lb. per yd.	15	11 2
Fishplates	100 yds. of 80 lb. per pair	1	8 8
Marshall's patent joints	100 yds. of 105 lb. per yd.	0	9 0
Bolts and nuts	100 yds. of 105 lb. per yd.	0	5 4
Soleplates	100 yds. of 105 lb. per yd.	1	0 3
Tiebars	100 yds. of 3 in. x ½ in.	0	2 8
Unscreened granite shingle		0	4 0
Cement		0	5 1
Labor (packing rails)		0	3 0
Road scrapings (or plastering rails)		0	0 6
Track labor		1	3 0
Team labor		0	1 0
Soleplates punching		0	1 0
Blacksmiths' work		0	1 3
Repairs to punches		0	1 9
		£	13 1 4

The totals reduced to dollars are. For Demerbe system, \$4.71 per yard; \$8,200 per mile. For girder system, \$5.60 per yard; \$9,850 per mile. The principal saving, it will be remarked, is in the lighter rail that can be used with the Demerbe system.

The Alamo Heights Street Ry., of San Antonio, Tex., was sold by order of the court, November 9th. The purchaser was Otto Kochler, who will remodel and extend the line.

OIL ON HIGHWAYS.

Results of California Experiments in Sprinkling Common Roads with Crude Petroleum—Data on Cost—Application to Roadbeds of Steam Railroads—Possible Advantages of Using Oil on Street Railways.

Dust is a very serious annoyance to many suburban and inter-urban electric railways laid in highways, for sprinkling which no provision is made, and we feel confident that the question of oiling such highways will be given earnest consideration in the near future. A car filled with flying dust, and with a thick layer of it on all the seats and window sills is not pleasant to ride in, and the road where these conditions obtain can expect only the patronage of those who ride because they must; pleasure riding is unknown on such roads.

In May last the writer rode over a newly opened road laid along one side of the highway, and at the end of the journey emerged from the car with his hair, eyes, lungs and clothing full of dust. The manager remarked that the dust was one of his worst worries, and that he was going to look up the matter of sprinkling the road with oil. Another shorter road with which the writer is well acquainted extends for half a mile along one side of a much used highway which is never sprinkled, and unless there has recently been a rain or there is snow on the ground the dust makes riding on the rear platform a most disagreeable experience.

In 1897 crude petroleum was first applied to the roadbeds of steam railroads (by the Albany & Hudson and the Long Island) to lay the dust and prevent the growth of vegetation in the ballast, and the results have been considered very satisfactory. The cost of this treatment was reported at about \$150 per mile per annum.

About 18 months ago it was announced that the experiment of treating common roads with petroleum was to be tried near Des Moines, Ia., under the direction of the United States Department of Agriculture, but we have seen no report of the results obtained. The first account of oiled highways of which we know is that given by Mr. O. W. Longden, of San Gabriel, Cal., in a paper before the Good Roads Association of Southern California. The following is an extract giving the results obtained:

"The first application of oil to the highways of Los Angeles county, for the purpose of laying the dust, was made in the summer of 1898, six miles being oiled. In 1899 the same roads were again oiled and seven miles of new road treated. This year 50 miles of road have been oiled, most of it receiving two applications, and we are much pleased with the results.

"While we have much to learn regarding the best manner of applying oil, the best manner of repairing oiled roads, the most economical quantity of oil to use, and the kind of soil and condition of road surface best suited to its use, yet on these points we are fast forming an opinion, and on one point we are agreed, and that is, that well oiled roads are dustless, and dustless roads are a boon to any country, and particularly so to California, with its climatic conditions. When people have become accustomed to traveling on dustless roads, whether water-sprinkled or oiled, the dustless condition must be maintained. The demand for good roads free from dust is growing daily.

"There is no doubt as to the efficacy of oil on roads. It is superior to water in that, when properly applied, it is lasting, costs less, makes a desirable road and can be used in districts where water cannot be had. It coats the road with a wearing surface that needs but slight attention to keep in good repair. It builds up the weak places and makes an even surface, while water finds and increases the number of chuck-holes. Oil soaks in and remains a part of the road, while mud sticks to the wheels and water evaporates. Oiled roads, properly made, are free from dust in summer and free from mud in winter.

"The first requisite for a good oiled road is the proper preparation of the roadbed by grading and crowning the road so that it will shed water—rolling the road thoroughly after a thorough wetting, if possible, filling all uneven places that develop. The better the foundation the more satisfactory and lasting the oiled surface. We apply the oil hot, by means of the De Camp machine. The hotter the oil the quicker it unites with the dust, and the more readily it is absorbed by the road surface. Cold oil rolls up in balls

and will not take kindly to the dust, nor spread evenly over the road. Hot dust and hot oil, thoroughly mixed, is the motto of our oil men, and the result is a dustless road, approaching asphaltum in texture and appearance.

"The heavy oils, carrying from 25 to 50 per cent of asphaltum, have given the best results, the light gravity oils being not much better than water on account of their tendency to evaporate.

"A loose, dusty surface is as necessary for the successful application of oil as a good foundation is necessary to make it lasting; therefore, when our road is prepared, as stated above, we do one of three things before applying the oil: First, use the road until the ordinary travel and summer drouth have made the road surface loose and dusty; or, second, cover the road surface with a coating of dust and loose earth from the roadside by means of the grader; or, third, loosen the surface of the road itself with a harrow, and then apply the oil. All three of these methods have given satisfactory results, and each has its place in our varying soils.

"It is claimed by the California Dustless Roads Co., which controls the patent for the use of oil on roads, that oil will lay the dust and improve the surface of a road on any kind of soil, it being a question of 'oil, not soil.' While this may be, and doubtless is, true, yet the question of economy confronts the supervisors, who have ten dollars' worth of work demanded for every dollar of road money in the treasury, and our experience has been that results do not warrant the outlay for oil on light sand, alkali, or coarse gravel roads, the best results being obtained on our mesa roads, sandy and gravelly loams, decomposed granite and clay soils. On coarse gravel roads the rocks in the gravel soon cut through the oil and dust cushion, the rocks become loose and chuck-holes are formed. On alkali roads the oil lays the dust for a short time, but it is not practicable, for the alkali soon destroys the oil and the desired effect is lost.

"We have also observed that old roads that have been sprinkled for years, with very poor results, have been put in good condition with one or two applications of oil. On most of our roads the oiled surface is 12 ft. wide. On a few of our heaviest traveled roads we have oiled 18 ft. wide. The first year two, and frequently three, applications of oil are necessary, the second year two applications, and the third year one application. This is not an absolute rule, however, as quality of oil, quantity applied, kind of soil and amount of travel on the road will vary requirements in different places. On the first application we have averaged about 60 barrels to the mile, 12 ft. wide; the second application, where made, has varied from a slight touching-up of weak places to a 40-barrel covering. The oil costs up from \$1.10 to \$1.25 per barrel in Los Angeles, and 25 cents additional delivered on the road, making the average cost under \$150 per mile per annum.

"Our best samples of oiled roads are those that have been oiled for three successive years, these roads requiring this year only one application of from 40 to 50 barrels per mile. Our experience has suggested the following points as among the essentials for making and maintaining good oiled roads, namely:

"A well-graded road, packed by the winter rains or by thorough rolling. Oil as soon as there is sufficient dust on the roads in the late spring or early summer. Oil often enough and with sufficient quantity of oil to make them pack. Apply the oil when the weather is hot. Loosen the surface of hard roads. Re-oil dry places to prevent chucks. Oil and dust of the street are good materials with which to repair chucks on oiled roads or dry roads. Rolling a few days after oil is applied is beneficial. Occasional going over the road with a plank-drag helps it, where the traffic is inclined to wear the roads in ruts. Have the road foreman keep a few barrels of oil on hand, with which to repair chuck-holes and weak places. A little oil and a hand-rake will work wonders on the imperfections of an oiled road.

"There are some people who object to oiled roads. When the oil is first applied the oiled road is not a place for fast driving, as particles of oil not thoroughly incorporated with the dust are liable to be taken up by the wheels and be thrown on the vehicle and its occupants. This objection disappears in a few days, however, for as soon as the oil is absorbed by the dust and roadbed it has no affinity for buggy wheels, and sticks fast to the roadbed, where it belongs.

"There are people who object to the odor of crude oil, but as this odor lasts only a week or two while the volatile oil is evaporating, this objection is not permanent. Some teamsters claim

that a load pulls harder on an oiled road than on a sprinkled or dry road; others claim the reverse. It will take a scientific test to prove which is right. Some people claim that an oiled road is hotter than a dry dirt road, and others hold the contrary to be true. Some wheelmen detest, and others are loud in their praises of oiled roads. You can take your choice of opinions. The fact remains, however, that while the first oiled roads caused much criticism and many scoldings for the supervisors, yet the last 50 miles oiled have won the approval of the public very largely. For every word of adverse criticism now we have hundreds in praise of oiled roads. The oiled road has come to stay."

THE TROLLEY IN THE PHILIPPINES.

(From Our Own Special Correspondent.)

The Philippine Islands appear to offer an excellent field for the promoters of electric railways. In Manila all interested parties were quite confident that trolley lines connecting that city with the surrounding cities, towns and barrios would be well patronized. At Hoilo, on Panay, those in charge of the railroads have prepared plans for an extensive system of electric lines to connect the capital with the chief interior points. On Negros I was told that there was plenty of money available for such enterprises and that the wealthy natives—that is, the sugar mill operators and the rice and tobacco and fruit planters—would gladly take stock in railway companies if provision were made for handling freight, as well as passengers.

I visited the island of Mindinao with a party of miners and saw the essential need of better means for handling ore traffic. There are gold, silver, lead, copper and coal mines already operated on Mindinao and the work is greatly hampered by poor transportation facilities between the mines and the coast. Some of the richest mining concerns have been making estimates on the cost of the building of narrow-gage freight roads for their special use, but those with whom I talked stated that if a trolley line were put in and platform cars provided for carrying ores, they would certainly patronize the new road. As there are great sections of rich mining lands idle in the interior merely because of the great difficulty experienced in getting the output to the coast, it is safe to assume that the success of a trolley line would be assured at the start.

Even on the little island of Gimeras the people want a line for the purpose of carrying passenger traffic and dye woods. This island is rich in dye woods, but the roads are so bad that the woods cannot be taken to shipping points and therefore the owners of the great forests are obliged to check the cutting and send



NATIVE RAILROAD LABORERS.

to market only what little wood they are able to move by means of native animals and drag sleds. The same conditions prevail on Cebu, where there are great forests of hardwoods, including mahogany, black walnut, rosewood and other valuable woods, which for years have been permitted to go to decay through want of means to move the prepared timber to a marketable point.

But, of course, the central point of interest for all enterprise is the great commercial district in the vicinity of New and Old Manila. Hoilo ranks next in importance. In both of these places important steps have been taken towards the establishment of trolley lines and there is no doubt that before the close of another year several lines will be in operation at these points.

In Manila they now have the Manila & Dagupan R. R. in operation as far as Tarlac. The line beyond Tarlac is being put into order as fast as possible and will be running in a few months. The native started the line, together with the Spanish, and it has, up to the present, been one of the worst railroads in the country, so far as equipment and accommodations are concerned. They say that in order to get a ride on the car a year ago one had to remain over night at a station so as to be the first to mount. I always had to ride by hanging to a hand rail, for all seats and standing space on the little cars are taken promptly by the crowd that want to ride at any price. Although the road is run by steam engines, the cars are very like trolley cars for freight. They are small, always breaking down and running off the crooked and worn out track, and look like cattle cars fixed up with seats. Like almost everything else of the kind on the Archipelago, the rolling stock of the road has seen service and was worn out in Spain or some other country before it was sent here. In riding from Tarlac to Dagupan I noticed at the station called Bautista that the roadbed was in bad shape and the train rocked dangerously.

The road would promptly lose its custom if an up-to-date American trolley line were put in to compete with it. There is more than business enough for two roads running through the same places, while the extent of country which could be covered for miles on either side is unlimited. Lines of trolleys running through the cocoanut region on Luzon during the harvesting season would make fortunes carrying natives and their products from the groves to the central markets. At present this traffic is all conducted by pack animals or the caribou and drag sled, both of which modes are very slow and costly.

The Manila & Dagupan company is planning to build a new line to Hocus. This should properly be a trolley road, as the character of the business in this section calls for trolley lines with passenger cars to which are attached one or more platform cars for carrying freight. All along the road at present one may see natives carrying loads of farm products and merchandise from their homes to Manila or other central point. These persons necessarily occupy a day and experience considerable tedious work in covering eight to ten miles, while if there were a trolley line in operation they could be carried for 5 or 10 cents, with their packages on the platform car. Those who have been enterprising enough to start stage lines, charging high rates per mile to carry merchants and their loads, are making much money, although they do not assist the merchant very much.

To establish trolley lines in the city of Manila itself would involve some serious problems for the reason that the streets are exceedingly narrow. The cars now in use through the streets of the city are all very short and small, drawn by two native horses, and they are pulled around the short turns readily; an ordinary American car could not be taken around the curves. Therefore, it is proposed by engineers to overcome the trouble by tunnelling, and already some important steps have been taken in the proper direction. The city authorities are concerned in the matter, for they are aware that by tunnelling for the cars and removing the tracks from the streets that the serious congestion in Manila will be relieved. This congested condition has now existed for over a year and has been notably increasing. I was there a year ago and noticed then the crowded state of the streets, and several months later found that the conditions were worse. At present it is simply impossible to move about with freedom and the cars, carts and foot traffic are constantly mixed.

There are many canals in and about Manila and it has been proposed to build lines of bridges along the wharves for the street railways, for in most cases the main car lines are on streets parallel with the wharfage. But to erect wharves would mean the blocking of the channels to shipping and serious trouble would result. A main trouble in putting in tunnels, on the other hand, would rest in the uncertainty of the ground. The earth about Manila is unreliable and I recollect seeing engineers at work with a pile driver, where the piles would often drop through the slimy strata of their own weight without finding any foundation strong enough for a support. I have seen piles put down with a few strokes of the driver and two or three others caused to follow on top of each, without striking solid ground. The condition of the ground, therefore, would be one of the problems to struggle with in Manila, while out in the country, so far as is known by

the engineer the ground is not so good. If tunnelling is resorted to, it is evident that the Pasig River bed will be cut through from Intramuros to the Capitol House, making a short cut to Binondo.

While capitalists are thinking about how to relieve the situation in and about Manila, some of the smaller capital cities of the southern islands are going quietly to work and building roads. In Cebu the Cebu Street Railway Co. has been organized with a capital of \$200,000, for the purpose of putting in an electric system for the operation of trolley cars from the city of Cebu, the capital of the island of the same name, to the surrounding cities, towns and barrios, of which there are a large number, all thickly populated. Owing to the delay in getting an electric plant in operation, the directors at one of the recent meetings voted to begin operations just as soon as possible by using horse power, but at the same time to begin at once the erection of a power plant. I ascertained that the cost of getting the proposed lines in operation with horses would amount to about \$25,000 gold and that this money and much more was available. The people of Cebu have always been industrious and many of them control sections of the country that bring them large financial returns. I am personally acquainted with some of the native owners of the pearl industries that make large profits. Then there are the sugar and tobacco plantations, all of which pay handsomely. When it was proposed to get together thirty or forty rich Filipinos and Spaniards for the purpose of putting in a trolley line, it was only necessary to announce it through the Filipino and Spanish papers that circulate there and the moneyed men were promptly on hand. The road is to run through De Mabola, the Escolta, Calle Infanta, over the bridge at Taboada and to the interior points where the commercial interests are such as to warrant the undertaking of establishing trolley lines. The Tagalons and some bodies of Visayans are still operating lawlessly in Cebu, and this, of course, tends to hamper the working of the proposed new road, for the projectors fear that the insurgents may tear up the tracks and do other damage. But if this road is established, American soldiers will protect it, for the reason that there is no better or quicker way to end the rebellion than to introduce modern methods of business and works on which the idle population may secure employment, thus diverting their minds from things warlike. The busy engineer, motorman, conductor or track man would have no time to fight and he would become an industrious and peaceful citizen. No company need hesitate about erecting trolley lines in any portion of the Philippines for fear of interference on the part of ladrones, bandits and rebels, as the Americans will protect their interests.

In promoting railways in this territory, however, there are several points that should be observed. In the first place, the pro-



HAULING SUPPLIES.

motor should go over the territory thoroughly and become familiar with the character of the land. I know of several instances in which promoters of railroad schemes operated from Spain, and sold considerable stock in projected roads to natives, and then finally failed to carry out the plans, offering as excuse that the nature of the country prevented it. Some of these schemes were evidently instituted with a view to fraud. The earnest parties who calculate to operate trolley lines here will go over the ground thoroughly and establish their headquarters in one of the leading cities to be traversed by the road. From this point they can handle the af-

fairs of the new company to advantage. The rails, cars, steam power, plant and all desired machinery and supplies can be ordered just as soon as the location of the road is settled upon and proposed capital available. Then while the material is on its way from America, the country can be gone over for the purpose of examining and putting in the roadbed.

There are many rivers in the Philippines and the interior points can be reached readily by means of boats manned by natives, who follow the river to the beach and there get a boat load of gravel and take it to the desired point. This gravel makes a very excellent ballast and as it can be mixed liberally with earth, one boat load of the gravel goes a great ways. Two natives to a boat are sufficient and these two natives work for 15 cents per day each and furnish the boat themselves, and also care for themselves. The company can keep a fleet of boats engaged at this rate at low cost and secure excellent ballast. At some points immense quantities of sandstone are located in the interior, and this stone breaks easily into a crumbly condition suitable for purposes of grading. Large gangs of native labor can be hired along the road for 10, 15 and 20 cents per man per day. The natives have only the crudest sort of tools to work with and means should be taken to provide the proper tools.

There are numerous rivers to cross, and a year ago I observed that about one-half of the rivers were without bridges, these having been burned by the rebels or permitted to decay. Crossings were effected by fording or on rafts. But the United States military officials have compelled the people to rebuild the bridges, so that at present practically all of the rivers are provided with strong bridges, in some cases heavy enough for a trolley line, but as a rule the railroad people should expect to put in iron bridges at the various river crossings or at least good, strong wooden bridges. This will be quite an item of expense, but the way it is done in this country, if a sugar mill owner wants to bridge a river so as to accommodate his sugar teams, he posts a toll collector at one end who collects toll for every passenger and team. Those who do not want to pay ford the stream. The railroad would be permitted to charge toll for the use of its bridges except for United States troops, horses and wagons. The same conditions apply to the rafts and ferries at the wide rivers. The expense of getting rolling stock here and the purchase of tools and supplies are disadvantages, but these are more than balanced by the difference in cost of labor in the islands.

Horses, caribou and oxen, with sleds for moving supplies, can be secured for 10 cents per day each. When the road is complete conductors, motormen, and, in fact, the entire force of the road, can be engaged at wages which seem simply ridiculous. But the people of the islands have been accustomed to working for 15 and 20 cents per day all their lives and they know how to live on these wages. Foremen of sections, engineers, head clerks, office men in general, and others concerned in the management of the road would of course be paid as high salaries, if not higher, than in America. Possibly the chief engineer of the works would have to be engaged from America at five, six or seven dollars gold per day, while the superintendent would be worth eight or ten dollars per day.

The government has not been able to secure effective means for distributing mail in the Philippines and often bags of mail are held at central points for weeks before some army train goes out to the destination of the bags. If trolley lines were in operation, the companies could derive considerable revenue handling the mails for the government.

INSPECT NEW YORK AND BOSTON STREET CAR TRACKS.

A party comprising President E. S. Goodrich and General Manager N. McD. Crawford of the Hartford (Conn.) Street Railway Co. and a number of city officers of Hartford left that city November 12th on a tour of inspection of the grooved rail street car tracks in Boston and New York, with a view to deciding which sort of rail used in these cities would be most suitable for the proposed street railway construction in Hartford. The committee was entertained in both Boston and New York by officials of the cities and the street railway companies, and returned to Hartford November 14th after a profitable trip.

**CLUB HOUSE OF SUBURBAN EMPLOYEES,
ST. LOUIS.**

The St. Louis & Suburban Railway Co., of St. Louis, has placed one of the buildings owned by it at the disposal of its employes to be used as a club house. The building was formerly the depot of the old steam dummy line, which was merged with the Suburban, and is a one-story building centrally located so that it can be reached from the terminus of any line within 20 minutes.

The company has installed baths and toilet conveniences and furnished a gymnasium and billiard and card rooms. Three bath rooms are provided, one being a shower. The billiard room has two combination pool and billiard tables; tables for cards and similar games are provided, and the principal daily and technical papers are kept on file. The gymnasium apparatus includes rings, ladders, horses, rowing machines, punching bags and boxing gloves.

The club house is conducted entirely by the employes themselves, who are nearly all members of the Suburban Mutual Aid Association, though all expenses are borne by the Suburban company. The house is open from 7 a. m. to 11 p. m.; a janitor is in attendance to act as caretaker. The management is vested in a house committee of five members.

The Suburban Mutual Aid Association makes its headquarters at the club house. This association pays sick benefits of \$7 per

**MINUTES OF A DIVISION MEETING ON THE
BOSTON ELEVATED.**

In our issue for May, 1900, in describing the system of the Boston Elevated Railway Co., mention was made of the semi-monthly meetings of the division superintendents with the general superintendent, and the similar meetings of the inspectors and starters with the several division superintendents. At that time we published the minutes of one of these meetings, and now we give the report of another meeting, that held by the inspectors and starters of Division 9, on Feb. 8, 1900. The record is as follows:

Meeting of inspectors and starters, held at my office today. All present except Starter Doloff, excused.

Chief Inspector Stearns reported that some of the new conductors, in looking over the general order book, had found a general order stating that snow plow wings must be ridden. Recommended that said order be declared void, since levers are now provided for the work.

Inspector Kingsbury had noticed conductors on duty with pants tucked into rubber boots. This was thought to be a good point and inspectors and starters were notified to report conductors thus offending. Did not think conductors should be allowed to have uniform covered up in this manner, any more than they should by wearing cardigan jackets over vests. Now that nearly all switches have a switchman, did not think conductor was obliged



EMPLOYEES CLUB HOUSE, ST. LOUIS AND SUBURBAN RAILWAY CO.

week, the dues being 50 cents per month. The officers of the association are: President, Thomas F. Whalen; recording secretary, R. C. McGilway; financial secretary, Edward M. Spates; treasurer, James Gibbons.

We are indebted to Mr. T. M. Jenkins, general manager of the St. Louis & Suburban Ry., for the photographs from which our illustrations were made.

ACCOUNTANT'S OFFICIAL REPORT.

In less than 30 days after the Accountants adjourned their annual convention at Kansas City, Secretary Brockway had issued in book form his official report of the meeting. It is unusually complete, attractive and a handsome piece of printing.

DAYTON (O.) & TROY ELECTRIC RY.

Work on the Dayton & Troy Electric Ry. is being pushed rapidly. Contracts have been closed with the Westinghouse company for two 400-kw. generators, the Carnegie Steel Co. for 2,500 tons of 70-lb., 64-ft. rails, and the New Castle (Ind.) Bridge Co. for the bridges. The power house, car barns and repair shops will be at Tippecanoe City.

to leave the car enough to warrant him wearing boots. Inspector Kingsbury also stated that he thought some cars had brakes set too tightly, i. e., shoes too close to wheels, so that when there was a little snow on the rail wheels would skid. He was instructed to turn in a report of all such cases which came under his observation, that action might be taken to remedy difficulty.

Inspector Carl, in speaking of some of the cars, thought that if a wider iron strap or support was placed in the car floor over the trucks to support traps, same as the Laconia cars had, much cold air could be kept out of the car.

Inspector Russell had nothing of importance to offer at this time.

Inspector Miller had been asked by conductors what they should do if a man persisted in spitting on floor after he had been given a spit notice. Had instructed them to get person's name and address if possible, also to get good witnesses and turn in a report to superintendent's office.

Starter Abbott had noticed that a good many headlight glasses were broken by jolting of cars in running over special work and switches. Thought that a good preventive would be a felt rubber washer to be placed between glass and iron frame, also that the washer would aid in keeping out dust, thereby keeping glass and lamp cleaner.

Starter Day brought up the subject of cold cars, particularly on 12 o'clock midnight trip. This to be remedied by substituting car with six heaters for one with four now in use. Car with four heaters had been used on account of a certain car being required on Adams Sq. trips.

Starter Wright wished to mention that of late conductors had not been as particular as they should in making out accident reports, and had neglected to state whether the time given was meant to be a. m. or p. m. Also sometimes omitted car numbers. He was instructed to make a report of all such cases that he noticed, that suitable discipline might be given offenders.

Starter Walsh, transferman at Coolidge's Corner, complained that it was almost impossible to see to punch transfers after dark at Coolidge's Corner, owing to lack of light. Wished to have a light or cluster put on a pole at this corner. (To be taken up later.)

Starter Buxton wanted conductor's attention again called to necessity of keeping car doors closed.

No further remarks being forthcoming, a portion of the minutes of the last superintendent's meeting was read for the men's information. Particular emphasis laid on necessity of cars being properly spaced on street. No excuse for motorman of rear car to say that he is on time and man ahead late. If motormen are noticed chasing other cars too closely inspectors must board car and warn motorman that he must discontinue such practice. No necessity for men to hurry and crowd other cars, so as to get back exactly on the schedule time. What is known as allowed time, i. e., lay off at end of route between trips, if less than 30 minutes, is paid for and men might just as well spend some of it on the street as sitting down in the car at end of route.

Memoranda in regard to carrying articles on platform of cars, also in regard to delays by "Funeral Procession," and what action conductors should take in case of recurrence of this in this Division, also concerning delay caused by Father Morris' funeral read from minutes.

Inspectors were instructed to look out for flat wheels and report all cases noted. The attention of inspectors also called to excessive crowding of passengers. Heavy riding trips should be reported, that steps may be taken to relieve such crowding by adding or inserting trips where needed.

Meeting of about one and one-half hours.

MASSACHUSETTS ELECTRICAL COMPANIES.

Under date of Nov. 7, 1900, President Gordon Abbott, of the Massachusetts Electrical Companies presented his report for the first fiscal year ending Sept. 30, 1900. The properties controlled by this company are managed by trustees who on June 30, 1899, held a majority of the whole of the stock of 30 street railways, 2 lighting companies and a park company, operating in Massachusetts, Rhode Island and New Hampshire. Since that time the trustees have purchased the stock of the New Bedford, Middleboro & Brockton company, 12,000 shares of the Lowell & Suburban Street Ry. and 6,574 shares of the South Shore & Boston Street Ry.

In order to facilitate operation and improve the service which was greatly hampered by various contracts and agreements between the companies a number of consolidations and mergers were effected, thereby reducing the total number of companies from 36 to 14. These companies own 776 miles of street railway track in 23 cities and 62 towns and are: Beverly & Danvers; Brockton; Globe; Gloucester & Rockport; Hyde Park Electric Light Co.; Lowell, Lawrence & Haverhill; Lowell & Suburban; Lynn & Boston; Nashua; Newport Illuminating Co.; Newport & Fall River; North Woburn; South Shore & Boston; West Roxbury & Roslindale.

The gain in economy of operation and the betterment of the service are reported to be most gratifying. During the year \$1,055,245 was spent in improvements and extensions which included 19.3 miles of new track mostly 90-lb. girder and 70-lb. T rails, 15 miles of track reconstruction, 61 miles of additional feeder lines, 16 box cars, 31 open cars, 34 snow plows, 156 new motors with controllers, a new brick car house at Brockton, and addition of machinery at the power stations. The company has 19 power stations and 2 electric light stations; it is the policy to combine stations where conducive to economy and it is expected the present number will be further reduced.

The balance sheet for the 14 consolidated companies shows assets of \$30,427,189, of which \$28,631,989 is in the property account.

For the year ending Sept. 30, 1900, earnings were \$5,518,838; expenses, \$3,659,337; charges, \$994,294; net divisible income, \$865,206; dividends paid \$645,545; charges to renewal funds, \$89,000; charges to depreciation and sundry accounts, \$93,229; surplus for the year, \$37,432.

The only income of the Massachusetts Electrical Companies is from the dividends on the stocks owned and interest on loans made. Its income was \$904,758, of which \$807,311 was from dividends. Its disbursements were: Salaries, legal and miscellaneous, \$18,900; interest and other charges, \$44,024; dividends, \$480,000; leaving a balance of \$361,834. This balance, some 26 per cent of the income available for dividends is held to provide reconstruction reserves.

The report says: "An important fact concerning the net divisible income for the present year should be noted. Almost all of the companies were not insured against accident at the time when you became interested in them, and it was felt that conservative management demanded that insurance should be provided. A mutual insurance company charter granted in 1895 was therefore acquired, a company formed called the "Massachusetts Street Railway Accident Association," and in that company each one of the street railway companies in which you are interested is now insured.

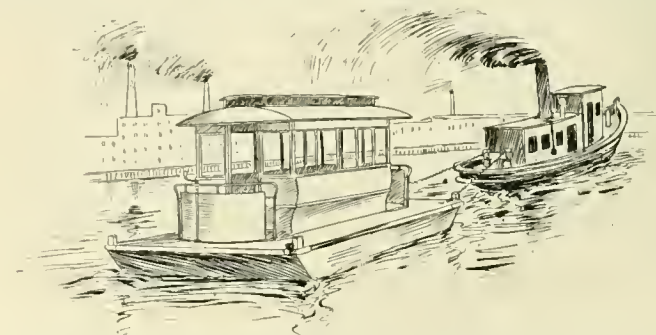
"The institution of this system of insurance, while advantageous from every point of view, has caused practically a double expense for accidents during the past year, as the companies have paid out considerable amounts in settlements of claims due to accidents which happened before the beginning of their insurance, and have also paid the premiums for the present year, all of which has been charged to operating expense. Had the companies continued without insurance, paying claims as they were settled, in accordance with the custom which obtained down to your acquisition of their shares, the amount of net divisible income for the past fiscal year would obviously have been increased by the amount remaining in the treasury of the insurance company on September 30th, last; this balance amounted to \$103,000. It is probable that the last of the claims which antedate the beginning of insurance will not be settled until the latter part of the present year, but when that time comes the income of the companies will quickly feel the full benefit of the new system."

During the year Mr. Amos F. Breed, the first president of the companies, died.

The present officers are: President, Gordon Abbott; vice-president, Charles E. Catting; general manager, P. F. Sullivan; secretary, Everett W. Burdett; treasurer, Joseph H. Goodspeed; general auditor, D. Dana Bartlett.

STREET CAR AS A HOUSEBOAT.

The retirement of the time-honored horse cars all over the country has diverted many of them from the tracks into all sorts of odd uses and purposes. In one case three of them end to end



are being used as a little chapel; in Providence several serve as lunch rooms, and in St. Louis as a photograph gallery. In each instance the wheels have been removed and the box set up on short posts.

In Chicago one of the old City Railway cars has been mounted on a scow and transformed into a very respectable houseboat.

The Massachusetts Railroad Commissioners are now investigating the desirability of placing vestibules on Boston electric cars. A number of witnesses, among them several motormen, testified that the vestibuled cars were equally as safe as the others to operate.

WHAT WOULD THE IDEAL FRANCHISE CONTAIN.

The following letters were received in reply to an inquiry sent out by the "Review" asking what an ideal franchise—one that would be desirable from the standpoint of the company and at the same time, just and fair to the city—should, and should not contain, as regards paving, sprinkling and repairing streets, taxes and percentage payments to the city, rates of fare, etc.

Mr. Samuel M. Jones, mayor of Toledo, writes: "In my opinion no private franchise or privilege for operating a public utility for the purpose of making private profit out of the necessities of the people can be, in the best sense of the word, 'ideal.' Ideality is, in my mind, so closely allied with the idea of unity, of oneness, of equality, of brotherhood in short, that I cannot associate the word ideal with any relation in life that admits of one man using his fellow man as a mere instrument out of which to make profit. The streets of the city are the common property of the common (all) people. Clearly the people are entitled to the free and untrammelled use of the streets, or ought to be, without paying tribute of any sort to any private profit getter. Under the specialized conditions of today, a street car is as necessary a part of the street as the paving, and there would be as much justification in scientific fact for granting a franchise to private contractors to pave and repair the streets and collect toll from the people who use them as there is for granting private franchises to street railway companies. But we have not yet reached this state of idealism, and it is probable that we shall not for many years to come, although it is as surely ahead of us in the future as was the electric car ahead of us 25 years ago. More marvelous developments are to be witnessed in social and political relations during the next quarter of a century than the wonderful things we have seen in the material world during the past half century. The world is rapidly learning that things should be made for use rather than for profit, and once the people fairly grasp this truth the day of the private profit-getter, and the idle shareholder, and those who exist on dividends which are the result of the toil of other people will be at an end.

"Meanwhile private franchises will probably be the rule of the day. As to their terms while this immature state exists, I would be inclined to be exceedingly liberal with the franchise owner, depending for 'protection' to the city's interest upon the growth of the morality and public sentiment of the people themselves. I think I would favor stipulating the portion of the street that the car company should care for, which will in every case be a subject of dicker, bargain and sale, or trade between professional traders—the lawyers who represent the railway company and the representatives of the people. Then I would endeavor to fix the rate of fares as low as could possibly be secured, leaving entirely out of consideration the question of paying any percentage of gross earnings into the city treasury. The percentage should go directly to the people who pay the fares; they and not the tax payers and heavy property owners who ride in automobiles and fine carriages are the ones who should receive the benefit. Next I would limit the franchise to the shortest time practicable so as to prepare the way for making the transition from private to public ownership as easy as possible. I am an advocate of public ownership of everything in sight. I believe in all of the people and in the morality and integrity at the heart of the nation.

"Because even the conditions of our developing commercialism are better today than in the past, because the sum total of human happiness is greater today than at any other period of the world's history, because in short the present is better than the past, I believe that the future is to be better than the present; and I think the people are learning this lesson, that they cannot lift themselves by their boot-straps, that is, they cannot, without violating a fundamental principle of justice, make something out of nothing. By and by the ethical point will be revealed that no government, municipal, state or national, has a right to deliver its people over to be used for purposes of profit; that it is not only the privilege but it is the duty and business of government to operate every public utility for the benefit of the people at actual cost without profit to any.

"In the developmental stage that we are now in I would especially avoid complexity in franchises. I would make simplicity the main point, and, as I have already said, secure as good a bargain as can possibly be had by dealing with the fundamental points that

I have mentioned. I think the representatives of the cities should stand for these points above all others: low fares, short term franchises, definiteness with respect to the corporation's share of the paving, repairs of bridges, etc. While the franchise system continues the city is, of necessity, in copartnership with every owner of a franchise. Ethically I believe it to be an immoral relation for the reasons that I have stated. The franchise owners—that is a few of the people—have no moral right to make profit out of the necessity of the rest of the people. But taking things as they are, there is a certain mutuality of interest between the owners of a private franchise and the city, and for this reason the city may be better served in that class of utilities known as natural monopolies, such as street railways, by one corporation than by inviting a competing corporation into the city and thus authorizing the investment of double and triple the capital required to carry on the business. In consequence of this wasteful and strifeful competitive method through which we have passed, the street railway lines of this city are today capitalized for several times what it would cost to replace the entire system, and the people must pay the penalty of the warfare that has gone on in years past between private corporations striving for private advantages. There is probably no room for reasonable doubt but that were it not for this phase of our civilization the people of Toledo could have 3 cent fares, and the earnings would provide amply for all the necessary expense of carrying on the work, and leave a handsome margin in the bargain.

"I have endeavored to present this question fairly, as it appears to me. It is well known that I am unalterably committed to the policy of public ownership. I believe in it as a fundamental principle of right relation between men in the affairs of government. I know that it is the order of the future, and I believe that the early years of the 20th century are to witness marvelous and rapid changes in social and political relation along these lines that shall put the municipalities of the United States as far ahead of the cities of the old world, ethically and politically, as they are today in material and economic development."

Mr. Albion E. Lang, president of the Toledo Traction Co., writes: "Conditions of course vary in different cities. Generally speaking, however, I believe a street railway franchise should be perpetual in order to enable the company to borrow money at the lowest rates of interest as do steam railroads, and also in a sense a monopoly which would secure to the company the right to extend lines from time to time as the city develops. On the other hand the franchise should require the company to build extensions under just regulations. In all cases it should carry with it a requirement to transfer passengers from one line to the other, so that one fare will carry persons to any part of the city.

"Such franchises should also require the company to assume obligations to either pave and repair portions of the streets occupied by it or pay a given percentage of its earnings to the city—either or both, as local conditions may be deemed just. I sometimes think that the city should do all of the paving and repairs of streets, making such charge against the company as may be fair, thus silencing the citizen, who is constantly complaining that the company avoids its obligations in this respect.

"I believe that street railway companies at a proper time in their existence can well afford to pay to the community all earnings in excess of the true expenses of operation, plus taxes, interest on fixed debt, an allowance for depreciation and a reasonable dividend to its stockholders, or in lieu thereof, such percentage of its gross earnings as may be deemed the equivalent.

"Under a franchise constructed along these lines the rate of fare should be 5 cents."

Mr. H. A. Everett, president of the Cleveland Electric Railway Co. writes: "I think that franchises ought not to have any clauses which may cause litigation. I suppose the theory of the company paving its tracks in the old horse car days is so established that it would be impossible to secure franchises without that clause. The sprinkling of the tracks is certainly of mutual advantage to the city and the company. I think that the railway ought to pay taxes on a fair and equitable property basis, similar to other properties, and if a percentage of the gross receipts is paid to the city, the same should be nominal. As to the rate of fare, I think 5 cents cash, or 6 tickets for 25 cents, with unlimited transfer privileges for continuous rides, is the correct rate, but think the company should have some protection against trafficking in transfers."

Mr. W. F. Kelly, general manager of the Oakland (Cal.) Transit Co., writes: "The tendency of the rapacious politician who controls municipal affairs is to burden the street railway interests with numerous petty restrictions which increase the cost of operation and hinder the development of street railway systems. The newspaper press is unceasing in its attacks upon corporate investments of this character and creates a hostile sentiment in the minds of the unthinking public so that they are incapable of judging or dealing fairly with street railways. My own idea is that the matter of franchise should be as simple and clear as possible. From a public standpoint a street railway system should be so constructed and operated as to afford ample, speedy and safe accommodations to the traveling public. Construction should be first class, equipment up to date and kept in good order and cars run with sufficient frequency to meet the needs of the traveling public. Transfers should be issued to and from all lines. Under such conditions the public is well served and it would seem that nothing more could be reasonably asked or required in the matter of service.

"Now what should the company pay for the privilege of doing this? To my mind the simplest solution is a percentage of the gross earnings paid into the city treasury. What is a reasonable percentage depends much upon the local conditions and earning capacity of the system. In the smaller towns and cities the municipality could well afford to pay a bonus for the construction and operation of a street railway as no other enterprise would enhance property values so much. It is scarcely possible that any of the citizens of such a community would be far-sighted enough to do this, but under the conditions named they could at least grant a franchise without requiring any percentage of the gross earnings or imposing burdensome conditions as to street paving, car license, etc.

"Again in large cities where the profits arising from the business are large it is but right and reasonable that a percentage of the gross earnings should be paid into the city treasury for the public benefit. The difficulty in determining what is a reasonable percentage grows out of the fact that the average city official has an exaggerated idea of the profits of the company, and the management of the company from a selfish standpoint is loath to surrender any portion of its earnings for the city's use. A graduated percentage ranging from 1 to 5 per cent would under existing conditions be a fair compensation for the franchise. So far as the whole public is concerned a better arrangement to my mind would be no charge for franchise, street paving, car license, etc., but a condition that every 10 years the council should have the right to fix the rate of fare, but in no case should the rate of fare be fixed lower than the operating cost plus 6 per cent of the capital actually invested in the enterprise. A lower rate of fare is always to the advantage of the millions who use the street railways while a large franchise tax, and other burdens such as paving, sprinkling, car license, etc., render the lower rate of fare impossible and only contribute to reduction of taxes for city uses which in turn benefits the large property owners and tax payers and not the large number who pay but a limited amount of taxes.

"Another difficulty in the way of percentage on gross earnings is in the matter of extensions to existing lines. With the growth of the city, the lines are reaching farther and farther into the outer limits. They are not new and distinct lines in many instances and are not operated as separate lines, and the earnings arising from such extensions cannot be kept separate from the older portion of the system. To include in the franchise for such an extension a requirement that a certain percentage of the gross earnings of such extension should be paid to the city is an absurdity as there can be no means of ascertaining what the gross earnings are.

Under existing conditions as many street railways have franchises in perpetuity and others for long terms of years none of the street railway companies nor the city government would be willing that the present conditions should be changed and new franchises granted on a radically different basis, no matter how great a benefit such new franchise might be to the general public. It seems therefore impossible that there will be any decided change in this matter until public sentiment is educated to the point of believing that a first class railway system is a great benefit to the community and that the tendency of all legislation regarding street railways should be towards better service and lower fares."

Mr. D. B. Dyer, president of the Augusta (Ga.) Railway &

Electric Co., writes: "I would briefly state that in my opinion the function of a street railway is to convey the population to and from their homes to places of business and for business purposes, as well as for recreation. In other words, it is recognized as a necessity, and my idea is that franchises should be granted without any restrictions as to paving or keeping up of the streets in any way, except where the street railway disturbs a street in relaying or repairing its track. I believe that the paving of streets would never have been required of street railways, had it not been for the fact that the original service lines were mule and horse lines and that the animals tore up the streets to such an extent that the citizens concluded that the company should keep the portion of the street between its rails in repair. This was an equitable assessment but since the roads are propelled by electricity or steam the same obligation is not due from the railroad companies. I think that in exchange for franchise privileges the cities should assess the railway companies a certain percentage of their gross receipts."

Mr. A. C. Frost, vice-president of the Chicago & Milwaukee Electric Railway Co., writes: "Personally, I have always held that the best compensation a transportation company can give to a municipality is good, efficient and frequent service at a low or at least a reasonable rate, and that municipalities in their greed to get large compensation overlook the most important points, namely, service and rates. Where a street railway company operates in a city of several hundred thousand people, it may be reasonable to ask for compensation but where it operates in a community having a population of fifty thousand or less, or in new territory, I consider that it is unreasonable to ask compensation or any other concessions except, perhaps, to pave between the tracks in improved streets."

Mr. Charles T. Yerkes, of Chicago, speaking before the American Street Railway Association last year, upon the subject of street railway franchises made the following remarks:

"The most important matter in regard to the security of street railway securities is the length of charter under which they are operating. This question is of as much importance to the people as it is to the street railways themselves. The longer time that is given to a charter to run, the greater improvements and the more expensive plant can be operated by the companies. That is to say, it can be made more permanent than if the charter was of short duration, and naturally it would be. If a company had a charter with but a few years to run, the improvements will be of a cheap character, commensurate with the length of that charter, and the better the improvements, the better it is for the people. Not only for those who own property, but for those who ride and have no property. We see this exemplified daily. Let us ask the question, how many bridges of iron or stone would the steam roads have if their charters ran for only a few years? There would certainly be none, and the speed of trains would be greatly reduced. Years ago 30 miles an hour was considered rapid traveling, with 20 as an average. Now the rate has been run up to more than 80, with 45 as an average on fast trains. This latter condition would never have existed if the steam roads had not had charters long to run. Why should not the charters of street railways be equal to those of steam railways? In fact, considering them all in all, they should be longer. The cost of a steam railroad today is not nearly equal to the cost per mile of a street railway, even counting all the appurtenances that go with each."

RENO INCLINED ELEVATOR AT MANHATTAN STATION.

The Manhattan Elevated Ry., of New York, has recently installed a Reno inclined elevator at its 59th St. and 3d Ave. station. The moving platform is 17 in. wide and beside it is a flight of steps 2 ft. 6 in. wide for use in descending; the angle is 42¼°. The surface speed of the platform is 90 ft. per minute and at this station the time required to carry a passenger from the street to the platform is 30 seconds. To walk would require about 22 seconds. By walking on the moving platform the time can be easily reduced to 14 seconds. The capacity of this elevator is stated to be 3,000 persons per hour.

MANCHESTER (ENG.) CAR SHED.

By courtesy of Councillor Boyle, chairman of the tramways committee of Manchester, England, we are enabled to show the accompanying plan and exterior view of the tramway car shed recently completed by the municipality. This building is known as

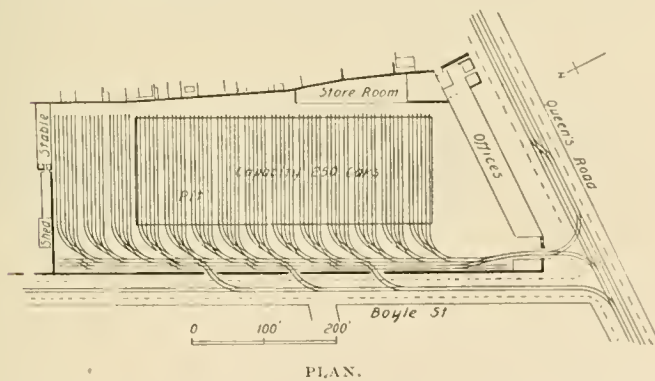
ation to Yorkville, the southern terminus, by early in December. The construction of the most modern and substantial character, 60 lb T rails, oak tie, gravel ballast and standard appliances being used. The overhead line is No. 00 trolley, supported on brackets where the road is built at the side of the highway, and by span construction elsewhere. Three miles of private right of way



EXTERIOR OF QUEEN'S ROAD CAR SHED, MANCHESTER (ENG.) TRAMWAYS.

the Queen's Road car shed, the main front being on that street. It will be at once remarked that this building is of more imposing appearance than most American car houses; another peculiarity is that of putting the special work all within the building. The longest side of the building is about 670 ft. and the width at the nar-

was acquired to shorten distance and avoid grades. The company has no power station or car house, but the line is operated by the Aurora Street Railway Co., which, under contract, supplies power, maintains the equipment and line, and furnishes car men and other help required. The company owns four double truck Brill cars of the interurban type and proposes to furnish an hourly service with a maximum fare of 20 cents.



The district served lies south of Aurora along the beautiful Fox river, the country is rich and thickly settled and has formerly depended upon the meager accommodations furnished by the Fox River branch of the Chicago, Burlington & Quincy R. R. Yorkville is the county seat of Kendall County, and has a population of 2,500, while Oswego, lying midway between Aurora and Yorkville has a population of 1,000. At Oswego the line crosses Fox River on a new bridge built jointly by the railway and the township authorities, and enters the town over a trestle 600 ft long and 30 ft high, which permits it to avoid a dangerous grade crossing and a steep hill. The country for 2½ miles north of Yorkville, where the line runs through private right of way, is picturesque and beautiful. Heavy woods, deep ravines, and the river always in sight, makes the ride a particularly delightful one and insures the popularity of the line for summer business.

rowest part, 240 ft. There are 42 storage tracks 16 ft. long, 33 of which have pits 147 ft. long. The total capacity is 250 cars. In the rear of the car shed is a yard with sheds for storing track supplies.

The company purchased 50 acres of land lying along the bank of the river three miles south of Aurora, and converted it into a park, the railway passing directly through the center. This park has been equipped with pavilions and all the buildings usually found at resorts of this kind, and it proved to be very popular during the past summer. The entire line was constructed by Mr. D. A. Belden, general manager of the Aurora Street Railway Co., and of the Aurora & Geneva Railway Co.

A NEW ILLINOIS INTERURBAN.

One of the recently completed electric interurban lines in northern Illinois is that of the Aurora, Yorkville & Morris Railway Co., operation over the whole line having commenced early in the present month. This company was incorporated in 1897 with the object of building a railway from Aurora to Morris, via Montgomery, Oswego and Yorkville, a total distance of nearly 30 miles.

During the recent Fall Festival in Cincinnati the Cincinnati Street Ry. carried more passengers than during the great G. A. R. encampment of 1898.

Nothing was done beyond securing a right of way, until August, 1899, when the project was taken up by Col. H. H. Evans, of Aurora, V. A. Watkins and S. H. Case, of Chicago. The company was organized with Mr. Watkins as president, Mr. Case, secretary, and Mr. Evans, treasurer and general manager. Three miles of line were then built, connecting Aurora with Montgomery, a village of 500 inhabitants, and this line was operated during the winter of 1899 and 1900 with cars belonging to the Aurora Street Railway Co.

The Washington (D. C.) Traction & Electric Co. has been requested by the commissioners either to use or to remove the street car tracks in various parts of the city that are not in regular use.

In the spring, it was decided to extend the line to Oswego and Yorkville, making a total of 12 miles, and to abandon the plan of building to Morris. The line was completed as far as Oswego on July 1st, and has been in operation since that time. The rest of the line was built during the summer and fall and was in oper-

The Omaha (Neb.) Street Railway Co. will improve its service, establishing a five minute schedule on local lines. The capacity of the power plant is to be nearly doubled.

The Michigan Traction Co., operating the new interurban line between Kalamazoo and Battle Creek, Mich., will carry the mails between the two cities and the villages of Augusta, Galesburg and Comstock.

INTERNATIONAL TRAMWAY CONGRESS.

The International Tramway Congress was held at Paris, September 10-13, 1900, under the auspices of the Union Internationale Permanente de Tramways. We give below short abstracts of the 11 reports presented to the congress. M. Nonnenberg, secretary of the Union, has already issued a printed summary of the proceedings, and the verbatim report is promised within a few weeks.

TRAMWAY FARES.

Mr. Geron, of the Cologne Tramways, presented a report upon rates of fare and the effect of modifications made within five years. The replies received indicated that wherever fares had been reduced there had been an increase in traffic and in most instances an increase in net profits. Mr. Geron's deduction was that the bases for the formation of a tariff are essentially different according to circumstances, and that only general conclusions can be arrived at. These are (1) that the tariff of urban tramways should be simple and cheap, and established to meet the requirements of the particular localities; (2) for large cities it is advisable in general to provide an interior zone with a tariff at a single price, and in which should not be comprised any suburban lines; (3) that the system of transfers is to be recommended, but it will be advisable to examine in each particular case if there should be a charge for the transfer, and what should be its amount.

The discussion was principally on the third conclusion. Mr. Dubs, Marseilles, preferred to lower the fare rather than give transfers. Mr. Pieck, Berlin, was opposed to free transfers, and thought they should be graded as to cost. The congress concurred in the first two conclusions of Mr. Geron and a committee was appointed to further consider the third conclusion and report on it at the next congress.

EFFECT OF ELECTRIC TRACTION.

Mr. Pirch, of the Barmen-Elberfeld Tramways, discussed the results of electric traction from the points of view of traffic expenses and profits, but all the data he had been able to secure related solely to the overhead trolley system. His conclusion, adopted by the congress, was:

Overhead electric traction recommends itself in place of animal traction and also in place of traction by locomotives, when the system demands small trains succeeding each other at short intervals, on long lines, and with heavy traffic, on the conditions that the duration of the concession is sufficiently long and that the other conditions are favorable to the equilibrium of the undertaking.

NARROW GAGE ROADS.

Mr. Gunderloch reported on the relative advantages and disadvantages of a narrow gage (1 m. or 39 $\frac{3}{8}$ in.) as compared with standard gage. From the replies of 11 companies he drew the following conclusions:

1. The narrow gage permits an easy rounding of sharp curves. With the present types of motor cars, with a wheel base of from 1.6 m. to 2 m., this advantage is not a very important one. It has been found that of 61 electric roads having curves of 20 m. radius or less, 33 employ the standard gage, and only 28 the meter gage. This shows that the occurrence of a few sharp curves should not be sufficient cause to induce railway companies to adopt the narrow gage.

2. There is less expense connected with the construction and maintenance of a narrow gage than standard gage. This, of course, only becomes of importance where the company builds its own roadbed, and where the same is of considerable length. The narrow gage requires a smaller expenditure for roadways, the transportation of earth and general construction.

3. As the electric roads are feeling more and more the competition with steam roads, especially in the transportation of freight, it is to their advantage to use the standard gage, as it enables the electric freight cars to traverse the tracks of the steam road, thus saving the cost of unloading, and vice versa. To permit this the following conditions, however, must be observed in the building of the street car line:

- (a) There must be no curves of a radius less than 150 m.
- (b) The rails must be so supported that they can resist at any point a moving load of 6,000 kg. at a speed of 30 km. per hour.
- (c) There must be a clear space above the track of 760 mm.
- (d) The track centers must be 4 m. apart.
- (e) There must be no grades which would overload the motors for too long a time.
- (f) Such brakes must be installed and such a speed must be chosen on public highways that the train can be brought to a stop within the distance required by law.

It is worthy of note that a number of original narrow-gage roads, in order to become more serviceable, have changed over entirely to the standard gage, or have laid a third rail.

4. As the motors are mounted between the wheels of the motor car, it is evident that larger motors can be installed on standard-gage cars than on those built for narrow gage.

5. The use of large motors on narrow-gage cars takes up all the room between the wheels. Thus the accessibility to the various parts is made more difficult, which is a great disadvantage. The motors are further exposed to a greater extent to the water thrown up from the track during travel, as the space beneath the motors is too small to allow for the provision of proper guards.

6. The small space also forbids the mounting of air pumps for the use of air brakes alongside of the motors, and in any case the arrangement of the brake mechanism is less convenient on narrow gage than on standard gage cars, on account of the crowded condition between the wheels.

7. The standard gage cars are also more stable than narrow gage cars. In the latter cars with longitudinal seats the wheel boxes become very objectionable.

8. In conclusion, a few remarks should be addressed on this subject to the owners and maintainers of highways who are in the habit of advising the railway companies to build narrow-gage roads because they take up less room than those of standard gage. This is an erroneous idea, however, as experience has shown that other vehicles will not use the narrow gage tracks, but travel alongside, and thus take up a great deal of valuable space on the roadway. As the narrow gage cars have the same width as the standard gage ones, the space taken up by them is the same. There will, furthermore, be fewer collisions between vehicles and cars on broad-gage roads, as the former are kept further away from the gage line.

From the above it will be seen that for electric street railway service the standard gage possesses many advantages, and is more commonly employed. A change to the narrow gage, which would exclude the possibility of running street cars over steam railroad tracks, should not be recommended.

Mr. de Burlet, director-general of the National Local Railway Co. of Belgium, objected to the conclusions as applied to country roads for freight traffic. He said there were 100 local lines in Belgium, aggregating over 1,500 miles, and that 1,200 miles more were under construction. Of these 100 lines only three had normal gage. The cost of narrow gage lines, including rolling stock, was 48,000 francs, while for the normal gage it was 100,000 francs. In 1890 the Tramway Congress had approved of the narrow gage.

Other members believed that conditions had changed since 1890, and that the conclusion of the report was correct. Decision on the conclusions was postponed till a later congress.

POWER STATIONS.

Mr. Thonet, of Liege, and d'Hoop, of Brussels, presented elaborate reports giving detailed information concerning the equipment of street railway power stations, and concluded that: In large installations it is necessary to adopt compound steam engines, direct connected and condensing. In installations of medium size there is generally room in or near the works for a battery of accumulators. In small installations, if fuel is dear, the employment of gas engines, even with poor gas, gives very advantageous results.

An amendment was made to the first conclusion as follows: In large installations it is necessary to adopt steam engines, either compound or triple expansion, connected direct and condensing, seeing that triple expansion engines secure a notable economy, and

permit very great facilities in coupling alternators in parallel. The conclusions were then adopted.

CURRENT DISTRIBUTION.

Mr. Van Vloten, Brussels, reported upon the question of the best method of distributing current to a large system of tramways with suburban lines capable of long extensions.

The deductions were:

(1) When the line is not longer than 8 to 10 km. from the works, and with a not too heavy service, the preference should be accorded in general to ordinary distribution by continuous currents with or without secondary batteries; (2) when the line extends under the same conditions to 15 or 16 km. from the works the distribution of continuous current from the central station with transformers and secondary batteries presents advantages; (3) in certain altogether special cases the preference should be given to traction by means of accumulators when the line is not more than 15 to 20 km. in length; (4) the distribution of continuous current, in series, can be applied to still longer lines, above all when it is possible to utilize the power of a distant waterfall, but that distribution from the traction point of view has the inherent defect of systems in series (risks of powerful perturbations affecting the surroundings of the installation), so that it is not advised when the intensity of the service is variable; (5) for these reasons the distribution of polyphase currents with converting stations to continuous current feeding the working lines is a distribution which presents the same advantages from the point of view of the utilization of waterfalls, and is more convenient, principally when the service is intense and variable, the trains heavy, and the line long—say from 20 to 30 km.; (6) the direct distribution by polyphase currents with revolving field motors on the vehicles does not seem to adapt itself to the same conditions of traffic, length of line, etc., so well as to the ordinary railways, independent of the working of urban tramways, and constructed on a special platform.

FALK JOINTS.

Mr. Fisher-Dick, Berlin, submitted a report upon the Falk cast-welded rail joint and its application to many railways in Europe and America. Mr. Thonet stated that railroads had at first been used with Falk joints in France, but had been found unnecessary and were not used in later installations.

ACCUMULATOR TRACTION.

Messrs. Broca and Johannet, Paris, had the report on Accumulator Traction, which included lengthy communications from the Hanover Tramway Co., describing its system, and from Mr. E. E. R. Tratman of the Engineering News, describing the Chicago Electric Traction Co.'s road. Mr. Tratman's answers were doubtless prepared some time ago, as no mention was made of the fact that the Chicago Electric Traction Co. has abandoned the storage battery in favor of the overhead trolley.

After an animated discussion the congress adopted the following resolution:

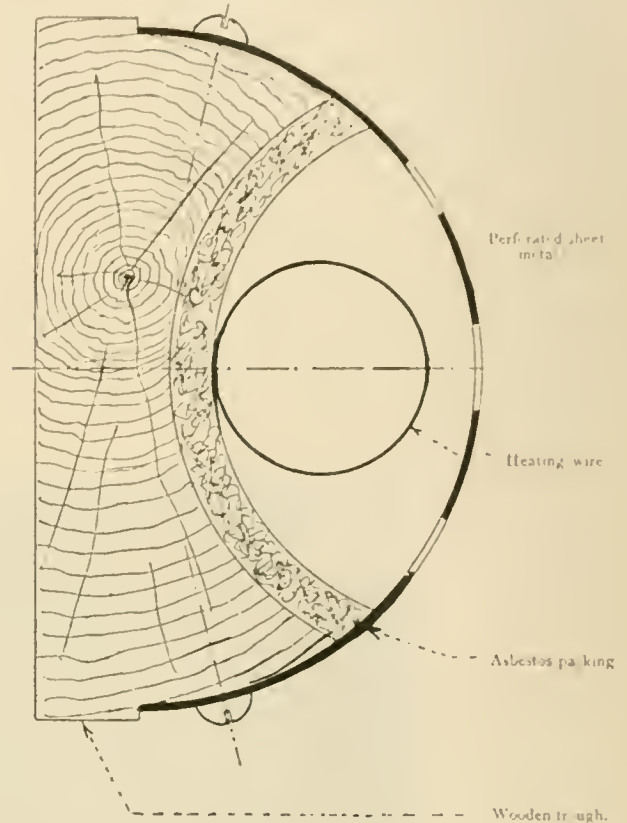
Ignoring the greater cost of accumulator traction, and speaking only from the point of view of the service the public deserves to receive, traction by accumulators does not ensure in a sufficient degree the necessary regularity, elasticity and capacity; that up to the present no important advances have been made in accumulator traction for tramways; that the accumulator system is much less sure and much more onerous than the overhead trolley system, and can be recognized as applicable only in certain very exceptional and very special cases.

CAR HEATING.

Mr. de Burel, Brussels, presented a report on car heating. It appears that the heating of cars on urban tramway lines is not the common practice in Europe. In Aix-la-Chappelle briquettes are used; in Stettin, stoves; in Vienna and Hanover, electric heaters; the Swiss General Tramway Co. uses hot water heaters.

The Hanover company has no room for heaters under the car seats, the space being taken by the accumulators, and a form of

heater to be attached to the vertical surface of the seat and extending the whole length of the car was devised. This is shown in section in the illustration. The length and diameter of the wire are so chosen that it may be heated to redness by 3.5 ampere at 500 volts. These heaters will raise the temperature in a car 10 degrees (C or R not stated) in ten minutes. The cost of metal



SECTION OF HEATER, HANOVER.

is \$10 per car, and the current consumption is 1.75 kw. h. per hour, costing 2½ cents. This method of heating is sufficient for suburban runs, but has been discontinued provisionally in the center of the town because of the doors being opened so frequently.

The congress adopted the following resolution: It is desirable that the question of heating urban cars and the cars of local lines of railway should remain an order of the day of the Union of Tramways, and that the inquiry which has been commenced should be followed up for succeeding meetings. The affiliated societies are therefore invited to collect information on the question, and to make known their experiences.

OPERATION OF LIGHT RAILWAYS.

Mr. Ziffer, Vienna, presented a brief report on the question of operating local (or light) railways, whether they should be operated by the owners, or by the great railways to which they are feeders. But two replies were received, one from Belgium and one from the French General Tramway. In Belgium the system of the National Local Railway Co. leases some of its lines to the main railway companies, some to companies working several lines and some to companies working one line only. Mr. Ziffer concludes that it is difficult to make any general recommendations, and that each case must be considered on its own merits.

RATING OF ELECTRICAL MACHINERY.

Mr. Macloskie, Paris, submitted a report based upon the questions: Is it desirable to adopt a standard rating for generators and motors? On what should it be based? Can the same rating be applied to other electrical apparatus used on street railways?

The replies received from member companies were mostly in the affirmative. Mr. Macloskie's conclusion was that it was possible to fix a single method for rating all electrical apparatus used

on cars. While the maximum current capacity is the determining factor for controllers, circuit breakers, etc., such apparatus is always used with motors and could be given the same rating as the motor.

For a motor rating the combination of three things is suggested, the data to be written in the form C-A B, where

A is the current in multi-amperes to produce a tractive effort of 1 kilogram with a wheel 800 millimeters in diameter (31½ in.); A varies somewhat with the speed, increasing as the speed increases.

B is the current in amperes required to compensate for mechanical and electrical losses in the motor. For modern motors $B = A P \div 5,000$, where P is the weight in kilograms; this is only approximate for large motors.

C is the kilowatt input under which the motor will work for one hour with a temperature rise not exceeding 75 degrees C.

The question was remitted to the next congress.

BRAKES.

Mr. Monmerque reported upon new developments in brakes for street cars. Only four companies sent data, three were using air brakes and one hand brakes and electric brakes. There were no innovations to report, and it was recommended that this topic be kept open as one of the questions of the day, because of the great importance of efficient braking with mechanical traction.



SUBURBAN CAR SERVICE BETWEEN ATAMI AND YOSHIHOMA, JAPAN.

Mr. Monmerque added some information concerning the brakes required by the regulations in effect in Paris. The specification is that each car shall be equipped with brakes sufficiently powerful to make stop from 20 km. per hour in 20 m., the rail being dry. The General Omnibus Co. placed five brakes on each of its electric vehicles, of which three could be worked by the driver and the others by the conductor in the rear of the vehicle. The driver worked, first, a compressed air brake; second, a reversing brake, and third, a hand brake. The conductor at the back had an automatic compressed air brake and a hand brake. All these brakes were inspected for each vehicle, and the company invited the government engineers to assist them in its efforts. The brakes were tested every morning by the drivers who had to use them.

In the discussion reference was made to brake tests made at Hamburg for the German Tramway Union. These had been conducted under three different conditions—with sanded rails, with dry rails, and with wet rails—on automatic vehicles with two axles, with one motor and with two motors, as well as on vehicles with four axles and two motors. The vehicles running at 22 km. per hour stopped themselves at a distance of 9.5 m. to 10.80 m. in the first case, and 9.90 m. to 10.90 m. in the second case, and at 14 m.

to 20 m. in the third case. (1) The short circuit brakes gave the best results as emergency brakes, but they presented serious imperfections when constantly or partially used as regular service brakes. (2) The electro magnetic brakes gave good results, and can be recommended, especially in systems where heavy cars are used, or where the topographical conditions are very varied. (3) Compressed air brakes generally gave good results, but they should be further experimented with. (4) Other brakes have given results which are insufficient to warrant a pronouncement respecting them. Mr. Roehl, of the Hamburg Tramways, stated that the Hamburg tests had not been conclusive and the authorities had not been able to base requirements on them.

AN ODD JAPANESE CAR.

A tourist has discovered an interurban railway in Japan which is operated by man power. The line is seven miles long and connects the two coast towns of Atami and Yoshihoma in the province of Izie. The train crew comprises two men and a boy. The men, muscular coolies, push the car on the up-grades and jump on the rear platform for a ride when the car is coasting on a level or down-grade. The boy rides on the front platform and it is his duty to blow a horn as a warning at hills and curves, and to manip-

ulate the brakes. The fare, including tips for the crew, on this road is the equivalent of 21 cents per round trip.

A FRANCHISE BRINGS \$1.00.

On November 9th the commission of public works sold at public auction a franchise asked for by the Syracuse & Oneida Electric Railroad Co. The cost for advertising alone was \$504 and there were other expenses connected with the sale. A certified check for \$5,000 to guarantee that the purchaser would comply with the condition of the sale was required, and the terms were one-half cash down and one-half within 30 days. The attorney for the street railway company was the only bidder and the franchise was knocked down to him for \$1. He did not ask for the 30 days' time, but paid the purchase price all at once.

The Des Moines (Ia.) Street Railway Co. desires a franchise to enable it to haul freight between the brick yards and the railroad stations. A popular vote on the proposition is necessary but it was not submitted at the election.

THE WORK OF THE LIGHT RAILWAY COMMISSION.

A paper read at the Light Railway and Tramway Conference, London, by R. H. Scotter, C. E., M. I. Mech. E.

(The meaning of the terms used in this paper will be better understood by American readers after a reference to the article on "British Methods of Tramway Promotion" published in the "Review" for February, 1900, page 95.—Ed.)

When the history of the light railway movement in this country comes to be written, two points will come out very prominently, both illustrating the deeply seated need which existed and which called forth legislation on the matter. 1. The non-political, or, rather, dual political character of the agitation, both in and out of Parliament. 2. The rapidity with which the facilities offered by the Act were seized and taken advantage of all over the country.

Both these are very encouraging factors in the work we, both individually and as an association, have undertaken to perform. The progress of the movement has been especially encouraging to those who have tried for so many years to convince the people of this country that cheap and ready transit from producer to consumer is an absolute necessity if we are to maintain our position in the world's commerce. The fact that both political parties are convinced of this assures us a steady run in the future, unhampered by general elections, or a chance vote snatched at a moment of political or municipal excitement. It is with these facts before me that I venture to call the attention of the members of the Tramways and Light Railways Association to the work which the Light Railway Commission has accomplished, and to attempt to call attention to some of the good points and some of the weak points of the Light Railways Act, 1896. I consider this a most opportune moment to bring the matter forward, because the act itself expires next year, and I feel that this Association can hardly render a better service to the public and the tramways and light railway industry generally than by discussing freely the working of the act, and before Parliament undertakes its revision, by submitting to the proper quarters some practical suggestions for its improvement. With the formation of the Light Railway Commission, the distinct advance in procedure introduced by the Commissioners, and the popularity which has attended its work and results, we are all more or less familiar. The bold attempt at decentralization introduced by the act, by which duties hitherto performed by the House of Commons were delegated to the Board of Trade and Light Railway Commission, caused many old parliamentary heads to shake with ominous distrust. But after watching the movement very carefully, I, for one, must unhesitatingly state my opinion that the step which has been made in this direction is an unqualified success. At the local enquiry, much more real information is forthcoming than in the House of Commons committee room; and this, together with the unvarying kindly patience and courtesy extended to all by the Commissioners, has done much to interest public bodies and the public generally in light railways and tramways. This in its turn has influenced the large development in the movement, as it is useless for engineers to spend time and thought and money in framing schemes to meet local needs if the public are not also interested. The success of the movement is evidenced by the large number of applications made, and the length of mileage asked for by promoters under the Act of 1896. When it is stated that between December, 1896, and May 31, 1900, 3½ years, proposals, plans, and estimates, have been received by the Commission for a mileage of 2,800 miles, a length greater than the total mileage of Irish railways equal to the London & Northwestern and the London & Southwestern combined, and greater than our longest railway, the Great Western, and more than double the total mileage constructed in 30 years under the Tramways Act, the magnitude of the need becomes apparent. Nor is the need confined to one part of the country or to one class of district. Places as far distant and as dissimilar as Penzance, Wick, and Inverness, Colwyn Bay, Bedgelert, and Southend-on-Sea, have benefited by the Act, as well as the most thickly populated manufacturing centres in the North and Midlands of England, and in the metropolitan area.

During the years 1897-98-99, 1900, the commissioners have held 208 local enquiries into the merits of 247 schemes, the general result being that 55 per cent were granted; 24 per cent rejected; 14 per cent withdrawn; 7 per cent to be dealt with. At the present

time the account stands thus: 258 applications received for permission to construct 2,657¼ miles, and capital estimated at £17,889,000. Add to this 24 applications lodged May 31st for about 240 miles, and the total capital may be placed between 18 and 19 millions sterling. How have these orders been dealt with? Of the 258 received to end 1899—138 have been granted; 65 rejected; 36 withdrawn; 19 not dealt with or deferred. So that the commissioners start next month with an arrear of only about 7 per cent to pull up, and then they have 34 schemes presented last month to take in hand. So far for the local enquiry. When the Light Railway Commissioners have satisfied themselves that a scheme is a good one, we should think the Board of Trade, the commissioners, promoters, solicitors, and all concerned, would hurry matters forward, so that the line might come into existence as soon as possible. But such is not recent experience. Of the 138 fortunate schemes approved to date by the Light Railway Commissioners, 108, representing 112 schemes, have been sent to the Board of Trade for confirmation. Of this number, 77 have been confirmed, leaving 61 approved schemes at the present time awaiting confirmation. It will therefore be seen that very often considerable time elapses between the verdict given by the commissioners in favor of the scheme and the actual issue of the order. The average time between the deposit of the plans and the issue of the order is 16 months, or nearly double the time required for the obtaining of similar power per act of Parliament or provisional order. Of this period not more than six months elapses between deposit and local enquiry; hence on an average, ten months are occupied in the process of "settling the order." Here, then, appears to be one weak spot in the constitution of the Light Railway Commission. More help is required, in order that the order, when once approved, may be rapidly settled. This point has been brought out very forcibly by the commissioners in their reports. They say that "the time lost in traveling from place to place is very considerable, and the ever increasing number of applications will make it impossible to deal with them in the proper time unless some fresh arrangements are made." I would suggest that the attention of Parliament might be directed by this association to this point. That an increase of the number of commissioners might be suggested with a view of curtailing the time allowed between approval and confirmation, and also to granting some additional powers by which the commissioners might "spur on" both promoters, objectors and their solicitors to prompt action within a given time. At present valuable concessions are often hung about by frivolous objectors, who take advantage of this flaw in the act, and impose upon the courtesy of the commissioners, in order to obtain some real or fancied advantage. While they are thus hanging matters over public interest flags, the scheme is somewhat discredited, and the chances of local financial support minimized by the dog-in-the-manger policy adopted by objectors. If a "time limit" were imposed, no injustice would be done to either side, and many frivolous objectors would be brought to their senses. At present, Parliamentary procedure is "limited" by the length of the session; a bill must be passed or thrown out during that period. Under light railway procedure, much of the money saved by simplification is lost, either directly or indirectly, by the scheme "hanging fire" after it has been approved by the commissioners.

Two other facts have been noticed with the development of the light railway movement in this country, and I venture to think we who are so closely connected with the industry cannot afford to overlook them. In the early days of the movement, the existing railway companies gave no encouragement to the light railway movement. Wherever they could they opposed, taking refuge in that bogie "competition." We contend that a light railway, properly designed, cannot compete with an existing line, because the true function of a light railway is to continue into hitherto unremunerative districts the facilities offered by the railway. The light line can live where the "heavy" one would starve, because it has a smaller carcass to keep up. Railway companies, however, held aloof from the movement, no doubt because their managers very little understood that light railways would bring grist to their mill at little or no expense to themselves. When, however, it dawned upon them that the movement was one come to stay, they very cutely stood aside, nodding approval while other people found the money, and now their attitude is wholly different. Scarcely a railway in the country, I believe, maintains its former attitude. Several are promoting light railways themselves, and others are on the

watch to get their hands on the purchase clause. Herein a word of caution is necessary. We must not give away our birthright for a mess of pottage; 25, 30, or 42 years is short enough time for repayment of capital in an enterprise which is absolutely new, and which depends for its existence on crumbs which have been cast from the rich man's table. In other words, light railways and tramways tap districts hitherto untapped by railway companies because they would not "pay." They will rely largely upon creating new traffic. When it has been created and nursed, it will not be fair that our quasi-benevolent neighbors, the railway companies, should then swoop down and take all the profit. It is a point which must be taken into account and kept in mind when railway managers smile approval upon the promoters of a light railway. Mention of the purchase clause, too, reminds me of the altered attitude of local authorities, and the county councils in particular. I believe in many parts of the country, the local authorities, having their hand on the pulse of the people, are more keenly alive than any other class of the community to the importance of light railways and tramways. Their support has been loyally and heartily given to many good schemes. But here, again, a word of caution is necessary, so that too much may not be given away by promoters. Some county councils—I do not refer to the London County Council—are making efforts to obtain a clause in each light railway order promoted within their area, that at the expiration of 25 or 30 or 35 years, they shall have the power to purchase the undertaking if the local authorities fail to do so. Now this introduces a new element. We all know that the chances are very much against the whole of the local authorities agreeing to purchase. But when the county council comes along, with its respectability, its weight of influence, its massed debt, and its ability to borrow money, the chances of the light railway company having short notice to quit are enormously increased. I am quite aware this card has two faces, but that it must be considered as a new element in the game I think all will concede, and it must receive most careful attention when the act comes on for revision in 1901. Cannot this new bill be made to settle once for all the supposed difference between a light railway and a tramway? Cannot we insist upon the Tramway Act of 1870, being revised at the same time? I believe it will be possible to effect such a change, if we show ourselves desperately in earnest about the matter.

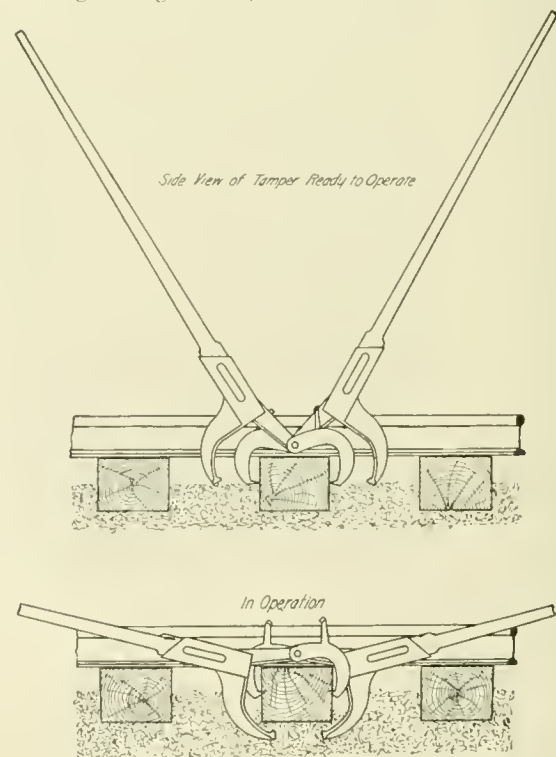
It will be noted that the Light Railway Commissioners themselves divided all applications into two classes: a. Light railways resembling ordinary railways; b. Lines which may be shortly described as road or street railways. By approving over 250 miles of the latter class, they have set their approval on the use of the ordinary roads of the country for the carriage of both passengers and goods traffic. I believe this practice to be a good one, and that it opens up an enormous field for electric traction, as steam locomotion is by no means suitable for this purpose. In many cases the roads have to be widened before the lines can be laid. I think this a wise and fair regulation, but I consider that provision should be made in the revised act to prevent promoters of light railways being mulcted when carrying out what is undoubtedly a public improvement. Wider roads are for the benefit of all the users of those roads. Hence when a railway or tramway company finds it cannot buy land for that purpose except at an abnormal rate, legislation should step in. Undoubtedly one great improvement which the act will allow to be carried out will be a solution of the housing problem. It can only be solved by allowing the worker to live away from congested town centres. To do this local authorities have tried and failed. If light railways and tramways accomplish this end, they should certainly feel that the local authorities will help them over the purchase question. In revising the Tramways Act our policy must be to get rid of Clause 43. Parliament has gone half way by allowing promoters of light railways a longer time than 21 years in which to recoup themselves. Here, again, tramways and light railways should be put on the same footing. But let us have Clause 43 abolished from the statute book forever. No clause has been so detrimental to the progress of electric traction. I presume, however, its funeral will be attended by our legal friends in full force. But no one else will be there! On the question of financing light railway and tramway undertakings, I will content myself with mentioning the fact that although Parliament some four years ago sanctioned the spending of £1,000,000 by way of loans at 3½ per cent for the purpose of helping the development of light railways, the concession is so hedged in by "provided thats" that so

far only half a dozen grants have been promised. I think that the future of the movement depends very largely upon the support private enterprise can give it, and in this direction I would point out that although investors have not given great attention to light railways, they will certainly become paying concerns in the future. The Board of Trade and the Light Railway Commissioners exercise such a rigid control over the financial side of the matter that over-capitalization is practically impossible. This should go far to induce local capital to be invested in an enterprise which depends for its success upon local opinion and local support, and is specially concerned with the development of the country through which it passes. In conclusion I trust the association will strengthen the hands of the Parliamentary committee by sending in full and practical information upon the working of the Light Railways Act, and endeavor, by discussion, by meetings, by agitation, to formulate and transmit to the proper authorities such practical amendments of both acts that we may obtain a light railways and tramways act which may enable us to make up for lost time, and bring electric and other systems of traction in this country up to their proper level.

I feel the Association, by pursuing this policy, will confer a benefit not only on the industry, but upon the whole community.

DEVICE FOR TAMPING TIES.

Mr. Frank P. Sheppard, of Boody, Ill., has devised a simple apparatus for tamping ties which he states has been tested to satisfaction with finely crushed rock, burned gumbo, and gravel ballast. From the illustration, for which we are indebted to the Railway and Engineering Review, it is seen that the device consists of



THE SHEPPARD TAMPER.

two hooks, similar to ice-hooks, for gripping the tie, and two tamping heads with sockets into which wooden handles are thrust for operating. It is presumed that three men are required, one at each handle and one to shovel the ballast in front of the tamping heads.

CINCINNATI, NEWPORT AND COVINGTON.

The condensed statement sent us by Mr. J. C. Ernst, president of the Cincinnati, Newport & Covington Railway Co., shows for the month of October the company had gross receipts of \$66,640; operating expenses, \$27,167; tolls, taxes, damages, etc., \$12,479; net profit, \$26,994. For the 10 months of the current year the net profit is \$266,158 as against \$229,830 for the corresponding period in 1899.

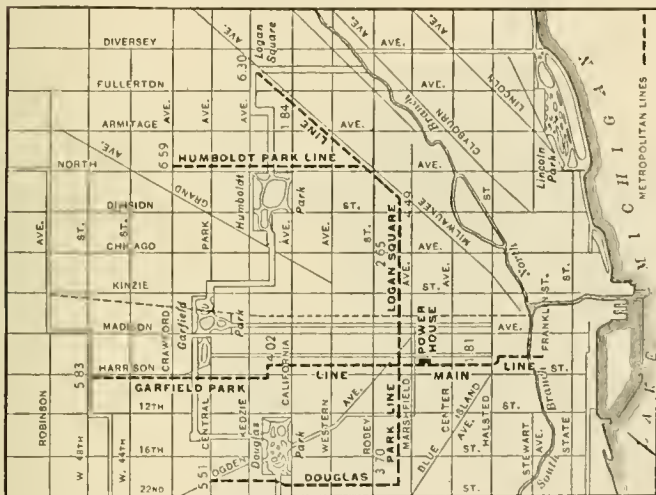
EXTRA TRAINS ON CHICAGO METROPOLITAN.

CAR SANITATION.

We have at various times commented on the increase of traffic that came to the Chicago elevated roads after the opening of the Union Loop in 1897, which gave these roads good terminal facilities in the business district. During the rush hours in the evening the trains are crowded by the time they leave the loop and thus passengers at intermediate stations often find it necessary to wait for several trains before one comes that can accommodate them.

The Metropolitan Elevated found that a large number of passengers delivered at its Canal St. station (this is not shown on the map, but it lies just west of the river) between 6:30 and 8:30 a. m. wished to start home between 5:30 and 6:15 p. m., thus greatly increasing the density of traffic in the evening. A count showed that only two-thirds as many persons were carried from this station as were delivered there and it was decided to try and regain the lost traffic by putting on additional "shuttle" trains.

The main line has four tracks and extends from the loop to Marshfield; one of the two platforms at Canal St. was extended and a stub track laid between the regular tracks, with switches to each of them. Ten extra trains of three cars each have been put in service during rush hours and two of these make two trips, giving 12 extra trains. They are run on the Humboldt Park and Logan Square branches with no stops on the main line between Marshfield Ave. and Halsted St., and are put in between the regular trains.



The method is to switch one of the shuttle trains onto the stub track at Canal St. where it is loaded and then let it follow one of the regular trains out. These 12 trains arrive at Canal St. between the hours of 6:25 and 8:15 a. m. and leave this station between 5:15 and 6:20 p. m. Since the additional service was put in the evening traffic has increased to the normal.

Many of the persons working in the manufacturing districts near the Canal St. and the Halsted St. stations live near the northwestern terminals of the Metropolitan and the shuttle trains also relieve the regular trains of the large transfer at Marshfield Ave. from the south to the north branches.

The Metropolitan has recently issued a 16-page pamphlet descriptive of the line and pointing out the advantages of the West Side as a residence district. The company is making every effort to accommodate patrons, as the following paragraph will show:

"All stations on the system have free wheel racks for passengers who like to ride to and from trains on bicycles; and the terminal stations have special rooms for storing wheels. If a woman starts down town with a baby she may check the baby carriage at the station to await her return. The stations contain toilet rooms, cigar and news stands and waiting rooms, the approach of trains being indicated by bell signals, so that in stormy weather passengers need not wait for trains on open platforms."

The statement of the Consolidated Traction Co., Pittsburg, for the month of September, 1900, shows: Gross earnings from operation, \$247,810; net earnings from operation, \$142,871; total net earnings, \$170,955; surplus after deducting fixed charges and dividends on preferred stock, \$20,406.

Dr. J. N. Hurty, secretary of the State Board of Health of Indiana, presented a paper on "Passenger Coach Sanitation" at the thirteenth annual meeting of the International Association of Railway Surgeons, in which he discussed the subject with particular reference to the coaches of steam railroads. Those portions concerning cleanliness and disinfecting are of interest to street railways also, and we make the following extracts:

The interior of coaches should be as plain as possible. Panels, angles, carvings, bead and channel work are costly, are not necessary for ornament, make cleaning difficult and are great catchers of dirt and filth. Window frames and sills should be rounding, the car sides perfectly smooth, the seat frames should be perfectly plain, the seat arms never upholstered, but on the contrary made of hard polished wood or enameled iron, and round, simple and plain. The seat supports next the aisle should be simple, round, enameled iron posts. Curved, fluted and elaborate supports should not be thought of, and it would be well to do away with foot-rests, for they are not really necessary, favor dirt accumulation, and are a hindrance to cleaning. The floors should be hardwood, well filled, and kept so.

There is no reason why duplicate cane seats and backs could not be provided for the hot months. Slats or blinds should never be used at the windows. Only smooth, impervious material on automatic rollers should be tolerated. The plain, uncarved interior need not be without ornament, for painted panels, stenciling and frescoing would take their place to relieve the eye.

Being sanitarily constructed as described, a coach on arrival at a cleaning station should have the bottoms and backs of seats taken out and immediately placed in a steam sterilizer of sufficient capacity where they would be thoroughly sterilized and afterward dusted by means of the air blast. Or, ordinarily, they might be dusted first and then sterilized. If the seats and backs were kept in duplicate, clean sterilized seats could always be at hand. As soon as this first cleaning step has been taken, the floor of the car should be lightly sprinkled with water containing a very small amount of some efficient disinfectant (formaldehyde preferred) and then swept. Scrubbing with soap and water should then follow, the arms of the seats and all surfaces which need it should be washed and wiped and all dust taken up with damp cloths.

If a car thus cleaned be closed and allowed to stand a while in the sun, upon opening offensive animal odors are in strong evidence, hence the necessity of disinfection. For car disinfection Mr. W. Garstang, superintendent of motive power of the Big Four, has invented a giant spray. This is a strong copper can with a capacity of one gallon, provided with an atomizing tube of proper size. It is attached to the air hose, and after filling with formaldehyde the workman enters the car and proceeds to the opposite end, dragging the hose after him. He now quickly backs out, spraying the chemical onto the floor, side walls, window sills, into corners, and onto bottoms and backs of seats. The air pressure is so strong and the atomizing tube so well adjusted, that the formaldehyde is driven forth more as a nebula than a spray. By means of this nebulizing the formaldehyde gas is set free and penetrates every part of the car, effecting complete disinfection. A car thus treated does not manifest animal odors upon standing closed in the hot sun.

TAXING TEXAS CORPORATIONS.

The District Court of Dallas County, Texas, has upheld the legality of a tax on franchises. The assessors in several counties have placed the assessments of corporations at high figures on the theory that the franchise enhances the value of the corporation's tangible property and is therefore taxable as part of the whole property. There is no state law directing the assessment of franchises and the assessor's action is said to have been suggested by speculators who have contracts with the counties for collecting the tax. In Dallas county alone the franchise assessments of all corporations amounts to \$20,000,000.

It is said that the city of Lake Charles, La., offers exceptional inducements to the promoters of street railways. A road is desired to carry freight from the rice fields to the shipping station in Lake Charles.

AUTOMOBILE EMERGENCY WAGONS.

The rapid strides made during the last two years in the developing of the automobile warrants the assumption that the self-propelled vehicle has come to stay, and the builders of these vehicles, encouraged by the success that has thus far attended their efforts, are already looking for new fields to conquer. One of the latest uses to which the automobile is being put in as a substitute for the horse drawn emergency wagon for street railway repair work. Experiments have been carried on along this line during the past few months on the Consolidated Traction Co.'s system at Pittsburgh, on the Columbus (O.) Ry., at Washington, D. C., and at other places, but with the exception of the work at Washington, these experiments have not resulted in anything tangible as yet.

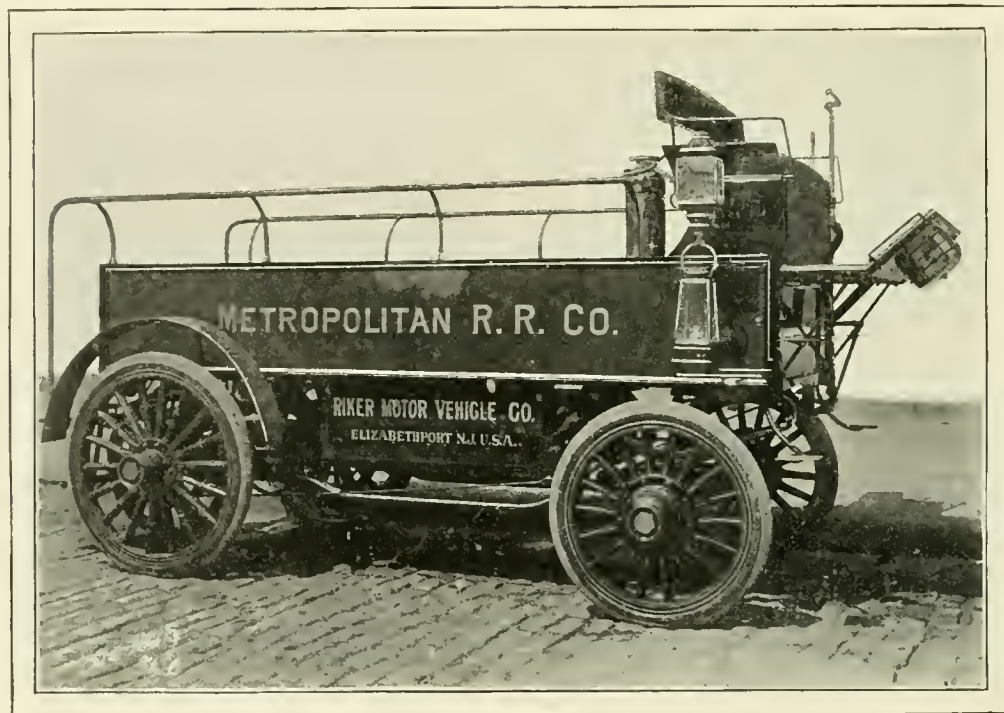
The possibilities in this direction however are worthy of close attention on the part of managers. The same arguments that applied to the substitution of electric traction for horses on street railway lines will apply in this case. Horse power is always expensive at the best and any mechanical substitute is, as a general proposition, desirable. The electric vehicle is readily controlled, can be backed, turned or stopped at will, and is capable of fast speeds, especially in crowded streets. Furthermore the current for

at a speed of 12 miles per hour, and is guaranteed to climb a 15 per cent grade. As the vehicle is equipped with a rheostat for charging anywhere on the line, the mileage radius is practically unlimited, and the repair crew can answer any number of calls in rapid succession. Two powerful band brakes, sufficient to stop the vehicle within its length when going at full speed are furnished, and to prevent any possibility of the wheels slipping upon sudden application of the brakes in smooth, slippery places, two sand boxes are installed in the body of the wagon, and sand can be caused to flow to the tread of the driving wheels by pressing a button in the foot board.

The wagon is equipped with a sledge hammer, axe, pike, machine hammer, Stilson wrench, two monkey wrenches, and an A ladder, 9 ft. 6 in. in height, the top of which, when in place, stands 13 ft. 6 in. from the ground. The crew consists of three men. Complete, the wagon weighs 7,000 lb. and has a normal carrying capacity of 4,500 lb.

The body is painted a Paris green, the side rises and running gear a Brewster green, the moldings and battery compartment in black. Striping consists of two ¼-in. lines of gold. On the side panel the company's name appears in plain gold letters.

A hand rail runs the full length of the body, from seat to the



AUTOMOBILE EMERGENCY WAGON, WASHINGTON, D. C.

the batteries can be taken from the line at any point without any appreciable effect on the power station load.

The principal difficulties encountered in designing an electric emergency wagon are of course the scarcity of good storage batteries combining efficiency with light weight, and the severity of the service on the gears. But these obstacles are not unsurmountable and we look for a more extended use of the electromobile repair wagon in the not distant future.

Through the courtesy of Mr. H. L. Hart, until recently general superintendent of the Washington (D. C.) Traction & Electric Co., we are able to publish the accompanying illustration and description of an automobile repair wagon built by the Riker Motor Vehicle Co., of Elizabethport, N. J., for the Metropolitan R. R., of Washington. The vehicle has been in service several months and Mr. Hart states its operation has been highly satisfactory to the management.

The running gear is of the Riker flexible type and the wagon is equipped with two 4-h. p. motors, guaranteed to stand without injury 100 per cent overload for one hour.

The battery equipment consists of 44 cells of 13 plates each, having a total capacity of 200 ampere hours. This electrical equipment will propel the vehicle 30 miles over level asphalt or macadam.

steps. Hand lamps and electric side lamps are hung on either side of the seat. All metal trimmings are of brass.

One feature that is of special convenience to the workmen, and greatly facilitates their work, is the combination volt and ammeter, placed in a convenient position on the foot board. This tells at all times the pressure across the cells, the rate of discharge and the rate of charge when batteries are being renewed.

In regard to signaling and dispatching Mr. Hart states that the hurry-up wagon is called out so seldom, the company does not think it necessary to have any special signal system of its own. When the wagon is wanted an employe calls the station where it is located by the city telephone.

ELECTRIC RAILWAY STATISTICS.

The statistician of the Department of Agriculture has undertaken to collect data concerning electric and other street railways of the United States, with special reference to their extension into the rural districts and the results of such extension. Information concerning the freight and express business is sought, including amount of traffic, rates and effect on traffic of steam roads.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ADMISSIONS MADE BY CONDUCTOR TO THIRD PARTIES AFTER ACCIDENT.

Kay v. Metropolitan Street Railway Co. (N. Y.), 57 N. E. Rep. 751. June 19, 1900.

A conductor cannot bind or affect the company, the court of appeals of New York holds, by any admissions or declarations, after an accident, made to third parties. They are admissible in evidence only to contradict or impeach him as a witness for the company in case he testifies to anything inconsistent with them.

STREET RAILROAD IS TAXABLE AS REAL ESTATE.

State (Newark & Hackensack Traction Co., Prosecutor), v. Mayor and Council of the Borough of North Arlington (N. J.), 46 Atl. Rep. 568. June 11, 1900.

An electric street railroad, the supreme court of New Jersey holds, is real estate, within the tax laws. But a mistake of an assessor in listing as personal property described in terms showing it to be real estate, it holds, may be corrected, even after the duplicate has been delivered to the collector.

RIGHT TO PLEAD SETTLEMENT BY PLAINTIFF.

Zaitz v. Metropolitan Street Railway Co. (N. Y.), 65 N. Y. Supp. 395. June 22, 1900.

Where the plaintiff in an action brought to recover damages for personal injuries settles, unbeknown to his attorney, with the defendant, after issue is joined, and executes a general release, the appellate division, first department, of the supreme court of New York holds, should be allowed, on application, to set up in a supplemental answer the settlement of the action and the release by the defendant, notwithstanding that the plaintiff's attorney may have given notice of a lien upon the cause of action, and the plaintiff may not be pecuniarily responsible.

REQUIRES NOTICE OF LITIGATION TO BE FILED TO CONSTRUCTIVELY BIND PURCHASERS.

Detroit Citizens' Street Railway Co. v. City of Detroit (Mich.), 83 N. W. Rep. 104. June 5, 1900.

The right to maintain and operate a street railway upon a street, the supreme court of Michigan holds, is an interest in land, to which section 441 of the Compiled Laws of Michigan is applicable, which requires the filing for record of a notice of the pendency of suit to render the filing of a bill constructive notice of the proceedings to any purchaser of real estate, in consequence of which it does not consider a company acquiring such right by purchase pending litigation thereover bound by a decree entered in the suit, no such notice having been filed for record, and actual notice at the time of purchase not having been proved.

DAMAGES ALLOWED FOR LOCATION OF TURNPIKE IN FRONT OF PROPERTY.

Louisville Railway Co. v. Foster (Ky.), 57 S. W. Rep. 480. June 15, 1900.

One of the provisions of the constitution of the state of Kentucky is that, "municipal and other corporations and individuals invested with the privilege of taking private property for public use shall make just compensation for property taken, injured or destroyed by them." In view of this, while the owner of city property fronting on a street must submit to all those noises, smells and disturbances that are usual in city life, including the use of the highway by a street railway, in so far as they are reasonably incidental to the operation of a street railway in a city, and borne by the public generally, nevertheless such owner, the court of appeals of Kentucky holds, can recover for any substantial injury to his property arising from the location or operation of a turntable or cars that is caused by such noises, smells, and disturb-

ances as are not fairly incidental to the usual operation of such a street railway, and borne by the property owners generally along the line.

WHEN EXPRESS WAGON NECESSARILY OVERLAPS TRACK WHILE BEING UNLOADED

Holzman v. Metropolitan Street Railway Co. (N. Y.), 64 N. Y. Supp. 1120. May 28, 1900.

At a place where the space between the curb and the track was very narrow, an expressman was on his wagon, unloading it, which he could not do unless it overlapped a part of the public highway occupied by the track, when a car ran against the wagon, throwing him to the ground and seriously injuring him. In affirming a judgment in his favor for damages, the city court of New York, general term, says that if, as stated, the wagon was partially over and upon its tracks, the street railway company's driver being aware of that fact, it was his duty to notify the expressman of his wish to pass. Then the expressman had the legal right to unload his wagon, taking only a reasonable time to do so; and, until the lapse of such a period, the company's driver should not have attempted to pass. The company, it says, had the right to run its cars, but the expressman had also the right to pursue his business as an expressman. Each one was bound to exercise his respective rights in an ordinarily careful and prudent manner. To this the court adds that the company's driver evidently thought he could pass, in safety, the expressman's wagon. In so thinking he erred, and the consequences of such error must be borne by the company.

CARE REQUIRED IN EJECTING TRESPASSING BOY FROM CAR.

Nussbaum v. Louisville Railway Co. (Ky.) 57 S. W. Rep. 248. May 30, 1900.

The evidence was conflicting, and the issue was whether the boy, nine years of age, to recover for whose death this action was brought, lost his life by reason of the negligence or wrongful act of the motorman. The boy had jumped onto the car to ride to the turntable, and, in affirming a judgment in favor of the company, the court of appeals of Kentucky holds that it was proper for the trial judge to tell the jury that the motorman had the right to eject the boy from the car if he used proper care in doing so. The instruction given the jury was that, if the motorman pushed the boy from the platform of the car into the street, and under or immediately in front of a passing wagon, whereby he was unavoidably run over, they should find for the plaintiff; also, that it was the duty of the motorman to make him get off the car by warning him to do so, or, if necessary, by using such force as was reasonably necessary to make him get off, but that in using force to eject the boy, if he did eject him by force, it was the duty of the motorman to exercise ordinary care to prevent injuring him or causing him to be injured by such ejection; and, if he failed to use such care, and by reason of this the boy was injured, the jury should find for the plaintiff. This, the court of appeals pronounces a fair statement of the law of the case.

SEPARATION OF COLORED FROM WHITE PASSENGERS ON ONE LINE ONLY IS REASONABLE.

Bowie v. Birmingham Railway & Electric Co. (Ala.), 27 So. Rep. 1016. Apr. 12, 1900.

A rule or regulation of a street railway company requiring white passengers to occupy seats in one portion of the cars operated by it on a certain line of its road, and negroes to occupy seats in the other portion, the supreme court of Alabama holds reasonable. The principle upon which it sustains the reasonableness of the rule it says, is that the carrier's right of property in the means of the conveyance and the public interest is best subserved by a separation of negro and white passengers; that their separation tends to secure order, promote comfort, preserve the peace and maintain

the rights of both carrier and passengers. Nor does it consider it of any consequence in this connection that the company operates other lines, and no such regulation is enforced by it upon them. The fact that it does not exercise the right to establish and enforce such a regulation upon its other lines, the court says, affords no reason for saying that the regulation established and enforced on the line where it is, is unreasonable, or that the company has no right to establish such a rule. As to whether the reasonableness of such a rule is a mixed question of law and fact, or purely a question of law for the court, the supreme court takes the latter view, saying that when the rule is established by the evidence, and its violation shown by a passenger, undisputably, it is a question of law for the court.

CONSENT NEEDED TO CHANGE LOCATION OF TRACK BUT NOT TO TAKE IT UP.

Borough of Shamokin v. Shamokin & Mt. Carmel Electric Railway Co. (Pa.), 46 Atl. Rep. 382. May 23, 1900.

This was a suit to enjoin a proposed change in the tracks of the railway company, which change, it appeared, would greatly improve the street and benefit the property owners, their tenants, and all persons having occasion to drive on it. The contemplated change was the taking up of the south track and the moving of the north one to the center of the street. The ordinance granting the right of way, which was the contract between the parties, had a provision reading that, the "railway track, switches, turnouts and sidings are in all cases to be located under the supervision of the committee on streets and highways." And, under this contract, the supreme court of Pennsylvania holds that the company could not change the location of the north track to the center of the street, without the consent of the committee on streets and highways; and that it was properly enjoined from doing so. But it does not consider that anything in the contract bound the company to keep the south track in place, but that could be taken up and removed from the street. Nor does it consider that this was changed by language in the ordinance to the effect that the track should be laid to grade; should strictly conform to existing grades, unless consent be given to their change or alteration, in which event it should conform to altered grades; that the company should take up and change so as to conform to such grades as might be fixed by the authorities, etc.

VALIDITY OF CONSENTS PROCURED IN ADVANCE BY PROMOTERS.

Geneva & Waterloo Railway Co. v. New York Central & Hudson River Railroad Co. (N. Y.), 57 N. E. Rep. 498. June 5, 1900.

It is common practice, and perchance common prudence, the court of appeals of New York says, for the projectors of a railroad to employ parties in advance to procure rights of way, consents, or like privileges to be used after the incorporation. And the court holds that the fact that the railroad acquires such rights through an intermediary by assignment, instead of directly from the property owners themselves, does not affect their validity. What the constitution and the statute require in such cases, it declares, is simply the consent of the property owner that the highway through his property may be burdened with another easement in the form of a railroad, and when such consent is fairly and in good faith given to one interested in the railroad, and by him transferred to the corporation, the court declares that it is unable to see why it should not be treated and considered as valid as if it ran in terms to the railroad itself. Especially does it hold that it is not open to another railroad, for the purpose of defeating an application of a street railroad to cross its tracks, to impeach such consents as invalid. If there is any reason whatever to question the validity of such consents, that right, it maintains, should be limited to the state itself or to the property owners affected. On the other hand, when it appears that consents were neither given nor received in good faith for the purpose of facilitating the construction of a railroad, but for some other purpose, not contemplated by the statute, the court suggests that it might be timely to raise the point that it would be contrary to public policy and to the spirit of the law to allow individuals to procure consents to themselves, and then, as they might, sell them to the highest bidder.

MAY ADOPT REASONABLE REGULATIONS AS TO PAS- SENGERS CARRYING LIVE ANIMALS.

Daniel v. North Jersey Street Railway Co. (N. J.), 46 Atl. Rep. 625. June 18, 1900.

In an action for damages against a corporation operating a street railway for the refusal of one of its conductors to accept a passenger carrying in his arms a live goat, it is error, the court of errors and appeals of New Jersey holds, to submit to the jury the reasonableness of a regulation of the company forbidding the carrying of live animals in the cars. The reasonableness of such a regulation, it holds, is for the trial court. But whether, as a class, questions as to the reasonableness of corporate regulations are for the jury, to be taken from it only when deemed to be free from doubt, or whether they are primarily court questions, to be left to juries only when some other standard than that of reasonableness enters into the test of corporate duty, is a point upon which the majority of the court were not agreed. Moreover, the court avoids passing, in this case, upon the question of whether, if the regulation in question was a reasonable one, the company before enforcing it, must call the attention of the passenger to it. A majority of the court, however, it is stated, were of the opinion that the company might lawfully adopt some regulation with respect to the carrying of animals on its cars, and, as above announced, that the reasonableness of such a rule would be a question for the trial court, and not for the jury.

NEWSBOY NOT A PASSENGER.

Raming v. Metropolitan Street Railway Co. (Mo.), 57 S. W. Rep. 268. June 4, 1900.

It was alleged that the plaintiff, at the time a boy nine years of age, boarded one of the defendant's cars "for the purpose of selling papers to passengers, and with the intention of becoming a passenger thereon." But the words, "and with the intention of becoming a passenger thereon," the supreme court of Missouri holds, were by no means equivalent to an averment that the plaintiff did become a passenger on the car. With mere intention, unconnected with overt act or outward manifestation, the law, it declares, has no concern. Hence, there was no foundation laid in affirmative allegation that plaintiff was a passenger.

But, granting that the plaintiff was a passenger so far as mere allegation was concerned, still, the court says, there was no evidence to support it. He was simply a newsboy plying his vocation. He evidently did not intend nor expect to pay fare. According to his own story, he jumped on the car when in full motion, to sell papers, intending to jump off again, and to pay fare "if the conductor asked him." The conductor did not see him, and (according to the boy's story) the gripman tried at once to push him off. There was nothing to show that the gripman had any authority to grant the plaintiff permission to ride, or to refuse him permission, and therefore, the court holds, no contractual relation, either express or implied, was entered into by the plaintiff when he stepped upon and ran along the footboard of the car, attempting to sell his papers.

The court then quotes the following from what it states Judge Valliant, speaking for division No. 1, in the still unreported case of Padgett v. Moll, forcibly said concerning newsboys who sell newspapers on street cars. "But a newsboy jumping on and off a moving street car to sell his newspapers, not hailing to stop the car to receive him, nor signaling to stop to allow him to alight, not asking nor receiving permission, either express or tacit, not asking or waiting for leave or license, but jumping on and off under circumstances that clearly indicate no purpose to pay fare, and no aim to be transported, but only to avail himself of the presence of persons on the car likely to buy his papers, is in no sense a passenger, and the carrier is not under obligation to observe towards him the same degree of care that the law requires to be observed towards a person in the hands of the carrier to be transported."

Indeed, the supreme court goes on to say, in this, the Raming case, after making this quotation (and here it is the full bench speaking), that it might go further than the language just used in the quotation; for it is a matter of common knowledge, and therefore the court can take judicial notice of it, that a newsboy who hops on a car while at full speed, tries to sell papers, and then

hops off again while the car is in rapid motion, is in no sense, either in fact or intention or law, a passenger. If a newsboy is a passenger, then he has a right to hail a car in the middle of a block for the purpose of selling papers therein; stop it in full motion; get on; sell his papers; pay no fare; and then signal again, stop the car and get off. If this were the law, it is easy, it thinks, to see that street cars would be at the mercy of newsboys, and could not be practically operated.

Then, if the plaintiff was not a passenger, the defendant company the court holds, could only become liable by reason of the fact that the alleged acts of the gripman were within the scope of his duties. But there was no such allegation in the petition, and no evidence on the point, and, this being the case, no recovery, the court holds, could be had on such ground, absent such allegation and absent such evidence.

But no recovery could be had on that ground in this action, the court adds, because it was bottomed in theory on the fact of the plaintiff being a passenger, and on that theory it was submitted to the jury.

POWER OF CITY TO ORDER SUBSTITUTION OF GROOVED FOR OTHER RAILS.

Washington, Alexandria & Mt. Vernon Railway Co. v. City Council of Alexandria (Va.), 36 S. E. Rep. 385. June 14, 1900.

Six years after the construction, with the consent of the city council, of this railway over certain streets, using rails of an improved pattern, known as the "tram girder rail," such as were then commonly in use, and as are still used by many street railways, the city council ordered that a portion of one of the principal thoroughfares of the city should, for the distance of one square, be repaved with vitrified brick, on a six-inch concrete base. On the same date, it by another ordinance directed the company to put down, on the said square, rails to be approved by the committee on streets, and to grade and pave on the space between the railway tracks, and two feet on each side thereof, in a similar manner. Two months later, by another ordinance, it directed the company to take up its rails on that square, and to lay in their stead a grooved rail, with a groove not exceeding $1\frac{1}{8}$ inches in depth, and with a tram not lower than $1\frac{1}{4}$ inches below the head, and with the groove of the outline shown by the full lines of the drawing attached to said ordinance.

The company failing to obey, the city council presented its petition for a writ of mandamus to compel a compliance with the requirements of said ordinance, alleging, among other things, that a grooved rail was a necessary incident to the needed improvement of the street. The jury called to determine certain questions in the case, however, found that the rails in use would not obstruct the ordinary use of the street when the proposed improvement was made as set out in the first ordinance mentioned. It also found that the rails in use were of approved pattern; that is, of such merit and excellence, and adaptation for the purposes for which they were used, as should, in the opinion of the jury, be approved by the city authorities. It also found that the substitution of the grooved rail as proposed by the city was not a necessary incident to the paving and improving of the street with vitrified brick. Nevertheless, when the cause came on to be heard after the jury had rendered its verdict on the issues submitted to it, the circuit court rendered a judgment for the city council, and awarded the writ of mandamus.

This judgment the supreme court of appeals of Virginia affirms. It says that it might very well be that the jury was justified in all of its findings on the evidence submitted to it, and that the court might also have been of the same opinion upon the evidence. But the real issue to be considered was this: Was the ordinance of the city a reasonable one, regard being had to all the circumstances of the case, or did the city council, in passing the ordinance, act capriciously and arbitrarily? Its charter and the general law conferring upon it ample power to control and regulate the laying out, repair and use of its streets. On the question of reasonableness, it contents itself with stating that the evidence clearly showed that there was no fraud in the passage of the ordinance; that the city did not act capriciously, but in accordance with what it deemed best to promote the interests confided to it; that the action was urged upon it by many of its citizens; and that the rail adopted was that in use by the city of Washington, as required by an act of

Congress. Besides, it takes into account that representatives of the company were invited to attend a meeting of the committee on streets and the city engineer, where the whole subject was carefully considered, and as a result of their deliberations the engineer and committee recommended the proposed rail to the city council, and the latter thereupon passed the ordinance requiring its adoption. In view of these facts, it is manifest, it says, that the company did not overcome the presumption in favor of the reasonableness of the ordinance which it was ordered to obey; that it had not shown that it was passed arbitrarily or capriciously; and that the judgment of the circuit court must be affirmed.

NARROW STREETS AND BRIDGE AND OTHER TRACKS NEAR RENDER ORDER FOR EXTENSION UNREASONABLE.

Woonsocket Street Railway Co. v. City of Woonsocket (R. I.), 46 Atl. Rep. 272. Apr. 25, 1900.

Chapter 77, of the General Laws of Rhode Island, is entitled "Of Franchises in Highways." Section 5 thereof provides that "the use and enjoyment of all rights and franchises granted under the provisions of this chapter shall be subject to such reasonable rules and regulations and orders, controlling the extent and quality of construction and service to be maintained by the corporation to which such rights are granted, and prescribing the location and arrangement of its tracks, poles, wires, or conduits, and their appurtenances, as are, or may be from time to time, enacted by the town or city councils," etc. This section, the supreme court of Rhode Island says, is evidently intended to give a large discretion to town and city councils, with which the court would not be disposed to interfere upon slight grounds. But in this case, owing to the narrowness of some of the streets through which the city of Woonsocket ordered the complainant to extend its road, the narrow bridge on one of said streets, and also the narrowness of a portion of the proposed layout to existing tracks, the court is of the opinion, and holds, that the order in question of the city was unreasonable.

THINKS ESTABLISHED CUSTOM OF TURNING OUT FOR CARS SHOULD HAVE FORCE OF LAW.

Helber v. Spokane Street Railway Co. (Wash.), 61 Pac. Rep. 40. Apr. 4, 1900.

The supreme court of Washington here says that, while it is true, as it and many other courts have frequently said, that street cars have not an absolute right of way through the streets, and that pedestrians and others have an equal right to travel on or across any street, yet this latter right must be exercised reasonably, and is qualified by the fact that cars run on fixed tracks, and, in the nature of things, cannot accommodate themselves as readily to emergencies, and cannot even stop with the same promptness or facility, as can pedestrians or drivers of free vehicles, who can instantly stop, or turn to right or left, and avoid a collision with an advancing car. The universal knowledge of this fact, it goes on to declare, has established a custom which ought in justice to have the force of law, making it the duty of the party who can most easily and readily adjust himself to the exigencies of the case to do so, and to stop or turn to avoid a collision; and the motorman has the right to presume that such duty will be performed. Of course, it adds, if he (the motorman) discovers, or ought, as a prudent person, to discover, that it will not be performed, his duty is to stop in any event; otherwise, he will subject himself and his company to the charge of willful negligence. Furthermore, the court says, with reference to the other party's duty, that, while extraordinary mental alertness is not commanded by the law, common prudence is.

LIABILITY FOR INJURY TO BICYCLISTS OR OTHERS CAUSED BY DEFECTS IN ROADBED.

Laredo Electric & Railway Co. v. Hamilton (Tex.), 56 S. W. Rep. 968. Apr. 18, 1900. Rehearing denied May 16, 1900.

The court of civil appeals of Texas holds the following to be correct propositions of law: (1) The duty of a street railway company to repair the streets which it occupies, or, more definitely, that portion of the street upon which its tracks are laid, is a general one, requiring no legislative act or direct agreement to sup-

port it, and such a company is bound to use reasonable care and diligence to keep the space which it actually occupies in a safe condition for ordinary travel, failing in which, it must answer for the consequences. (2) A street railway company is bound to keep its entire roadbed, to the end of its ties and its crossings, in repair, so as not to obstruct travel across its road, or longitudinally upon it; and this duty is a continuing one, irrespective of whether the charter expressly requires it or not. (3) The fact that the city may have authorized the company to erect poles, stretch wires, and lay rails, ties, etc., on the streets and plazas of the city, without imposing terms and conditions by ordinance or by contract, does not discharge the company from the duties it owes to the public; nor does the fact that the party injured thereby may have a cause of action against the city relieve the company from responsibility for the condition of its line.

Municipal corporations are bound to use reasonable skill and diligence in making the streets and sidewalks safe and convenient for travel. And where the roadbed of a street railway company is constructed in the streets of the city, the railway company, the court holds, must use the same skill and diligence as to the part of the street occupied by its road.

In legal contemplation, the bicycle, the court goes on to state, is to be regarded as a vehicle, in relation to its use on the highway, and it is entitled to the same privileges and is subject to the same burdens as other vehicles. And it holds that if a bicyclist, while riding his wheel on a street where such vehicles are commonly used, is injured by being thrown from his bicycle on account of a defect in the street, and such defect was caused by the failure of the city or street railway company upon which the obligation rests to use reasonable care and diligence in keeping that portion of the street safe and convenient for ordinary travel, the city or company upon which such duty rests is responsible in damages to such bicyclist for any injury sustained by him.

In short, it being the duty of a street railway company to use reasonable care and diligence to keep that part of the street upon which its road is constructed in a safe condition for ordinary travel, the court holds that, if it fails to discharge this duty, and on account of this failure a person is injured while riding along the street on a vehicle such as is ordinarily used for travel thereon, the company will be liable for his injuries, if he is not guilty of contributory negligence, whether such vehicle is a wagon, carriage, bicycle, or other in ordinary use.

POWER OF CITY WHERE IT HAS RESERVED RIGHT OF CONDEMNATION FOR NEW COMPANIES.

Mercantile Trust & Deposit Co. v. Collins Park & Belt Railroad Co. (U. S. C. C.), 101 Fed. Rep. 347. Apr. 30, 1900.

The right to take the track of one company for the use of another, the United States circuit court, northern district of Georgia holds, must be reserved in the grant, or exist otherwise by contract, or such taking must be by the exercise of the state's power of eminent domain through the legislature of the state. Concededly, a city has no power of eminent domain in the matter where it has no grant from the legislature to condemn the track of one street railway company for the use of another.

The right to consent to the use of the streets for street railway purposes, as for example under the constitution of the state of Georgia, which provides that "the general assembly shall not authorize the construction of any street passenger railway within the limits of an incorporated town or city without the consent of the corporate authorities," the court holds, embraces necessarily the right to consent conditionally,—to consent with limitations, restrictions, and reservations. Of course, the city can in such a case, withhold its consent entirely. Wherefore, there can be no doubt of its right, the court declares, to withhold partially or to limit the grant. For instance, the city may, the court holds, reserve the right to condemn such portions of the lines, not exceeding five blocks, as may be necessary for the allowing of other street car companies to enter the central portion of the city, upon payment of just compensation to the company.

Then, in construing such a reservation as that just mentioned, the court holds that the city reserved the right to condemn the number of blocks referred to within what might be fairly considered the central portion of the city, adding that these blocks were to be used for the purpose of allowing any new company to enter

the central portion of the city, and not to approach it, or to run in such a way that it might ultimately reach it.

Again, the court holds that, the necessity for such condemnation being necessary to be determined, under such a reservation, before the right reserved could be exercised, the necessity could be determined by the city, notwithstanding that it made the reservation, and was to that extent a party to the contract of which the reservation was a part. But it says that a wholly unreasonable exercise of the reserved power would, in a proper case, be enjoined.

Nor does the court consider that a right to condemn so reserved by a city could only be exercised by it, but holds that it could be transferred, and that a just and proper method of carrying it into effect would be by adopting the procedure of the general law of the state governing condemnation proceedings.

It was hardly contested, the court says, that the city could, even in the exercise of its general powers over the streets, require the old company in question to move its track to one side of the street at a point within the central portion of the city, and allow the new company to build another track. And, if this be true, it says that it seems entirely reasonable that the city should, under a fair and just construction of such a reservation as that above mentioned, require the cars to be so operated by both companies that at such a congested point the cars on one side of the street should all move in one direction, and on the other side in the opposite direction. In other words, assuming the right to condemn the use of the tracks of the old company at such a point, under this reservation, the court says that it seems an inevitable conclusion that such a change and readjustment of the tracks as might be fairly and reasonably necessary to make the reservation effective and to accomplish its purpose could be ordered and enforced by the city.

CITY NOT EMPOWERED TO REQUIRE VESTIBULES

City of Yonkers v. Yonkers Railroad Co. (N. Y.), 64 N. Y. Supp. 955. May 29, 1900.

A city ordinance which prohibits the running of any street cars in the city during the winter months "unless said car shall have a vestibule upon each end thereof sufficient to afford protection from the weather to motormen, conductors and others standing upon the platforms of said car," the appellate division, second department, of the supreme court of New York holds, is not authorized by section 98 of the New York railroad law, as amended by chapter 676 of the Laws of 1892, which authorizes the common council of the any city in the state to "make such reasonable regulations and ordinances as to the rate of speed, mode of use of tracks, and removal of ice and snow, as the interests or convenience of the public may require." It does not consider that the ordinance has any relation whatever to the mode of the use of the railroad tracks, and it says that the act relates to the preservation of the interests and convenience of the public in the use of the streets and tracks as such, and the regulations, to be lawful, must be directed to matters connected with the construction and operation of the cars, which in some manner involves and affects the streets and tracks and their use. This, it declares, the vestibules would not do, directly or indirectly.

Nor does the court think the suggestion deserving of serious consideration that the authority to pass such an ordinance is contained in the provision of a city charter which confers power on the common council "to secure and promote the public health and safety; to determine public nuisances, and to prevent, restrain, remove and abate the same." So far as any evidence appeared in the case, it says that it preponderated in the direction that the vestibules would be more of a menace than a protection to health and safety. Besides, it says that the ordinance in question was not passed in the exercise of the power conferred by such provision, nor does its subject-matter relate even remotely to the abuses aimed at.

Neither can such an ordinance, the court holds, be upheld as a valid exercise of the police power.

Wherefore, the court holds here that, however reasonable the ordinance of this character here in question might be in itself, it was to be condemned as an exercise of a power not inherent to municipal existence, an interference with the affairs of the defendant railroad company, which the legislature had failed to authorize, and the assertion of a right on the part of the city which it did not, so far as appeared, reserve to itself, as a condition of the consent to the use of its streets by the defendant company.

EXPRESS SERVICE BETWEEN PASADENA AND LOS ANGELES.

The express business of the Los Angeles (Cal.) & Pasadena Electric Ry. is handled by a separate company known as the Electric Express & Storage Co., which has a 10 year contract for operating express cars over the Los Angeles-Pasadena electric line, at a stipulated sum per month, the schedule as at present agreed upon calling for four round trips for each week day and one trip on Sunday. The rate per month increases a certain amount at the end of each third year of the contract. The express cars and their motormen are furnished by the railway company, but the

To expedite the service and for the convenience of customers in ordering, the company leases a private telephone line between the two cities, for the use of which no charge is made to regular patrons. The company also owns 15 wagons, which call for and deliver goods shipped over the electric road, no extra charge being made for delivery within a radius of one mile from company's offices in Los Angeles or Pasadena. In connection with the regular carrying business, for a nominal sum the company will take C. O. D. packages, collect for them and return the money to the consignor.

Mr. W. H. Smith, manager of the Los Angeles & Pasadena Electric Ry., to whom we are indebted for the data and accom-



FIG. 1—EXPRESS CARS—LOS ANGELES & PASADENA RY.

motormen are required to assist the express company's servants in loading and unloading goods.

Express packages are also carried on regular passenger cars between the runs of the express cars, the railway company receiving for each article so carried a stipulated amount in addition to the regular monthly rental.

When this express business was started, there were in operation between the cities of Pasadena and Los Angeles some six or eight wagons, upon which charges were very high and service poor. There are now, however, but two wagons in operation, with the prospect that they will soon have to give up, as the car service is becoming more popular every day. During the summer season, when California is very dull, the express cars are used extensively for shipping fruit, such as prunes, apricots, peaches and grapes, from the ranches on the line of the road to the canneries and wineries.

panying illustrations, writes that in 1898 one car and two wagons were all that were required to carry on the express business, but now two cars of 20,000 lb. capacity each, 30 horses, 15 wagons and 30 men are employed. The weight of shipments at the present time average 50 tons per day. Mr. H. H. Hut is manager of the Electric Express & Storage Co.

In Fig. 1 are shown the two special express cars. No. 4 is equipped with two 50-h.p. Westinghouse motors, and No. 1 with two 40-h.p. motors of the same make.

Figs. 2 to 7 are reproductions of blanks used in carrying on the business. Fig. 2 is the form made up by clerks at the initial office, showing abstract of each car load of express matter. From this blank the bookkeeper makes proper distribution of charges. The original is 13 3/4 x 8 1/2 in. Fig. 3 is a form made up by clerks at the sending office, checked by the express messenger, and by him turned over to the checking clerk at the destination office.

Form No. 11-1900-5M

RECEIVED from **ELECTRIC EXPRESS AND STORAGE CO.** Trip No. _____
 Book No. _____ Page _____

In good order, the following articles set opposite our respective names

PASADENA, CAL. 1899

W. B. No.	Date	SHIPPER	ARTICLE	CONSIGNEE	ADDRESS	Weight	EXPENSE	COLLECT	RECEIVED BY	PAID	REMARKS ETC.

FIG. 3.

Electric Express and Storage Company

Messenger, Trip No. _____ W. B. No. _____

EXPRESS WAY BILL From _____ To _____ 1900

CONSIGNOR	CONSIGNEE	No.	ARTICLE	Value	Weight	Rate	Earnings	Adv.	PREPAID		Total Collect	Stamps
									Charges	Cash		

Form 13-1900-5M

FIG. 4.

clerk; it is then checked, receipted for and returned to the driver for his record. The shipping clerk is furnished with a copy of this form, and entry is made by him on the way bill (Fig. 4).

Fig. 6 is a small order blank furnished for the convenience of patrons. The blank itself is 2 3/4 x 4 1/2 in. and forms one page of a four-page folder, the other three pages of which are devoted to advertising the service and to a schedule card showing the leaving time of the express cars.

Fig. 7 is a notice which is used in various sizes for advertising purposes. It is printed on the back of order blanks, in hand bill form, and in poster form.

The C. O. D. feature has grown to large proportions, and is taken advantage of by merchants and dealers all along the line, who

ELECTRIC EXPRESS AND STORAGE COMPANY

TRAIN SCHEDULE:

Beginning October 1, 1899, the following Time Card will be in effect:

LEAVE PASADENA	ARRIVE LOS ANGELES	LEAVE LOS ANGELES	ARRIVE PASADENA
*4:30 a.m.	5:05 a.m.	*5:25 a.m.	6:10 a.m.
7:30 a.m.	8:10 a.m.	8:30 a.m.	9:30 a.m.
11:15 a.m.	12:00 m.	1:00 p.m.	2:00 p.m.
2:30 p.m.	3:15 p.m.	4:00 p.m.	5:00 p.m.

SHARP

NORTH PASADENA AND ALTADENA AND MT. LOWE CONNECTIONS

Los Angeles	Pasadena	N. Pasadena	Altadena
Lv. 8:30 a.m.	Ar. 9:30 a.m.	Ar. 10:00 a.m.	Ar. 10:20 a.m.
Ar. 12:00 m.	Lv. 11:15 a.m.	Lv. 10:45 a.m.	Lv. 10:30 a.m.

*DAILY, All other trains daily except Sunday.

**Shipments for each train must be received at
warehouse 15 minutes prior to leaving time.**

PASADENA OFFICE 107 S. FAIR OAKS AVE. TEL. MAIN 12	LOS ANGELES OFFICE NORTH SIDE PLAZA TEL. MAIN 1232
---	---

FIG. 7.

can in this way fill mail and telephone orders as quickly and as safely as they could with their own wagons. When the express company collects a bill for a package delivered, it retains the money and remits the amount to the sender by its own check, taking a receipt therefor. The bill accompanying articles which are to be paid for on delivery is placed in a heavy manila envelope, 3x5 1/2 in., on the outside of which are blank spaces for filling in amount of bill and charges for returning money, names of consignor and consignee, and way bill number.

SPECIAL TAX IN GEORGIA.

The city of Savannah, Ga., levied an occupation tax of \$100 per mile on the Savannah, Thunderbolt & Isle of Hope Railway Co., and collection being resisted the case was carried to the Supreme Court which on November 25th affirmed the judgment in favor of the city.

The justices all concurred in the following opinion: "The municipal authorities of the city of Savannah had power, under the charter of the city and the second proviso of section 2180 of the civil code, to levy and collect an occupation or business tax from street railroad companies for the use and occupation of the city streets by their tracks and cars, when such companies' principal business was the transportation of passengers from points within the city limit to other like points."

CANADIAN NOTES.

The Montreal Park & Island Railway Co. is contesting the judgment recently granted the town of St. Louis whereby the town was released from the original contract granting the railway company rights in the municipality.

Application has been made to the British Columbia Provincial Government for permission to build about ten miles of electric railway in the Chemains district. The applicant is the London & Vancouver Development Co., of London, Eng.

A proposition is on foot in Yarmouth, N. S., to extend the existing Yarmouth Street Ry. to Digby, passing through several towns en route. Owing to the prosperous condition of the country thereabouts it is confidently expected that the proposition will take definite shape.

There has been a marked improvement in the receipts of the street railway in Hamilton, Ont., since the Cataract Power Co. has taken hold of the system, and the city officials are congratulating themselves upon the increase in the percentage of earnings collected from the company.

The proposed Hamilton, Guelph & Galt Electric Railway Co. is encountering considerable difficulty in obtaining an entrance into the city of Hamilton, the city council having refused to accept the plan for the original route, and the city engineer has been instructed to make plans for an alternative route which are to be submitted later.

An action has been entered against the Montreal Street Railway Co. by a passenger who was refused transportation to the terminus of an existing line. The car upon which he had paid his fare was apparently behind time and turned back before reaching the terminus, in spite of the passenger's protestations, and he now sues the company for failing to fulfill its contract with him.

The Woodstock, Thames Valley & Ingersoll Electric Ry., formally opened the finished portion of its line, from Woodstock to Beachville, on November 8th. The builders are making every effort to complete the portion from Beachville to Ingersoll before the winter prevents the further work. It is the general impression that the road will be continued as far as Embro next year.

The Toronto Railway Co. has offered to supply the Toronto Baseball Club with suitable grounds, free of rental, on condition that other athletic associations will be permitted to use it, otherwise it would not be a paying investment. This is a new departure on the part of street railways in Canada, and is framed after the methods adopted by a number of the large American companies.

The prospects for the construction of the proposed Brockville & Ottawa Electrical Ry. are exceedingly bright, and promises are given that the work will be started early next spring. Mr. Kidd, the company's solicitor, is at present in New York, interesting capitalists of that place in the scheme. The company proposes placing a line of steamers between Brockville, Kingston, and the Thousand Islands, to be run in connection with the railway.

The Cataract Power Co., operating the street railway in the city of Hamilton, Ont., has been granted the right of way for the completion of its projected electric railway line through Barton Township to Bartonsville. The line to Barton to be completed within two years, and the Barton street railway within three years. The by-laws also contain the stipulation that a 5-cent fare shall be the maximum anywhere within the precincts of the township of Barton.

The charter applied for by the Queenston, Niagara & Port Dalhousie Electric Railway Co., which has for some time been opposed by the Niagara, St. Catherines & Toronto Railway Co., will be issued forthwith, the latter company having withdrawn its opposition upon being assured that its line would not be paralleled by the new company. The Queenston company will now be promoted to operate an electric street railway in the town of

Niagara and the village of Queenston, along the lake shore to Port Dalhousie, and from the latter point to the city of St. Catharines. The first half of the railway is to be completed by June, and the entire road to be in operation by August next at the latest.

November 22d, President MacKenzie, of the Toronto Railway Co., and other gentlemen interested in the road, made a final trip of inspection over the Metropolitan Ry., and it is now definitely stated that they have decided to acquire the road and use it as a main artery for several branch lines which are to thoroughly cover the country for 10 miles on either side as far north as Stouffville, Ont., connecting with the existing Toronto Railway Co.'s system, thus giving access to the city. This deal has been under contemplation for some time.

The contract entered into recently by the Chambly Co., whereby it agreed to furnish the Montreal Street Railway Co. with motive power, has been rudely abrogated by the failure of the Chambly Co.'s dam. Owing to faulty construction the pressure of water carried away about 60 ft. of the retaining wall containing the sluice ways, thus completely stopping the generators, and it will be some weeks before the break can be even temporarily repaired. The street railway company, fortunately, has been able to meet the requirements of the service with its steam plant.

It is rumored that capitalists are endeavoring to combine the Montreal Street Ry. with all the existing electric light and gas companies in that city, and it is stated that the first step towards this has been taken by the sale of the Royal Electric Co.'s manufacturing plant to the Canadian General Electric Co., of Toronto. This will leave the Royal company free to devote itself entirely to the supply of light and power, and as this company has a controlling interest in the Chambly company, which furnishes power to the street railway, this deal gives credence to the rumor.

The Government statistics show some interesting figures regarding electric railways in Canada. During the year ending Dec. 31, 1899, with a total of 612 miles of track, the car mileage was 20,646,847. The total number of passengers carried was 104,033,659, which is equal to carrying every man, woman and child in the Dominion, 20 times. The number of passengers carried per car-mile was 5.04, transfers not being included in these figures. As compared with the previous year the number of passengers carried increased nearly 9,500,000, and the number of miles run by over 1,000,000. The amount of paid up capital invested in Canadian electric roads on this date was \$21,700,000. It is confidently expected that when the statistics for the current year are compiled an enormous increase over these figures will be shown, both in the mileage and the number of passengers carried.

Application has been made for the incorporation of the Toronto & Central Ontario Railway Co., with power to construct and operate a system of electric railways, consisting of six or more main lines and their branches, running from the city of Toronto to the east, north and west, with a mileage of not less than 500 miles, all within a radius of 100 miles of the city. The project, it is estimated, will involve the expenditure of several millions of dollars, the capital stock is to be \$5,000,000 in \$100 shares with bonds and debentures limited to \$20,000 per mile. The company's main offices will be located at Toronto. It is proposed to give both passenger and freight service. It was the original intention of the corporation of the city of Toronto to build this road itself, but it has now decided to invite private capital to assist in the undertaking, and it is the intention that advertisements shall be placed before American investors, requesting them to assist in the formation of the company.

Mr. Duncan McDonald, at present superintendent of the Montreal Street Railway Co., has been appointed general manager of the Compagnie Generale de Traction, of Paris, France. Mr. McDonald has just returned from Paris, where he has been looking over the ground, and states that electricity as a motive power is but in its infancy in that city; a number of lines have already been constructed, but so far very few of them have been operated; they use what is known as the Diatto contact system. The company of which Mr. McDonald will be manager is capitalized at \$25,-

000,000, and controls many minor companies in Paris and elsewhere, and he will act in an advisory capacity toward these different boards of management. Mr. McDonald enters upon his new duties the first of the new year, and expects to Americanize the system forthwith. He will have associated with him in his new



DUNCAN McDONALD.

field, Mr. Nelson Grayburn, formerly electrical engineer of the Montreal Street Ry., at present occupying the position of superintendent of rolling stock with the Corporation Tramways of Glasgow, Scotland. Both these men are thoroughly up to date in every way, and will no doubt render effectual service to the public of the French capital by rapidly improving their very inferior and antiquated street railway system. Mr. McDonald, who has been connected with the Montreal road for over 20 years, is well known to the street railway fraternity, having been a member of the association and a regular attendant at the annual conventions for many years past, and his many friends will no doubt learn with pleasure of his advancement. Before leaving Montreal he will be tendered a dinner by the officials of the company, and presented with an illuminated address and a purse by the men employed in his department.

NEW YORK FRANCHISE TAX.

A great deal of litigation has resulted from the enforcement of the New York franchise tax law and the upper courts have had to pass upon a number of petitions for writs of certiorari looking to a review of the action of the assessors. A writ of certiorari issued at the instance of a Buffalo gas company required the tax commissioners to return the manner of making the assessment and the method pursued in fixing the value, but the Appellate Division of the Supreme Court directs this requirement to be stricken from the writ as the same points are covered by the statute.

The New York & Queens County Railway Co. failed to comply with the law and file its report before Oct. 1, 1899, and the tax commissioners opposed the issue of a writ of certiorari on the ground that by its failure to make a report at the proper time the company forfeited its right to ask for a review. The writ being refused an appeal was taken, which was on November 14th decided in favor of the company by the Appellate Division of the Supreme Court.

SHUCKERT SURFACE-CONTACT SYSTEM.

Since 1896 Messrs. Shuckert & Co., of Nuremburg, have been experimenting with their surface contact electric railway system and in the summer of 1899 put down a line in Munich embodying such improvements as had been found desirable; this line it is stated has worked quite satisfactorily. Illustrated descriptions of the system have been issued by the British Shuckert Electric Co., and copious extracts are to be found in our English contemporaries of November. The Shuckert system is a single-row contact-stud system with grouped automatic switching apparatus, of which each, while separately switched into circuit, switches out the previous apparatus in the route traveled.

YERKES' LONDON ROAD.

The contracts for the construction of the Charing Cross, Euston & Hampstead underground railway, Mr. Yerkes' London road, were signed on November 28th. The parties were C. T. Yerkes, H. C. Davis, A. A. Housman, of New York, J. J. Mitchell, of Chicago, on the one part and Price & Reeves, Westminster, England, general contractors, on the other part. The contract provides for the excavation and equipment, the total cost of the seven miles being placed at \$20,000,000.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

STORAGE BATTERIES IN RAILWAY POWER STATIONS.

Read before the New York State Street Railway Association, by H. H. Norris, Cornell University.

Within the past few years more attention has been given to the refinements of station operation than was possible at the time of the rapid change from horse and cable to electric traction. By the use of many engineering devices now popular the coal consumption in stations supplying power to electric railway systems has been reduced to a very respectable figure, not greatly exceeding 4 lb. of coal per h. p. hour in first-class plants. This accomplishment is remarkable when the nature of a railway load is taken into account. This load fluctuates greatly in two ways: First, from instant to instant, especially on small roads, and also on account of the variable nature of the business during certain hours of the day. These fluctuations tend to prevent economical operation of engines, boilers and generators, while the "peaks" and the extremely light loads reduce the load factor of the station. Careful selection of sizes of machinery tends greatly to economy, but there has long been felt a need for an automatic regulator of the load which should be economical and convenient. For this purpose the storage battery has always been considered a theoretically ideal device, but patent litigation and other difficulties interfered with its commercial development until quite recently. At the present time the use of the storage battery in railway plants is rapidly becoming general.

The financial features connected with the application of the storage battery to railway work form the determining factors in their adoption. These features have to do with the depreciation and cost as well as with the saving produced. There is no doubt, from an engineering standpoint, that batteries are successful in effecting a saving. They had not been in use in this country in railway work for a long enough period to determine absolutely their deterioration, but apparently this does not amount to much more than that of moving machinery. The experience of a number of large users of the storage battery shows that during the short periods in which the batteries have been in use, practically no money has been spent in repairs. The oldest battery for which data are at hand, has been in use five years, but most of the batteries have been installed within two years. The annual depreciation which one of the largest manufacturers figures upon is from 2 per cent in the best managed stations to 8 per cent in small plants considerably overworked. They consider 6 per cent per annum to be a conservative figure under reasonable conditions.

The first cost of a battery is considerable, being in average-sized plants not far from \$100 per kw. output when discharged in one hour. The same battery will have a much larger capacity when discharged more slowly. In order to obtain a general idea of the proportion of size of battery to capacity of station, data were obtained from a number of well known plants. Out of a station capacity of 43,560 kw. the batteries installed had a total capacity of 28,560 amperes for one hour, or an average capacity of two-thirds of an ampere-hour per kw. output, at the discharge rate mentioned.

By way of illustration assume a capacity of station of 1,000 kw. At the ratio given, a battery of 666 amperes output for one hour would be chosen. The exact battery capacity to be used will vary from this figure with a difference in the nature of the work demanded of it. For "peak" work a larger battery would be needed than for regulation only. If a battery of 270 cells were used, assuming an average pressure of two volts per cell, the cost of such a battery would be roughly \$35,960. At 6 per cent depreciation and 5 per cent interest, the annual cost of this battery would be about \$3,956, exclusive of booster, attendance and building. The booster is neces-

sary if a close regulation of voltage is desired and the cost of such a booster is between \$50 and \$150 per kw. If the booster produces a pressure of 50 volts, its capacity is about 9.25 per cent of that of the battery, so that its price in the assumed case would be somewhere between \$1,663 and \$4,983. Assuming depreciation on the booster at 8 per cent and interest as before, the annual cost of the booster would be between \$216 and \$649, the exact amount depending on local conditions. Attendance often involves no extra expense, as the regular employes of a station are usually able to give the necessary amount of time without seriously interfering with their other regular duties. Cost of extra building is a purely local matter and amounts to very little except in the case of large stations, as some spare room is to be found about most railway plants.

To offset the extra expenditure due to the use of the battery, there should be a considerable reduction of expenses in operating the boilers, engines and generators. This saving should result from the increased efficiency of the apparatus due to more effective loading; to reduced depreciation on machinery from the same cause; to the saving of wages through shutting down of plant during light loads; to the saving of copper in the lines when the batteries are installed in sub-stations, and other reasons following from these. The almost universal testimony is that the saving more than counterbalances the increased expense, and that therefore, the battery is an economical adjunct to a railway power station.

ENGINEERING FEATURES.

Viewed from the engineering standpoint a storage battery serves a number of very useful purposes in a railway station or sub-station. First, by reducing the fluctuations of the load and thus allowing the machinery to be operated under more advantageous conditions; Second, by acting as an energy reservoir for the supply of excessive demands of power, and thus permitting the installation of a smaller number of units than would be otherwise necessary; Third, by placing the batteries in sub-stations the pressure over the systems can be made more uniform, for the battery will be charged when the demand for power is small, and discharged when this becomes excessive; Fourth, by drawing upon the battery at times of very light load the machinery can be often shut down and the load operated from the battery alone. This feature is especially applicable to small stations, when the night load is very light and where accidents to machinery often cause annoying shut-downs.

The use of an energy storage reservoir is common in many applications of mechanical laws. For example, in the steam engine the fly-wheel absorbs the energy supplied very irregularly from the piston. If the load on the engine be steady, the fly-wheel regularly absorbs energy when the piston pushes more strongly than is necessary and gives out enough to supplement the effort of the piston when this falls below the amount required to overcome the resistance of the load. The pressure on the piston may vary from a positive value of 90 pounds per square inch at the beginning of the stroke down to a negative value of 60 pounds per square inch due to the back pressure. Through the medium of the fly-wheel, this effect is averaged and may deliver a steady effort equivalent to a uniform pressure of 40 lb. per sq. in. on the piston. If it were not for the inertia of the moving parts, the engine would stop before the load reached the average value of the piston effort. Still more so is this true when the load also is irregular. In this case the fly-wheel acts as a buffer between the variations on both sides. It is exactly in this way that a storage battery neutralizes the fluctuations in the current of a circuit when connected in parallel with it, for it absorbs energy and stores it in chemical form when the load is light, and restores energy to the circuit when the load is heavy.

Aside from this "fly-wheel" action of the battery, the latter also demonstrates its utility in taking care of "peaks" or unusual demands upon the generators. Peak work requires that the battery

shall be able to stand heavy loads for short times and this a good battery can do, although the efficiency of the process is somewhat reduced by the severe treatment.

As evidence of the fact that an actual saving is produced by the adoption of storage batteries, the following authorities are cited: Mr. W. E. Harrington, general manager of the Camden & Suburban Railway Co., of Camden, N. J., states that a reduced coal consumption of 23 per cent; an increased capacity of station of 300 amperes on account of a more economical load upon the engines; and a material reduction in expense for repairs upon machinery, are some of the results of the installation of a battery in his plant. The capacity of the station is 1,615 kw. and the battery has a capacity of 300 amperes when discharged in one hour, which is somewhat below the average stated earlier. Mr. John Murphy, general superintendent of United Traction Co., of Pittsburg, Pa., reports curtailed operating expenses equivalent to 24 per cent of cost of battery.

The use of batteries in sub-stations, particularly where the distribution of power is accomplished by the use of alternating currents at high pressure with rotary convertors, results in very high economy. The rotary convertor is loaded uniformly, so that its highest efficiency can be maintained, and thus an efficient supply of power is at hand directly where it can be used to the best advantage. Rotaries are used with great satisfaction by the Buffalo Railway Co., of Buffalo, N. Y., the Rhode Island Suburban Railway Co., of Riverview, R. I., and many others. In the immense system of the Metropolitan Street Railway Co., of New York City, twenty-one 1,000 kw. rotaries will be used. Mr. W. A. Pearson, electrical engineer of this company, states as the benefits due to the use of the battery in this connection, that it "decreases the load variations at the different stations, gives us reserve to fall back upon at times of heaviest loads and allows us to shut down sub-stations for work on high tension wires and on steam plants at hours of lightest loads."

The ability to shut down a station for even a few hours a day not only effects a saving in running expenses, but it allows time for repairs and inspection of machinery. It is better for the men, as it shortens the hours of labor, and it is better for the station.

In addition to the matters already mentioned, the battery is of great assistance in enabling the generating units to be kept fully loaded, as the load increases and decreases. In fact, in very large stations, this is one of the principal uses of the battery. It is the custom to install several generating sets and to start and stop them as the load demands. Without the battery, the load on the different units would be fluctuating, but with the battery the latter furnishes part of the power until it is found economical to shut down a unit and then it gives out power until the load has fallen to a point at which the unit next to be shut down is about one-half fully loaded. The reverse of this is true with an increasing load. This point will be brought out more fully in the discussion of the Buffalo railway plant.

A most important feature of storage battery installation is its use in "line work." It is a well known fact that the average power carried by a line is very small in comparison with the occasional heavy demands upon it. Thus, if a line be designed for a given drop with the average current, the drop with unusual demands for current will be excessive, which naturally occur when the pressure should be highest. To put enough copper into a line, especially when the latter is long, is impossible from a financial standpoint, so that a compromise has to be effected between excessive drop and financial economy. It is the emergency drop that has to be looked out for. Just here the storage battery is very effective. By locating it at some distance from the station the battery is charged rather uniformly from the line. When a heavy demand for current occurs, instead of an excessive drop in the line, the battery furnishes most of the current, and thus the drop is practically only the natural fall of pressure in the battery between charge and discharge. In one case the installation of a \$10,000 battery was stated by the engineer to have saved \$30,000 worth of copper. Although the depreciation in copper is less than that of the battery, it is not enough less to offset this saving.

Still other uses of the battery might be mentioned, but most of these follow as a consequence of the advantages described.

BATTERY OPERATION.

The beneficial effects of a storage battery are largely dependent upon the treatment which it receives. The battery has two pur-

poses; first, regulation, and second, preparation for emergency. In the first case the battery can be handled for economy much more easily than in the second. In anticipation of an emergency, such as a heavy peak in the load curve, or the possibility of a shut down, the engineer will naturally overcharge his battery in order to be sure that it contains the maximum possible quantity of energy. Overcharging necessarily involves a waste of energy, so that the battery will appear less efficient.

In regulating work the battery is most economical when it is about three-quarters fully charged. This is true for the following reasons: In charging and discharging there are two main sources of energy loss. First, the loss in amperes-hours due to overcharging, and local chemical action, and second, the loss in pressure both in charging and discharging, caused by the resistance of the battery and connections. Both of these losses are very much greater when the battery is fully charged, hence the desirability of keeping the charge below this amount. Three-quarters "full" is found to be about the best value. These losses can be made a minimum by careful handling, as will be brought out in the illustration from the Buffalo plant.

THE BUFFALO RAILWAY CO'S. NIAGARA STREET PLANT.

In order to illustrate the principles described in the first part of this paper, a well known and representative plant will be discussed in some detail, with a brief description of elaborate tests made upon it by students of Sibley College, Cornell University, during the past spring. The station of the Buffalo Railway Co. has been fully described in engineering literature, in which additional details can be found. The tests were made at the Niagara St. station, where power is obtained from a steam plant and from Niagara Falls. This station is now partly shut down and undergoing extensive alterations in order to utilize still more completely the Niagara Falls power, the experience with rotaries having been so eminently satisfactory.

The boiler equipment consisted of four 250-h. p. Babcock & Wilcox water-tube boilers, twelve 300-h. p. of the same make and two 300-h. p. marine boilers. The supply of fuel was as nearly automatic as possible, as an electrically operated elevator took coal from the dump near the railroad to a coal pocket of 2,500 tons capacity immediately behind the station. A second conveyor, electrically operated, raised the coal to the top of the boiler room, where a horizontal conveyor carried it to a 5-ton hopper. A second movable hopper of 1 ton capacity, distributed the coal to the Roney over-fed, automatic mechanical stokers. This portable hopper enables a very complete record of coal consumption to be kept by simply recording the number of times which it is emptied. Removal of ashes was accomplished by running a hand car in a tunnel below the hopper-shaped ash-pits, and emptying the ash-pits about twice each day.

Feed water was supplied either from the Niagara River, which is the normal arrangement, or from the city supply in emergencies. The water for the boilers was drawn from storage tanks of about 3,400 gallons capacity each, through feed-water heaters. These tanks were supplied from a hot well of about 310 cu. ft. capacity. The water in the storage reservoirs was kept at about 50 lb. pressure per sq. in.

The engine equipment consisted of 11 engines, all two-cylinder, cross compounds, as follows: Two horizontal Ball engines of 250 h. p. each; 9 vertical, marine, Lake Erie engines, three of 1,000 h. p. each and six of 500 h. p. each. To each of the three 1,000-h. p. engines a 10-pole, 800-kw. General Electric generator was directly coupled. To one of the Ball engines a 200-kw. Edison bipolar machine was belted, and two generators of the same type were belted to three of the Lake Erie engines and four pole General Electric generators, of 200 kw. capacity each, were belted to each of the three other engines.

A notable feature of the engine room was the rotary equipment. Four 6-pole, 500-kw. rotary convertors took alternating current from the secondaries of transformers at 350 volts pressure, three-phase. The primaries of these transformers are fed at 11,000 volts pressure from the Niagara Falls power plant. The rotaries convert the alternating current at 350 volts into a direct current at a pressure of about 550 volts.

The storage battery equipment of this station was a very large and complete one, having a capacity of 3,000 amperes for one hour and consisting of 270 cells of the "Chloride" type. As auxiliary to the battery a 70-volt booster, capable of passing 3,000

COST OF POWER FOR ELECTRIC RAILWAYS.

Output Measured by Wattmeter in Each Case.

STATION	MONTH, 1900.	Monthly Output, Kilowatt-Hours.	Cost of Electrical Output per Kilowatt-Hour—Cents.						Gals. Cylinder Oil per 10,000 k. w. h.	Gals. Lubricating Oil per 10,000 k. w. h.	Lb. Water per Lb. Coal.	Lb. Fuel per k.w.h.	Price of Fuel per Ton of 2,000 Lb.	Kind of Fuel
			Fuel.	Labor	Supplies, Oil, Waste, etc.	Water.	Re-pairs.	Total.						
1.....	July	1,697,522	.322	.166	.056	.037	.065	.646	3.86	1.27	11.12	2.45	2.63	Bituminous
1.....	Aug.	1,677,688	.324	.169	.039	.040	.049	.621	3.70	1.34	12.14	2.59	2.50	"
1.....	Sept.	1,794,635	.307	.155	.041	.033	.043	.579	4.13	1.18	13.20	2.34	2.62	"
5 Metropolitan Elevated, Chicago.....	July	1,372,246	.425	.195	.016	.015	.049	.700	2.36	1.70	6.55	4.67	1.82	Bituminous
5 " "	Aug.	1,510,281	.435	.177	.023	.021	.064	.721	3.67	1.40	6.18	4.83	1.81	"
5 " "	Sept.	1,539,698	.428	.169	.018	.018	.048	.682	2.73	1.66	6.44	4.80	1.78	"

amperes or more, was connected between the positive side of the circuit and the ground. The purpose of the booster was to force the battery to discharge when the load was heavy and to force it to accept current when the load was light. This was accomplished by raising the battery voltage in the former case and lowering it in the latter.

The station was supplied with all necessary modern auxiliaries which go to increase the economy of operation of such plants.

RECORDS AND TESTS AT THE BUFFALO RAILWAY CO'S. PLANT.

In the station just described very careful daily records of station performance have been kept for some years. These included readings of voltage, total current output and generator current output at 10-minute intervals. Also the daily coal consumption, number of boilers in use, wattmeter readings and weather conditions are recorded.

The conditions under which the plant operated were peculiar. A certain amount of power was purchased from the Niagara Falls Power Co. to be used continuously. Also the large number of cars constantly in operation made the load on the station remarkably uniform. These facts should be kept in mind in analyzing the results.

The charts plotted for the electrical readings, for the month of March, 1900, have been carefully studied for the purposes of this paper. On these charts a red line shows the total station output and a dark line the generator output. The difference in the position of these lines is due to the presence of the storage battery, which causes the red line to be above the black at times and at other times below it. When the red is higher the battery is discharging and vice versa. The area enclosed between the lines shows the amount of battery action, either charge or discharge, the enclosed areas being exactly proportional to the energy transferred from electrical to chemical form and vice versa.

The charts show the following points very clearly:

1. The effect of the battery in straightening the generator load line is evident from a casual glance, the peaks being practically entirely carried by the battery.

2. The storage of energy during light loads for emergency use is shown by the large "charging areas" at these times. At night, when the engines were all shut down and the load did not equal the capacity of the rotaries, the battery took up the surplus power. Similarly for the morning hours between the early peak and the noon hour.

3. The great assistance of the battery in adjusting the engines and generators to the changing load is brought out in a very interesting manner. As the load decreased the battery accepted more and more current from the generators, as was clearly shown by the battery ammeter. When the current had reached a value which had been fixed by previous experience, a generator was cut out. This reduced the generator capacity in operation, for the time, below that required for the load. The battery then discharged until the load had fallen below the capacity of the generators. This

continued until all of the generators had been cut out and yet none had been run at inefficient loads.

By integration of the charge and discharge areas on the chart, by means of a planimeter, the input and output of the battery, in ampere-hours, was obtained. From these measurements it was determined that during 31 days the battery received 189,369 ampere-hours and gave out 164,036 ampere-hours, or a proportion of discharge to charge of 86.6 per cent. This is independent of some slight minor fluctuations, too small to be noticed on the chart, but which affect the battery efficiency slightly. Assuming that the difference in pressure at the battery terminals varies by about 12 per cent between average charge and discharge, the efficiency of the battery for the work demanded of it in this case is about 76 per cent. This is lower than would be obtained for regulating work only, as the peak or emergency work requires overcharging with consequent loss of efficiency. In a case where the battery was used largely for regulating purposes with very small variation in voltage over 90 per cent watt efficiency has been obtained.

4. From the coal records the fact is deduced that less than four pounds of coal are required for each horse-power-hour of electrical energy given to the line.

This record system is admirable and gives data from which not only the performance of the station can be ascertained, but by studying which desirable improvements in equipment and methods of operation can be decided upon.

SIBLEY COLLEGE TESTS

Additional data for studying the operation of the plant under consideration can be obtained from a set of elaborate tests made during several days of March of this year.

The purposes of the tests were as follows:

1. To ascertain the station economy as a whole.
2. To discover the effectiveness of the storage battery.
3. To determine the relative economy of the power from the engines and from the rotaries.

Incidentally the efficiencies of the various parts of the equipment were necessarily determined. The standard methods were used throughout and no loss of any moment was allowed to go unmeasured. All instruments were carefully calibrated and all readings were made continuously for 24 hours at very short intervals. The error in the electrical measurements, as far as the instruments were concerned, was not more than one-half of one per cent, probably less. Particular interest in connection with the subject under discussion attaches to the battery measurements. A large Weston ammeter with "plus and minus scale" was used for the battery current readings. These were made at intervals of 20 seconds for 72 consecutive hours.

The data resulting from the tests comprise the following:

Complete sets of data relating to all individual parts of the station under three conditions:

1. Normal, that is with generators, rotaries and batteries operating as usual.
2. Without rotaries, that is without Niagara power.

3. Without battery.

The information obtained under these conditions comprises complete boiler tests, including every detail, and computation of boiler and grate efficiency; engine indicator diagrams and other measurements for determining engine output and efficiency; generator readings of current and pressure; battery readings of current and pressure at 20-second intervals.

The tests involved the employment of over 80 observers, and the computations required the labor of a number of men for several months. The results of the tests are given in the following tables, taken from the Sibley College thesis of Messrs. Burt and Macomber and already printed in the Sibley Journal of Engineering for June, 1900, in connection with a paper by Professors R. C. Carpenter and H. J. Ryan.

Partial Summary of Results of Tests.			
	Run 2.	Run 3.	Run 3.
Pounds of steam per i. h. p. per hour, auxiliaries included.....	24.88	24.38	25.79
Water from and at 212° F in lb. per e. h. p. h.....	34.1	33.5	34.2
Coal per i. h. p. per h., lb.....	3.53	3.31	3.64
Dry coal per e. h. p. h., lb.....	4.23	4.04	4.17
Ave. mech. efficiency, per cent.....	84.1	83.7	84.2
Engine i. h. p. h.....	69,900	107,700	53,250
Generator output, h. p. h.....	61,300	92,600	46,600
Battery h. p. h. charge.....	5,350	6,100	.....
Battery h. p. h. discharge.....	1,950	1,500	.....
Rotary output h. p. h.....	37,500	.....	31,100
Total output e. h. p. h. without rotaries	59,900	88,000	46,000

DISCUSSION OF RESULTS OF TESTS.

The data resulting from the tests show that more steam and more coal are consumed per indicated engine horse power when the battery is not in operation than when it is. This is due to the increased efficiencies of the moving machinery. The summary shows that the efficiency is slightly less under normal conditions than when operating without the battery, but this is the average efficiency for the whole plant, some parts of which operated for a comparatively small number of hours per day.

The apparent battery efficiency is very low, due to a prolonged overcharging. It has been previously shown that the efficiency of the battery is not far from 75 per cent under normal conditions, and overcharged only to an amount necessary to secure a reserve for emergencies. Unfortunately the cells had been heavily overcharged just previous to the test, on account of some cells which had been short-circuited. Also, at the time of the tests a very heavy snowfall drew so heavily upon the resources of the station that the engineer evidently heavily overcharged in order to be ready for any possible emergency. This accounts for the low efficiency of the battery. The accompanying table shows a history of this overcharging during the days of the tests.

Overcharge of Battery March 1, 2 and 3, 1900.		
Horse-power hours		
In.	Out.	Net gain from start.
1160.7		
	35.9	1124.8
6.		1130.8
	996.	134.8
2155.7		2290.5
	.2	2290.3
48.4		2338.7
	81.4	2257.3
4.1		2261.4
	4.	2257.4
12.2		2269.6
	3.2	2266.4
9.6		2276.0
	25.6	2250.4
185.		2335.4
	361.1	1968.3
4984.2		6952.5
	1003.5	5859.0
43.2		5893.2
	7.	5886.2

32.6		5918.8
	-6.6	5892.2
208.8		6101.0
	73.1	6027.9
1624.1		7652.0
	24.7	7627.3
2.5		7629.8
	26.6	7603.2
21.9		7625.1
	616.7	7008.4
13.1		7021.5
	11.6	7009.9
3452.7		10462.6
	411.9	10050.7
52.		10102.7
	34.2	10068.5
2146.3		12214.8
	340.9	11873.9
395.4		12269.3

The storage battery is not yet perfect, for there are disadvantages connected with its use. There is considerable variation in voltage; its first cost is high; some power must be wasted in the battery. To offset these facts, there is a decided advantage in steadying the load on generators, in keeping up the voltage when the battery is installed away from the station, in enabling the generators to be economically adjusted to the load line, in reduced wear and tear, at the generator commutators on account of the steady load, and most important of all, in the preparation for emergencies, such as peaks in the load line and possible temporary shut-downs. The remarkably rapid installation of storage batteries in railway stations, which has occurred within the last two or three years, shows that the advantages enumerated are generally believed to more than compensate for the disadvantages.

THE STEAM TURBINE.

Dr. R. H. Thurston presented a paper on this subject at the regular meeting of the American Society of Mechanical Engineers held in New York, December 4th to 7th and gave an interesting history of steam turbines from the time of Hero to the present, a discussion of the theory of this type of heat engine, and analyses of practical tests made with modern turbines. The conclusions drawn from the data presented are:

- (1) The steam-turbine thermodynamically approximates in its real form more closely to the ideal than does any other type of heat-motor. Its cycle lacks only the introduction of the Carnot compression.
- (2) It is entirely free from that waste, which in the real steam engine of common type constitutes usually, if not invariably, the most important of its extra thermodynamic losses.
- (3) It is peculiarly well fitted for use with those very high steam pressures as we now regard them, which must ultimately probably be resorted to by the engineer designing heat engines in his endeavor to further improve the efficiency of that class of motors.
- (4) It is only limited in speed of rotation by the strength of its materials of construction.
- (5) It is especially suitable for use with superheated steam, it having no rubbing parts on which lubrication may be difficult, in presence of superheated steam, and the limit to the superheat, so far as the motor is concerned, being only found at that point at which increased temperature of metal produces reduction of tenacity in objectionable amount. That limit, not as in earlier days of lubrication with animal oils, and still with other engines, is fixed with this machine at the boiler.
- (6) As to its operation, it is obvious that friction is peculiarly active for evil in this motor, and that small diameters of journal, freedom from contact of part with part, except as absolutely required by the construction, and minimizing fluid friction by superheating steam, and by securing as complete removal of the atmosphere, air, or vapor from about the revolving wheel as practicable, must be carefully sought in order that the mechanical efficiency of the machine shall be made a maximum.
- (7) The wastes of the steam-turbine are all extra thermodynamic; the loss due, the absence of adiabatic recompression excepted. They consist of (1) journal-friction, which is made a

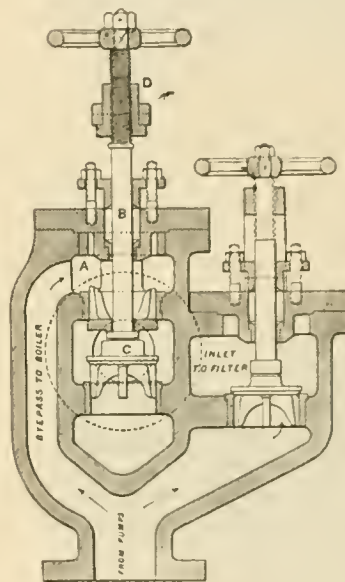
minimum by the use of a flooded bearing and a light ugent; (2) fluid friction between disk and leakage, steam, or suspended moisture in the jet, which may be made a minimum by super-heating, and between the disk and its enclosing atmosphere of vapor, which may be minimized by the employment of a good condenser; (3) loss of heat and of steam by leakage, which may be reduced to a minimum by durable material, fine workmanship, and close fits; (4) waste by incomplete expansion, which may be reduced to a limit determined by the finance of the case, by the resultant increase of friction and of cost due the necessary enlargement of the turbine; and, finally (5), thermo-

QUICK WORK ON HOLLOW SHAFT.

The Bethlehem Steel Co. recently received from the Anaconda Copper Mining Co., of Anaconda, Mont., an order for a hollow-forged fluid compressed steel shaft 17 ft. 10 in. long and 15 1/4 in. to 20 in. in diameter, with a 7-in. axial hole, to replace a shaft which broke in the hoisting engine of the mine, necessitating a shut down until the new one could be received. The new shaft was taken in hand under emergency conditions and finish-machined complete within 14 days from receipt of the order, which was two days in advance of the contract agreement. The shaft weighed about 12,000 lb., but on account of the urgent nature of the case was shipped to Anaconda by express in a special car.

BOOTHMAN FEED-WATER FILTER.

The accompanying illustrations show plan and sectional views of the Boothman patent feed-water filter which is made by a Glasgow company. Each element consists of a solid-drawn brass casing, perforated, over which is drawn a stocking of Turkish toweling known as "brown terry" cloth which constitutes the filtering medium. The filtering tubes are enclosed in iron castings held in their seats by large set screws. The water is introduced so as to surround the filtering tubes and passes through the cloth to the interior, thence downward as shown by the arrows and to the boiler. Either single or double filtration may be provided for in the design.



The under side of valve C, exposed to the boiler pressure, is greater in area than the upper surface of valve A, exposed to the feed pump pressure. The surfaces are so proportioned that when the feed pressure becomes more than 25 lb. per sq. in. greater than the boiler pressure, due to the fouling of the filter, the valves will move down and open a by-pass direct from the pump to the boiler.

The filter is cleaned by admitting steam to the interior of the filter tubes and thus forcing the dirt out of the cloth. The makers state that a 3,000 h. p. filter can be cleaned in five minutes.

The contract to build the power house of the Toledo (O.). Fostoria & Findlay Electric Ry. as Fostoria has been awarded to J. B. Wells.

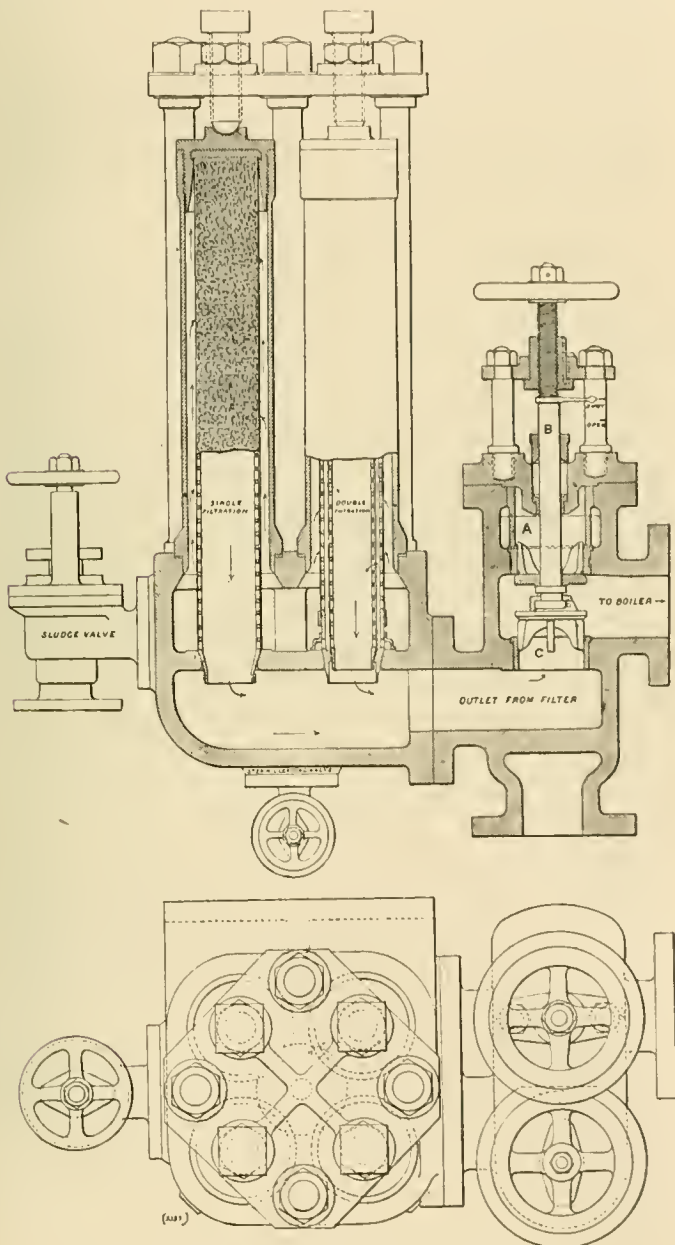
The Milwaukee Electric Railway & Light Co. contemplates rebuilding the power house at Racine, Wis. The station will be 110 x 75 ft. and one story high.

Current for the electrical operation of the Manhattan Elevated, New York, will be supplied temporarily from the station of the Metropolitan Street Railway Co.

The Winnipeg (Manitoba) Street Railway Co. has adopted a regulation requiring persons taking dogs with them on the street cars to pay 5 cents for the dog.

The New England Construction Co. has secured an old charter and will build an electric line in St. Albans, Vt., and to St. Albans bay on Lake Champlain, three miles distant, and to Swanton, eight miles distant.

Receiver Baer, of the Galveston City (Tex.) Railroad Co. has been ordered by the court to pay \$25,246.53 to Adone & Lobit.



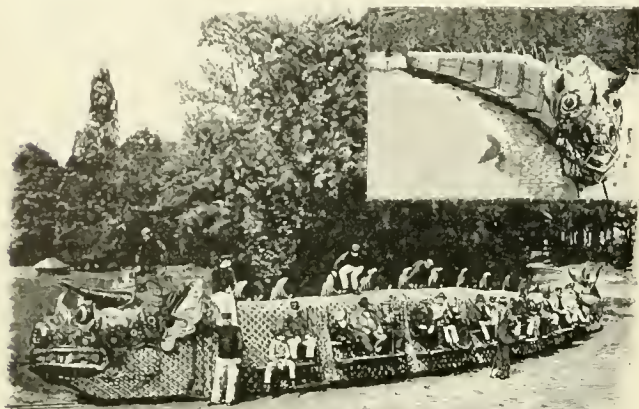
BOOTHMAN FEED-WATER FILTER.

dynamic waste by failure to secure that complete adiabatic recompression of the fluid which is necessary to convert the Rankine-Clausius' cycle into that of Carnot. The latter is a peculiarly difficult matter with the steam-turbine, since it probably necessarily involves the employment of a separate vapor-compression pump of special character, and an amount of added work and cost which may introduce losses more than compensating its gains.

The fly-wheel of a 400-h. p. engine in the power house of the Jackson (Mich.) Light & Power Co. burst on November 18th, and the street railway and lighting service had to be suspended till repairs could be made.

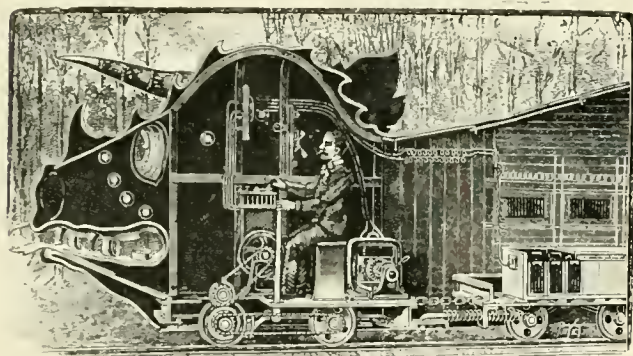
ELECTRIC SEA SERPENT FOR PLEASURE RESORTS.

The illustrations herewith show Mr. Walter Stenning's idea of the sea serpent which sundry and divers travelers have reported having seen at different times since 1555. It was built in Paris and during the past summer has been one of the attractions of the Jar-



ELECTRIC "SEA SERPENT" AT PARIS.

din d'Acclimatation. Our French contemporary, *La Nature*, says concerning the sea serpent: "The visitors to the Jardin d' Acclimatation arrest themselves stupefied when they perceive circulating



SECTION OF HEAD.

softly in the alleys, through the foliage, this rolling monster." And we do not blame them.

The serpent is about 100 ft. long and 6½ ft. in diameter; it consists of an electric locomotive drawing a train of cars carrying the necessary storage batteries to furnish current. Each car is covered with a ring of the animal's body.

MUNICIPAL OWNERSHIP.

At a banquet of the Merchants Club held in Chicago last month two papers discussing municipal ownership of public utilities were read. Prof. E. J. James, of the University of Chicago, gave his reasons for his opposition to municipal ownership and operation:

"First, private management is, on the whole, more efficient and operates under favorable conditions at a lower cost of production, and leaves, therefore, possibly a larger margin of profit for the community. This, in spite of the fact that individual instances may be found of very capable public management; in spite of the fact that municipalities may be able to borrow money at lower rates of interest than private corporations; in spite of the alleged fact that public employes have a keener sense of loyalty to the community than private employes to the company; in spite of the fact that with every passing year the efficiency of the municipality as a business agent is increasing. How far it is yet behind a well-organized pri-

vate business may be seen in comparing the manner in which the police service of this city is at present conducted and that, say, of suburban train service on the Illinois Central or the delivery of goods by Marshall Field.

"Another reason in my mind for rejecting municipal ownership as a general and satisfactory solution at present is that such a solution would end in increasing enormously the functionary class in our society—the class which, instead of depending upon its own right arm and good cause for getting on in the world, depends on getting a place at the public crib, where, protected by the conservatism of public employment, it may lead a life, if not of ease, at least of inertia, lack of initiative, and lack of strenuous effort. This objection holds especially against a permanent civil service—the absolutely essential condition of reasonable efficiency in public, as in private, employment."

Col. E. R. Bliss followed Professor James and said in part: "Municipal ownership, under existing conditions in this country, does not mean the wiping out of monopoly; it means the destruction of private property, for the purpose of enabling a municipal corporation to enlarge its functions and render an industrial service previously rendered by a private corporation."

CONSOLIDATION IN PENNSYLVANIA.

It was announced November 19th that the Lehigh Valley Traction Co., of Allentown, Pa., had arranged for the lease of the electric railways of the Easton Consolidated Electric Co., which will give the former company 150 miles of electric railways. The lessee guarantees 10 per cent on Easton Consolidated stock. Mr. A. L. Johnson is president of the Lehigh Valley and Mr. Charles E. Flynn, general manager of the Easton company, will be general manager of the consolidated lines. The Johnson roads in Pennsylvania include those in Allentown, the Bethlehems, Nazareth, Palmer, Slatington, Phillipsburg and Easton, the Slate Belt road, and the Kutztown & Hellertown.

The Inland Traction Co. is about to begin building an electric line between North Wales and Chestnut Hill Park, and this, together with an extension of the line from Richlandtown and Hellertown, now under way, will enable a passenger to go from Wilmington, Del., to Mauch Chunk, Pa., by trolley. As soon as these extensions are completed it is expected that through cars to Philadelphia will be put on.

There are a number of important connections serving as feeders. First beyond Philadelphia are the Willow Grove and Doylestown lines, now in operation from Germantown.

The second is the Chestnut Hill, Roxborough & Norristown Road, passing through Norristown and via the Schuylkill Traction Road to Colgevville and Pottstown, with a connection (about to be built) through Bridgeport to Valley Forge, to Phoenixville, thence over the Montgomery and Chester lines to Royersford, where another connection in course of construction will lead from Pottstown, through Boyerstown to Reading, from whence a road now runs to Lebanon.

The third will be the new Willow Grove and Glenside lines from near Ambler. The fourth will be the projected line from Perkasio to Doylestown, thence to New Hope, opposite Lambertville, N. J., a branch diverting to Easton.

The fifth is the newly built Bethlehem-Freemansburg lines to Easton. The sixth is the Allentown-Kutztown line now in operation to Griesemersville.

MAYOR OF CHICAGO ON FRANCHISES.

In a recent letter to the River Improvement Association of Chicago Mayor Harrison lays down five cardinal points to be considered in connection with any renewal of grant to the street railroad companies. These points are:

1. Compensation, based upon a percentage of the gross receipts.
2. Reduction of fare during the crowded hours of the day.
3. Betterment of accommodations for the public.
4. A provision for municipal acquirement of the lines at the expiration of the grant.
5. A requirement that before any franchise shall become operative it must first be submitted to a direct vote of the people for popular indorsement.

MECHANICAL DEPARTMENT

PAINTING CARS.

Practice in Philadelphia and Washington—Lettering—Painting
Roofs and Floors—Keeping Paint Shop Records.

The routine of repainting a car at the shops of the Union Traction Co. of Philadelphia is as follows:

First day, burn off all old paint, sandpaper and apply one coat of lead primer. Second day, putty thoroughly. Third day, sandpaper and apply second coat of lead. Fourth day, rub down, after which operation the car should stand 24 hours. Fifth day, sandpaper and apply third coat of lead, after which car should again stand for 24 hours. Sixth day, one coat rough stuff is put on in morning and another in afternoon. Seventh day, repeat as on sixth day. Eighth day, rub down and apply one coat of color. Ninth day, apply two coats of color. Tenth day, stripe, letter and decorate on the color coat and apply one coat rubbing varnish. Eleventh day, rub with hair and apply one coat rubbing and finishing varnish, mixed half and half. Twelfth day, apply one coat finishing varnish.

This routine cannot be followed strictly at all times, and when necessary one or two days are saved by rushing the work.

The cost of labor for thoroughly repainting as described a closed car, with 18-ft. to 20-ft. body, averages \$35, divided about as follows:

Burning, sandpapering and all colors.....	\$15.00
Painting roof	1.00
Varnishing sash	1.50
Varnishing inside or oiling.....	1.50
Varnishing outside, three coats.....	4.00
Lettering and striping.....	5.00
Painting floor and platforms.....	.75
Trucks	1.00
Washing car	2.50
Blackening off.....	.75

Total\$33.00

The total cost of material for doing this work averages from \$20 to \$25.

The cost for painting an open car is virtually 10 per cent less than the figures for the closed cars.

The Union Traction Co.'s standard color for exteriors was formerly red, but it is now using a light yellow, it having been found the yellows are cheaper, are more easily touched up and therefore wear longer, and do not shade down as quickly as the reds. For mixing body colors the foreman painter uses one-half pint of raw linseed oil to 10 lb. of color ground in Japan.

All lettering is done with plain block letters in aluminum and edged with black. Aluminum, taking into account its durability, is considered as economical as color paints for this work.

Ready-mixed paints are used for the trucks and roof. The dashes are treated in practically the same way as the bodies, but not so much oil is put in the priming coat.

All cars on the system are passed through the paint shop once a year for a thorough overhauling. They are washed and scrubbed inside and out, seats given one coat of varnish, all paint touched up where needed, trucks repainted and the body revarnished, this work requiring on the average three days for each car.

The washing is done in a special room fitted with hose, sinks along the walls, and a cement floor built on a slight grade for drainage. When a car comes in to be cleaned, several men take it in hand, and beginning at the top wash it down with hose, brooms and scrubbing brushes, using clean water and Babbitt laundry soap. Cars are also washed as thoroughly as possible each night at the different car barns.

The paint storeroom in connection with these shops is excep-

tionally well arranged, Mr. D. G. McGee, the foreman painter, believing the best results can be obtained by insisting upon neatness and system in every detail of the work.

The room is practically fireproof, with cement floor. Along the right hand side is shelving for the various colors. Ready-mixed paints that are used every day are kept in $\frac{3}{4}$ wooden tanks placed down the center of the room, where their contents can be drawn off conveniently. On the left hand side are the varnishes, turpentine and oils in 60-gallon metal tanks, each one marked with the grade and name. At the rear of the room is a lye tank and a rinsing tank with hot and cold water. The lye tank, which is used for cleaning pots and cups, has a steam pipe entering at the bottom for blowing steam up through the lye after it has been standing for any length of time.

Brushes are hung on nails along the sides of a box divided into compartments for the different standard colors, color brushes being kept in turpentine, bristle brushes in water and varnish brushes in varnish.

A chain hoist depending from a small trolley traveling on a runway supported from the ceiling enables barrels and tanks to be moved around the room easily and deposited in their proper places.

The Capital Traction Co., of Washington, D. C. finds the following routine for repainting cars gives as good results as any other it has tried:

On open cars the old paint is first burned off. The side panels are then smoothed off, sandpapered and given a coat of lead primer composed of oil, Japan and turpentine. This surface is scraped in with soft putty, sandpapered and reputted, Mr. W. E. Graham, the foreman painter, holding the opinion that a little more time spent in preparing the surface before painting will show 10 better advantage in the finished work, than time spent in rubbing varnish laid on a poor surface. In accordance with this policy the panels are next given three coats of lead tinted, when they are ready for the two coats of color. On the second color coat is laid the ornamentation, and lettering in nickel with nickel stripe border line, surrounded by a fine line of tinted white. The work is finished with but one coat of rubbing varnish and one of finishing varnish. Open cars are running on the road, with panels treated in this way, that have not had a brush touched to them since 1892, and the surface is still in good condition.

Closed cars are treated in the same manner, with the exception that a filler of rough stuff is laid under the color and the work is given an extra coat of rubbing varnish, as the larger expanse of panel surface on the closed cars makes a higher finish desirable from an esthetic standpoint.

On closed cars the main convex side panel designates the route the car is to take, and the concave panel bears near each end the car number, and in the center the name of the company. The car number is also placed on each dash.

On open cars the name of the line is painted on the top side-panel; the first and last seat panels bear the car number and the others a fancy design. The bottom sill bears the company's name. The car numbers are also painted on the dashes. This system of painting the route in large letters on the sides of the cars is appreciated by the public, but of course presents a serious inconvenience to the operating department when it is desirable to temporarily transfer a car to another line.

For rubbing varnish to a dead finish on doors and on interior work, curled hair is always used in preference to pumice or sandpaper. The hair is regular upholstery hair taken from old seat cushions, and the foreman states that it is better than anything else he has tried, as there is less liability of rubbing through or scratching the varnish and the finish obtained is more pleasing to the eye.

All cars are passed through the paint shop once a year for overhauling. At these times they are cleaned inside and out with soap

pumice stone and water. If the seats are in a fair condition they are given a coat of varnish, but if in bad condition they are scraped and receive three coats of varnish. Panels and dashes are touched up if they need it, and the trucks and roof are given one coat of prepared paint.

It is the practice to paint all iron work, including draw bar, bumpers, etc., with Prince's mineral brown.

Mr. Graham has a way of painting car floors that will commend itself to the practical man. He does not attempt to regrind paint skins and scrapings, but throws all skins, leavings and waste paint of whatever kind into a tub partly filled with oil and turpentine mixed, where they remain until a floor paint is wanted. This slush mixture is then well stirred and strained through a fine colander, the resulting paint being saved and the residue in the colander thrown away. The paint is of course a nondescript color, but has good body and wears exceedingly well on floors. When painting floors an extra coat of the paint is laid on where the most wear comes, as in front of all cross seats and on running boards of open cars, and on steps and platforms of closed cars.

When painting new canvas roofs no paste or sizing of any kind is used. A layer of linseed oil, tinted, is first laid on, and then three coats of white lead, tinted. All roofs are white and the tint is added to the coatings so the painter doing the work will not lose his place and leave some portion of the roof untouched.

Color brushes are kept in water and varnish brushes in varnish cut with a dash of turpentine.

Mr. Graham has a convenient way of keeping for ready reference, records of the work done by the paint shop upon all cars of the system.

Upon a sheet of paper mounted on a board he rules longitudinal columns, one for each division, and places in each column the numbers of all cars that run on that division. When a car comes to the shop he places a pencil mark after the car number. When the car has been overhauled and goes out he changes the first mark to a cross. The cars that were overhauled the previous season are designated on the record by a cross mark in front of the car number. By glancing at the sheet the foreman painter can tell what cars are in the shop, what ones have recently been through the shops, and what ones have not been recently overhauled, this information guiding him in his report to the manager as to how many cars he can accommodate in the paint shop each day, and what cars should be sent. This record is for quick reference only, a complete record showing in detail just what has been done to each car being kept in a blank book for reference when more accurate information is wanted.

HANDLING SCRAP.

Mr. J. A. Carney, of the Chicago, Burlington & Quincy R. R., recently read a paper before the St. Louis Railway Club, in which he described a method of handling machine shop scrap. The scrap divides itself into three classes: (1) borings and turnings; (2) punchings and shearings and odds and ends weighing not more than five or six pounds, and (3) large pieces. Borings and turnings should be collected in wooden trays set under the machine, thus catching nearly all the scrap; the small quantity which falls outside the trays can be collected by the sweeper, who wheels the scrap to a bin where it can be conveniently loaded into cars. At one shop this bin is arranged something on the coal chute order. The bins are filled from a platform on one side, and are so arranged that they can be emptied into a car on the other side by means of a suitable chute or apron. By this method no shoveling whatever is done. The only sorting that this kind of scrap can be given in most shops is to keep cast iron separate from steel and wrought iron.

Punchings, shearings, odds and ends, should be put into boxes of about 200 lb. capacity at the machine where they are made. These boxes, when full, are carried to the scrap shed, where they are piled up ready for shipment to the scrap dealer, or to a central point, where the scrap is sorted. If the scrap is sold, the boxes are dumped into cars. If, however, it is going to some central point for sorting, the boxes filled with scrap are carried into the cars and piled up securely. At the central point the scrap is unloaded in the boxes, sorted and thrown into the scrap bins, the boxes being returned to the point from which they started. The advantages of

handling scrap in boxes are (1) reduced cost of labor for handling and (2) sorting by a natural selection.

The old method of piling scrap up on the ground, then when the pile got in the way to move it to some other place, handling it with a shovel or picking each piece up by hand, was expensive. Practice has developed that a 200-lb. unit is an easy and convenient one to handle. The cost of handling small scrap by the old method amounted to about 20 cents per ton for each handling; by the box method it can be handled for about 6 cents per ton.

Where work on machines is fairly uniform the scrap made must necessarily be of about the same quality. This scrap, when collected and stored in boxes, requires little if any sorting. In this way machine shop scrap, blacksmith shop scrap and boiler shop scrap, especially that covered with scale and known as "lime" scrap, are kept separate, and can be sorted in 200-lb. units much quicker and easier than if each piece, weighing a few ounces, is handled separately.

The boxes used are made of 1-in. unfinished pine, and are 24x 14x5 in. deep, inside dimensions. The sides are extended to make handles for carrying, and the ends are bound with hoop iron.

Pieces of scrap too large to go into boxes are economical units in themselves, and are handled a piece at a time.

WOOD STAINS AND COLORS.

Wood stains differ from paint in that they are nearly transparent and bring out the natural beauty and richness of the wood itself, and while they impart a new color or tint, they do not spoil or obliterate the markings of the grain. Paint is a coat of colored pigments laid over the surface but stains act directly on the substance of the wood by chemical process. Both stains and paints must be finished with varnish if a hard glossy surface is desired.

To stain any wood yellow the timber should be coated with a hot concentrated solution of picric acid which will also give a fairly good polish. To procure a gray tint, apply a solution of one part nitrate of silver to 50 parts distilled water; over this apply a solution of ferric acetate until the requisite shade is produced. These stains are poisonous and should not be allowed to touch the hands.

A rich purple may be obtained by boiling 1 oz. of madder and ½ oz. of fustic in 2 gallons of water. The solution should be applied while boiling hot by brushing over the wood until the desired shade is obtained. Next apply a weak solution of nitric acid and finish with a mixture made as follows: Put 9 oz. of dragon's blood and 2 oz. of soda, both well bruised, into 6 pints of spirits of wine. Let the compound stand in a warm place, shake frequently, and apply with a soft brush, repeating the coats until the proper color is reached. Afterwards polish with linseed oil or finish with varnish.

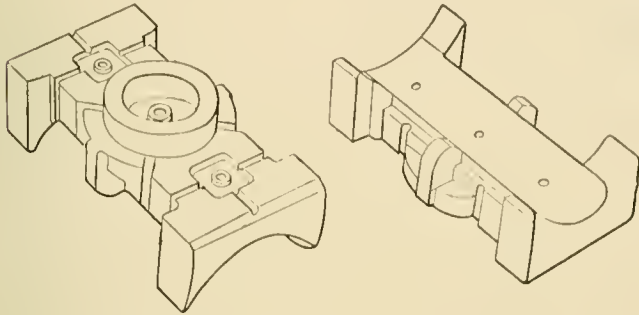
A good mahogany stain can be made by dissolving 2 oz. of dragon's blood in 1 quart of turpentine. To obtain a walnut stain dissolve some dry burnt umber in vinegar or mix 1 lb. of dry Venetian red with 1 pint of asphalt and 1 quart of turpentine. A fine red-brown can be imparted to maple, or a good yellow-brown to oak and fir by the application of a solution composed of 50 parts of commercial alizarine in 1,000 parts of water, to which ammonia is gradually added till its presence can be perceived by the sense of smell. When over this coat is brushed a 1 per cent solution of chloride of barium, the maple takes a dark brown tint, and the oak and fir a lighter brown. If a 2 per cent solution of sulphate of magnesia be substituted for the barium, a dark violet-brown will be obtained on the maple, and a dark brown on the oak and fir. Alum and sulphate of magnesia will make maple a vivid red and oak or fir a blood-red. Chrome and alum give to maple and fir a reddish brown, and to oak a fine Havana brown.

CONCERNING CAR JOURNALS AND BEARINGS.

A review of the subject of hot journals by Mr. Josef Grossman, inspector of the Northwestern Railroad, of Austria, has recently appeared in the *Zeitschrift des Oesterreich*, and was translated for the *American Engineer*. Mr. Grossman considers that experience as well as the elaborate tests discussed in the proceedings of the Institution of Mechanical Engineers (England) in 1883 show that a car journal cannot be oiled from the top. The lubricant must therefore be supplied from below, the journal running in a bath

or in contact with a swab or packing. If the bearing extends too far around the journal it will cramp and transfer the points of greatest pressure from the top to the sides, and the oil applied to the lower part of the journal will be scraped off.

To avoid cramping and because of the unsatisfactory behavior of oil leaders, Mr. Grossman recommends a narrow bearing without oil grooves or leaders, but there are small holes through the top of the bearing and the pressure of the oil layers between the working surfaces is utilized to force small quantities of oil to the back of the bearing, whence it runs through grooves to the unloaded portion of the bearing, thus providing for a circulation of the oil. This bearing is shown in the illustration; it is stated that these bearings have been used in Austria for three years with good results.



In our issue of August last, page 428, mention was made of the journal bearings used by the Indiana Railway Co., of South Bend, Ind. These are much narrower than the bearings generally used, the brasses for journals $3\frac{3}{4} \times 8$ in., having a projected width of only $1\frac{1}{2}$ in. and those for journals $4 \times 8\frac{1}{2}$ in. a projected width of only $2\frac{1}{4}$ in. The M. C. B. standard journal brass for $3\frac{3}{4}$ -in. journals is $3\frac{3}{8}$ in. wide, and that for $4\frac{1}{4}$ -in. journals is $3\frac{5}{8}$ in. wide. The superintendent of the Indiana Ry., Mr. Mark Cummins, stated that the narrow bearings had been used by him because they wore longer and gave less trouble from hot journals.

UNUSUAL CAUSE OF BREAKAGE OF INCANDESCENT CAR LAMPS.

An interesting story of a "trouble" recently came to our knowledge, and the statement of the case may be of assistance to others. The facts are as follows: The auditor of a large railway company found that the number of incandescent lamps for the cars, required at one of the terminals, was very much larger than he thought it ought to be, and called the superintendent's attention to the matter. The superintendent made an investigation and after a considerable time discovered that the fault lay with the men who dusted the interior of the cars. The feather dusters used, by friction on the varnished surfaces of the car, became charged with static electricity, and when brought near the lamps attracted the filament so that the latter was broken.

Such trouble from static electricity is not unusual in shops where there are belts running at high speed and much dust flying, the hot filament of the lamp being attracted to the glass and cracking it.

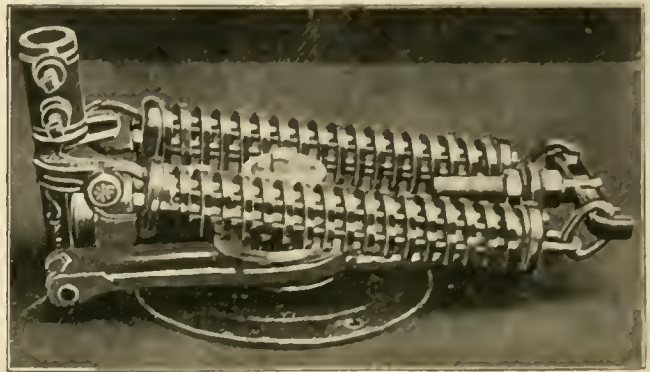
TEST OF WOODEN PULLEY.

Recently the Dodge Manufacturing Co., of Mishawaka, Ind., received an order for an iron center, wood-rim pulley $46\frac{1}{2}$ in. in diameter and 16 in. face, which was to be tested to a rim speed of 9,000 ft. per minute. When this order was filled a duplicate pulley was also made with the object of testing it to destruction. The maximum speed attained in the test was 2,400 r. p. m., corresponding to a velocity of 28,889 ft. per minute for the rim. Further tests are to be made with the idea of determining the maximum speed the pulley will stand.

There is a difference of opinion between the heads of the city departments of Water Supply and of Sewers and the Rapid Transit Commission as to the utility of building side galleries for pipes in the New York underground tunnel. The galleries contemplated in the tunnel plans extended only for a distance of 5,000 ft.

BALL-BEARING TROLLEY BASE.

The accompanying illustration shows a patent trolley base, now being used by the Montreal Street Railway Co., of Canada. The



IMPROVED TROLLEY BASE

pole socket revolves upon a shaft in the usual way, but it is also fitted with ball bearings which permit of every oscillation in conformity with the changes of position in the overhead line. The base is made in malleable iron, and is cheap and durable. It has



PARTS OF BASE.

been in use on the Montreal Street Ry. for some three years and has given the best of satisfaction. It is the invention of an official of one of the local roads.

ASSESSMENTS OF CHICAGO ROADS.

As modified by the state board of equalization the assessments of the street railway companies of Chicago are:

Chicago City Railway.....	\$700,000
Chicago Union Traction	400,000
Chicago Consolidated Traction.....	100,000
Chicago Electric Traction.....	10,000
Chicago General Railway	20,000
South Chicago City Railway.....	50,000
General Electric Railway.....	5,000

PROVIDENCE FENDER MOVES TO NEW YORK.

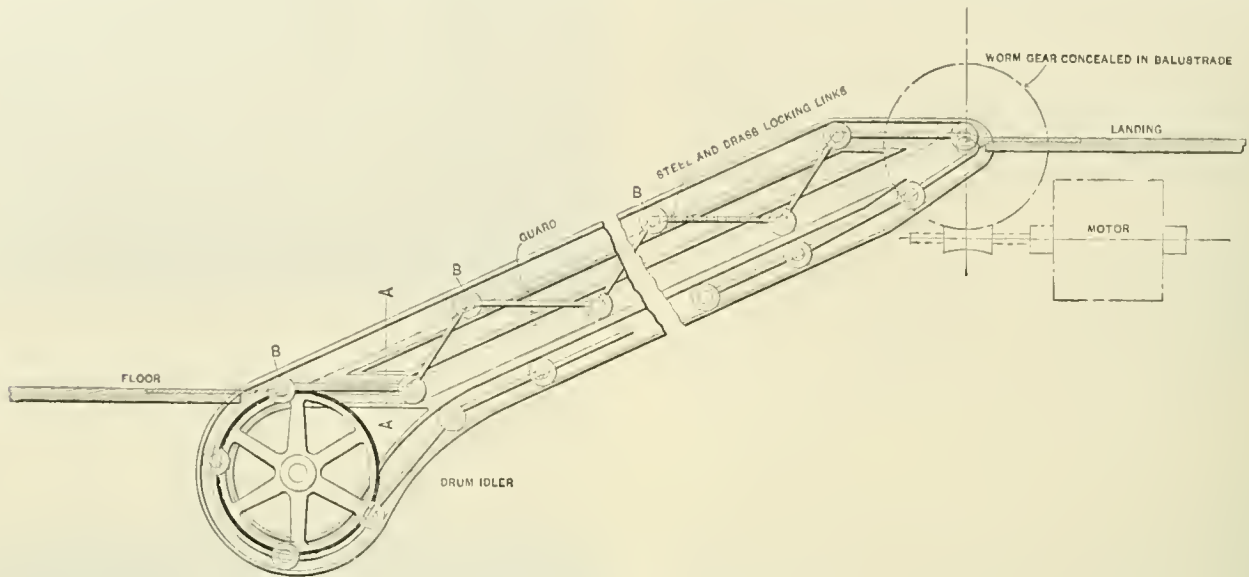
The Consolidated Car Fender Co., which has had its general office and factory at Providence, R. I., has moved its headquarters to New York City, and opened offices at 39 and 41 Cortlandt St. This has been found necessary on account of the rapidly increasing business of the company. The American factory will remain at Providence as heretofore.

General Manager Woodworth also advises us he has completed arrangements for the manufacture of his fenders in Canada, and will make them in Ottawa at the works of the Ottawa Car Co. Hereafter all the Providence fenders used in Canada will be made in Ottawa.

THE LINK-BELT STAIR-LIFT.

We illustrate, this month, in the Link-Belt stair-lift, the latest development in that line of passenger elevators known generically as moving stairways. The field of the moving stairway seems already well marked out. Where the problem is to handle a large

passage around the sprocket wheels or rollers, and perfect rigidity in the other direction, providing a perfectly secure and solid footing. This belt carries shafts with self-oiling rollers at intervals. The framing provides two tracks, an upper one and a lower one. A stationary frog at the foot of the stairway switches alternate shafts into the upper and lower tracks in turn, thus deflecting the

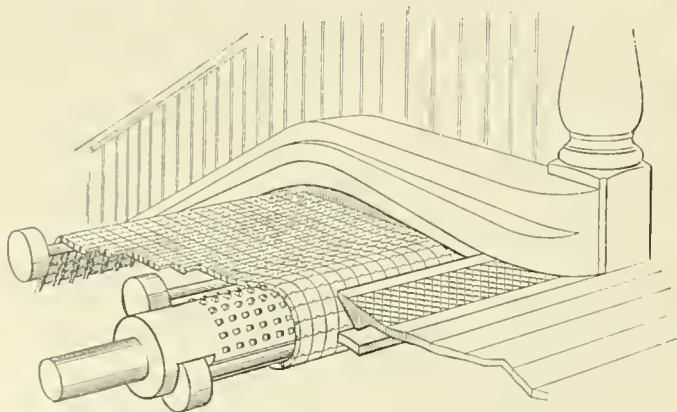


LONGITUDINAL SECTION OF STAIR-LIFT.

number of people expeditiously from floor to floor, the standard passenger elevator must take a rear rank position, both as to capacity and convenience. The fact that a moving stairway keeps everlastingly at it, and is doing efficient work all the time, gives it its tremendous advantage over any elevator, however large for handling great numbers of people for one story. It never has to go back after another load. Two general types have been evolved hitherto in the effort to meet the demand for an efficient machine. The first is simply a moving belt inclined upward. The second consists in detaching the steps of an ordinary stairway from each other and attaching them to an endless chain, and thus forming an elevator. The objections to this scheme are the necessity for extending the stairway into a moving platform at both top and bottom, its great weight and the space occupied. The objection to the first type is obviously the fact that the passenger does not stand on a level step.

The stair-lift seems to meet the conditions for a practical machine belt into alternate treads and risers. The cut of the foot housing shown herewith with the floor cut away gives a view of the flat belt as it comes around the foot idlers, and of the belt after it has formed into the treads and risers. The passenger simply steps on and is carried smoothly, rapidly and comfortably to the top, there

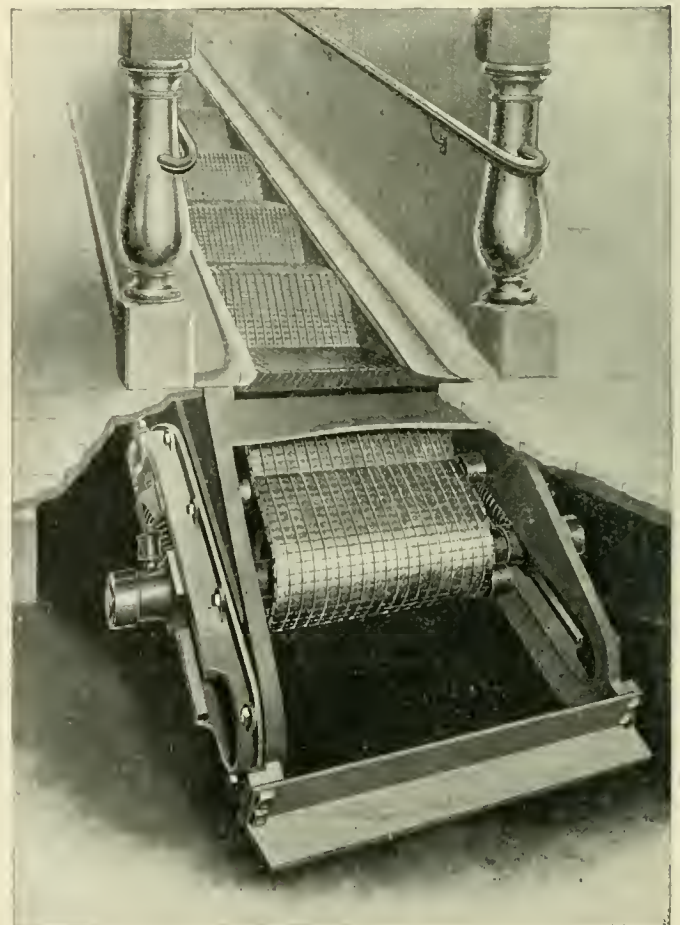
The stair-lift seems to meet the conditions for a practical machine



DETAILS AT LANDING.

very fully. It is strong, efficient mechanically, and light. It partakes of the good features of both of the earlier conceptions and of none of their faults. The belt construction gives compactness and lightness, and the fact that the passenger stands on a level tread attains to the one advantage which the second type mentioned above has to offset its cost.

The stair-lift is composed of an endless belt made up of steel links, so arranged as to give flexibility in one direction, permitting



GENERAL VIEW.

to be delivered safely, surely and easily, whether he remembers to step off or not. This is where the advantage of a flexible belt comes in. It makes it possible to run the entire belt around a very small sprocket roller at the head in close proximity to the dull edge of the landing plate placed slightly below the highest level reached by the tread in its ascent. The form of construction at this point is well shown in the engraving.

The stair-lift is the invention of Mr. James Mapes Dodge, president of the Link-Belt Engineering Co. and of the Dodge Coal Storage Co., a gentleman whose large experience in elevating machinery would seem to give some weight to his productions in the line of a continuous elevator for people.

The applicability of such a machine to the street railway world is obvious and immediate. For elevated railroads, for surface roads connecting with elevated roads, for roads running in a subway, it is destined to provide means for overcoming cheaply and completely the objection of the average human being to climbing stairs.

The stair-lift is actuated by an electric motor, placed beneath the floor. Traveling at the rate of 90 ft. per minute, with a passenger on each step, 3,000 people per hour can be elevated without crowding or delay. From rail to rail, the stair-lift is 3 ft. in width. The belt is only 21 in. wide, tests having proved that a greater width does not give any increase in actual carrying capacity. It may be noted in this connection that large passenger elevators in one of the biggest railroad stations in the country show a maximum of seven people a minute in rush hours, whereas this apparatus at the speed mentioned, 90 ft. per minute, will handle more than fifty. Unlike the vertical elevator, the stair-lift requires no attendant, and as but 5 h. p. electric current is required for a machine adapted to a vertical distance of 16 ft. under maximum load, its economy of operation is apparent.

NOTES ON TRACK.

The following notes are abstracted from reports submitted at the annual meeting of the Roadmasters' Association of America, held in Los Angeles, Cal., November 13th to 15th.

Mr. Gurdon W. Merrell presented a report favoring the adoption of a resolution recommending the reversal of alternating bolts at the joints where the rails used are high enough to permit the nuts placed on the inside to clear the wheel flanges. His reasons for this are several. The shoulders on bolts in slots in the angle bar cause an undue proportion of the stress due to expansion and contraction of the rails to come on one angle bar, frequently breaking the bolts and crowding the joint out of line. The staggering of the slots for spikes makes it impossible not to have some spikes so placed that they can not be driven or pulled without removing the bolt; by reversing alternate bolts the heads may be placed over such spike slots and this interference avoided. In case of a derailment of a single pair of wheels they will shear the bolts when striking the nuts while they will not damage them if striking the heads.

Messrs. T. Hickey, G. M. Brown, T. S. Cafferty, J. W. Meredith, H. Ferguson and P. W. McKeon made the following recommendations concerning the plugging of ties. 1. Since every spike hole left unplugged fills with water after the first rain, which remains there to soften and rot the tie, where a spike is withdrawn for any purpose the hole should be plugged and spike redriven in the same place, when practical to do so without weakening the tie by putting in a new place and cutting off more of the fiber of the tie. 2. A spike driven in the tie plug, more particularly in soft wood ties, holds with more than double the adhesive force with which it held when first driven; the advantage of driving the spike into the tie plug results from the fact that when a spike is driven into a tie it must displace and carry down with it a sufficient quantity of fiber to allow the body of the spike to be partly unsupported, whereas when driven into the plug it enters lengthwise of the grain of the plug and simply compresses the fiber of the plug against the walls of the spike hole. 3. Experience has demonstrated that the best kind of timber from which tie plugs should be made is second growth elm, white oak, and ash, in the order in which they are mentioned; cedar and pine are totally unfit for tie plugs, the timber being too weak and brittle to stand the impact of the blows necessary to drive them home, so that they will break off when only

partly driven. This is a very serious defect, because while it may plug the hole against water, if the spike should be driven into it, it will go partly down with it, and thus leave the spike unbraced either at its neck or at its point. The tie plug, therefore, should be of sound, hard, tough timber to secure the best results. Elm has the preference over oak, because when pressure and friction are applied to elm it develops a rough surface, whereas where the same forces are applied to oak it develops a smooth, slippery surface. Oak is also heavier and more costly. Ash is but very little different from oak as far as its qualities are concerned.

Mr. J. M. Meade, resident engineer of the Santa Fe, Topeka, Kan., presented a paper on the "Chemical Treatment of Cross Ties," and gave data on the cost of the zinc-tannin or Wellhouse method at the Las Vegas tie treating plant of the company. The figures for 1898 were: chemicals, 10.97 cents; labor, 2.50; fuel and supplies, .31, a total of 13.78 cents per tie. For 1899, the cost was: chemicals, 12.11 cents; labor, 2.26; fuel and supplies, .33, a total of 14.70 cents per tie. The average for the two years is practically 14¼ cents per tie. The Santa Fe has three tie-treating plants with a total aggregate capacity of over 11,000 ties per day.

SPECIAL CARS IN CALIFORNIA.

The Los Angeles (Cal.) & Pasadena Electric Railway Co. owns a number of interesting cars, several of which we are able to show herewith through the courtesy of Mr. W. H. Smith, manager.

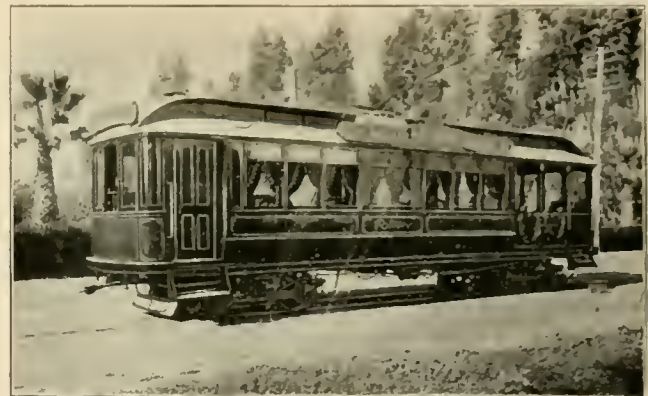


FIG. 1 OBSERVATION CAR.

Figs. 1 and 2 are exterior and interior views of a parlor car rebuilt from a standard coach. It has wide observation platforms, a feature that adds greatly to its value as a pleasure car. The



FIG. 2 INTERIOR VIEW.

interior furnishings include complete buffet, with china closet, ice-box and running water, electric stove and heater, and portab'e dining and card tables. The car is lighted with two 1,000-c. p. direct

current arc lights inside and one outside, which are operated in series with the arc headlight, the resistance of the lamps being used to heat the cars at night, which is necessary the year round in California. The arc lights are the invention of the chief electrician, Mr. S. H. Anderson, and any number up to eight can be operated in series, consuming but 2½ amperes. The company is now equipping all of its cars, inside and out with this style of light, and finds them to be as economical as the small incandescent lamps and



FIG. 3—STANDARD CAR.

far more satisfactory to the traveling public, as they will give a perfect light, even though the voltage drops 150 volts, whereas incandescent lamps would give hardly a glow. The car is equipped with two 50-h.p. Westinghouse motors and axle-driven air brakes.

Fig. 3 is the company's standard coach, 35 ft. long over all. It is equipped with two 50-h. p. motors and axle-driven air com-



FIG. 4.

pressors for the brakes. The seating capacity is 42, but upon one occasion the car has carried in one load 174 passengers from Los Angeles to Pasadena, and none were on the roof.

Fig. 4 is one of three cars which were originally constructed by the old company to be used as trailers. They were found to be too heavy for that purpose, however, and were therefore equipped with



FIG. 5—COMBINATION MAIL COACH.

two 50-h.p. Westinghouse motors and air brakes, and are now used to pull a light but substantial trailer, the seating capacity of the two cars being 72 persons. On the occasion of a big Republican rally in Los Angeles during the recent political campaign, the two cars hauled 153 passengers on one trip.

Fig. 5 shows a combination mail coach recently put in service under contract with the Government. It is 42 ft. 5 in. long, with 16-ft. mail compartment, and is equipped with two 50-h.p. Westing-

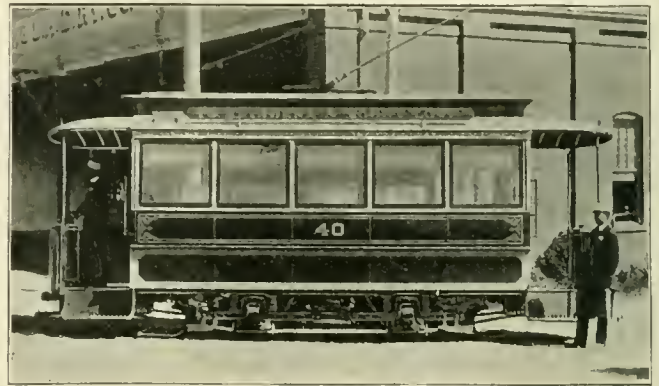


FIG. 6—STANDARD SHORT CAR.

house motors, air brakes, interior arc lights, and arc headlight. Its seating capacity is 32 persons. The car makes three round trips daily between Los Angeles and Altadena.

Fig. 6 is a standard "dinkey" used in local service in Pasadena. It is equipped with two 25-h.p. Westinghouse motors and arc headlights.

Fig. 7 illustrates the company's wrecking car, which is equipped with two 40-h.p. Westinghouse motors, and will pull a 15-ton car up a 7 per cent grade. So easily does it handle the heaviest cars



FIG. 7—WRECKING CAR.

on the road, the wrecking crew have hung up a sign in one end reading "All cars look alike to me." The wrecker is provided with several appliances for the quick handling of wrecks of all kinds, one of these being a four-wheel "dolly" truck used in cases of broken

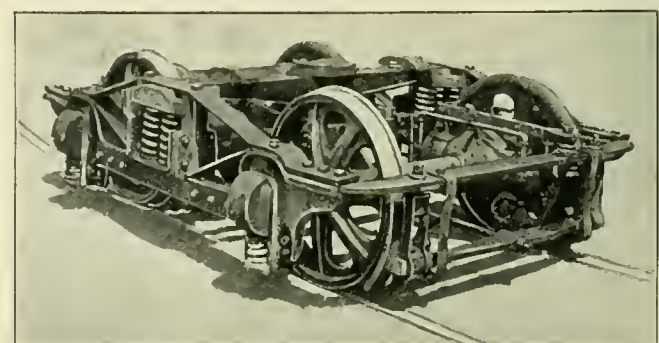


FIG. 8—STANDARD TRUCK.

axles and wheels. The "dolly" is run under the car in trouble, the truck is chained to the body, and the car hauled to the barn by the wrecker, with "dolly" acting as one truck.

Fig. 8 is the company's standard truck, which it builds at its own shops.

In Fig. 9 are shown different views of the Mt. Lowe division from Altadena to Alpine Tavern.

Mr. Smith adds the following information regarding the practice of cleaning cars:

"All of our cars except the three used for hauling trailers are upholstered in plush and are cleaned throughout once a week with compressed air. Owing to the fact that our cars lie over half an hour after each round trip at the Pasadena terminal, we are enabled to keep them swept and the windows very clean at a slight cost. We never use water on the windows or car bodies, but use for window cleaning 'Bon-ami' soap, and one man can clean the windows of one car perfectly in 20 minutes. For car bodies we use a liquid car cleaner, which we find has increased the life of the varnish six months and keeps the surface of the body always looking bright.



Granite Gate, "Ye Alpine Tavern," and View between Echo and Alpine.

FIG. 9—SCENES ON THE MT. LOWE DIVISION.

The aisles of all cars are carpeted, we having found after a great deal of experimenting that carpet wears the longest and is quite an attraction to passengers, and has the moral effect of assisting us to keep the cars cleaner, as we find that passengers of all classes will invariably scrape their feet before entering the car, and it is very seldom that cars are littered up with peanut shells, etc. We are also very strict regarding the rules posted in both ends of cars prohibiting the spitting on the floor, and the carpet has its effect in preventing that disgusting practice."

The Toledo (O.) Fremont & Norwalk Electric Ry. sells 1,000-mile ticket books that are transferable.

OPENING OF ALBANY & HUDSON RAILWAY.

The formal opening of the line occurred on November 22d last. On that day a party of 100 invited guests, including a number of gentlemen prominent in engineering and manufacturing circles, left the Grand Central Station, New York, at 9 a. m., by special train, and were taken to Hudson. Here two of the new electric cars were in waiting, and the run was made to Rensselaer at an average speed of 35 miles an hour, and a maximum of 50 miles on several stretches. On the return trip the party inspected the transmission line, power house, the North Chatham sub-station, etc., and it was evidently the verdict of the party that the promoters and engineers were to be heartily congratulated upon the manner in which they had faced and solved the intricate problems involved.

During the trip from Hudson to New York an elaborate luncheon was served under the direction of Delmonico.

FINANCIAL REPORT OF SOUTHERN OHIO COMPANY.

The Southern Ohio Traction Co., of Hamilton, O., held its quarterly meeting in the Garfield building, Cleveland, November 13th, President Will Christy, of Akron, presiding. The financial report showed that the gross receipts of the company for the period from May 1st to November 1st were \$171,040.62, the net earnings \$88,076.60, and the surplus \$42,406.95. A dividend of three-fourths of 1 per cent, payable December 1st, was declared. M. J. Mandelbaum, chairman of the executive committee, reported the negotiations for the extension of the company's line to Cincinnati as progressing satisfactorily.

STREET RAILWAY MAIL SERVICE IN GERMANY.

The city of Frankfort on the Main, Germany, which operates the street railways and has recently converted them for electric traction has made a contract with the imperial postal bureau for transporting the mails between the central post office and the railway station, which is a union station. Tracks have been laid in the court of the post office building and before the station, and special cars have been put on for the service.

These cars are 25 ft. over the buffers; 5.8 ft. wide, and 11.15 ft. high above the rail. The body is 15.74 ft. long and divided into two compartments one of which is three times as large as the other. The smaller compartment is used for letters and registered packages and the larger one for ordinary packages. It is expected that by using these larger vehicles the number of trips between the stations will be reduced to 20,000 per annum instead of 50,000 as formerly.

VESTIBULES IN MASSACHUSETTS.

The Massachusetts Railroad Commissioners will soon render their decision on the question of whether vestibules shall be placed on Boston street cars. The Lynn & Boston, the West Roxbury & Roshindale, and the Boston Elevated petitioned to be exempted from the law which makes vestibules compulsory outside of Boston and leaves their use within the city to the discretion of the Railroad Commissioners. A hearing was given the petitioners in November and the case continued until December 17th.

BICYCLES IN TACOMA.

It is the practice of the Tacoma (Wash.) Railway & Power Co. to transport bicycles on its cars, the wheels being carried on the car fender. Owing to the inconvenience caused by the delays of loading and unloading the bicycles, the company has been obliged to refuse to carry bicycles between 4:45 and 7:15 p. m., the period of greatest traffic.

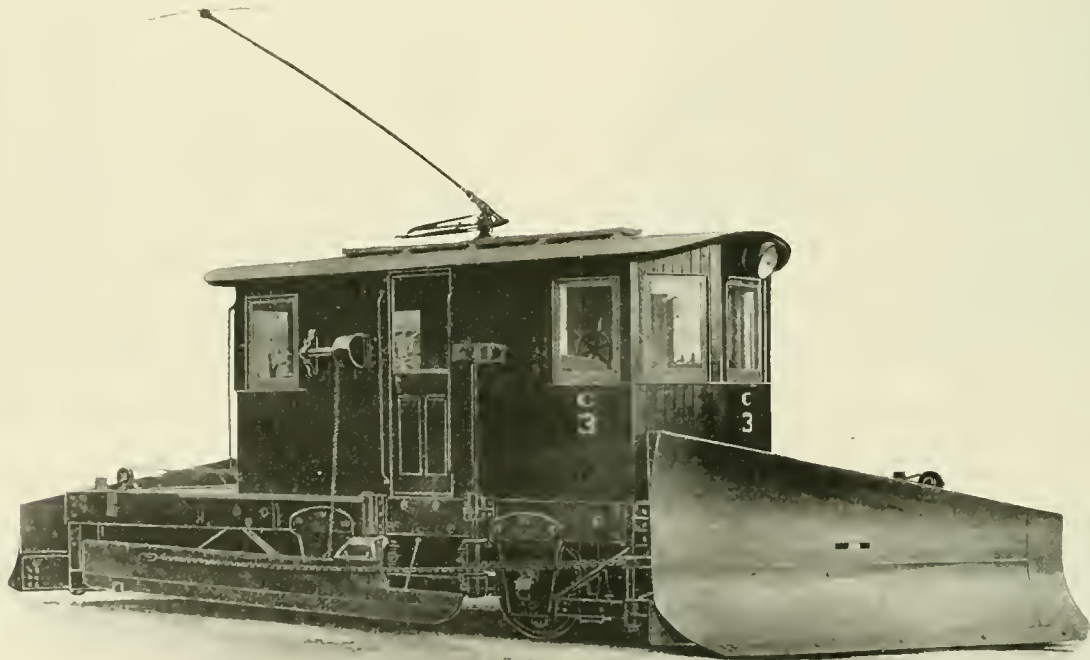
An employe of the Cleveland City Ry., having been detected in taking tickets from the company's safe, has confessed that he has stolen \$1,500 worth of tickets which he sold to conductors at half their face value.

LAYING TRAMWAYS IN GERMANY.

A number of attempts have been made in Germany to devise means for lessening the cost of maintenance of tracks laid in trees with asphalt pavements. United States Consul Hughes, of Coburg, writing to the State Department, states that just now much is being said in praise of a system which is being tried in Berlin. Contrary to the ordinary practice of laying the rails immediately upon a foundation of concrete and in direct contact with the superimposed asphalt, the new method consists in placing the rails upon a bed of coarse gravel and running a line of hardwood blocks along each side of the rail.

BUFFALO SNOW PLOW.

The accompanying illustration shows one of seven double shear snow plows built in its own shops by the International Traction Co., of Buffalo, after designs of Mr. Robert Dunning, master mechanic. The framing in the body is of oak, very heavy; the side sills are 6 x 12 in. and on each side one of them projects forward to support the front end of the shear. The shear is set at an angle of about 45 degrees with the center line of the car and is made in two pieces so that when it is desired to have the shear higher above the track it is only necessary to lift the lower half. The bracing of the shear is of old flat and T-rails and at the back it is supported by vertical T-rails which slide in grooves made to receive the rail heads. The side frames of the truck are made of two steel channels enclosing an oak timber; these side bars are also extended to support the lower corner of the shear.



BUFFALO SNOW PLOW.

A flue or leveler at the side is operated by chains which are wound around shafts driven by worm gearing. On the side where the fluke is used the lower half of the opening in the cab is closed with a door and a heavy curtain pulled down to meet it; on the opposite side the car may be entirely closed by a door making the cab very comfortable for the men.

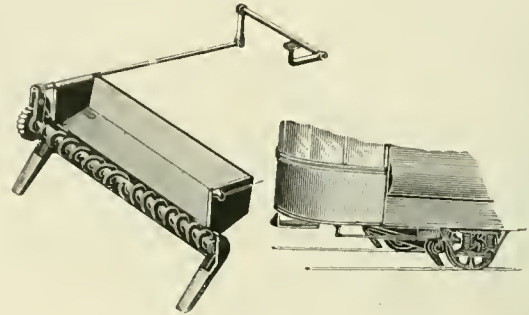
Each plow is fitted with two G. E. 57 motors and, fully equipped, weighs about 13 tons.

Three men are required to operate the plow, one at the controller, one to adjust the shear and fluke, and one for the trolley pole.

It is announced that work will be commenced in the early spring on the Grand Rapids (Mich.) & Ionia Ry. The route will include Lowell and Saranac.

THE HAMMOND SANDING DEVICE.

The track sanding machine shown in the accompanying engraving is the invention of O. S. Hammond, of 102 Pearson Ave., Toronto, Ont. It consists of the following essential parts: A hopper for the sand, carried underneath and running the full width of the car, immediately in front of the forward pair of wheels; a



HAMMOND SANDER.

spindle inside and near the bottom of the hopper, having upon its surface, right and left hand threads or helically arranged projections, which when the spindle is rotated carry the sand from the center of the hopper each way toward the ends; spouts at the ends of the spindle to guide the sand to each rail at a point just in front of the wheels; a system of levers whereby a pawl is made

to engage a ratchet wheel at one end of the spindle, and thereby rotate the spindle a portion of a revolution at a time, causing the sand to be fed upon the rails. The levers are operated by means of a foot piece projecting up through the front platform.

Among the claims made for the machine are that it is positive and economical in action and it will work with wet or lumpy sand.

LOW WIRE COSTS \$4,000.

Arbitrators, to whom the decision of the case was left, last month awarded Mrs. Ada L. Little \$4,000 for the death of her husband, who was thrown from a freight car by reason of striking a trolley wire of the Chester (Pa.) Traction Co. The plaintiff had sued for \$50,000.

HALF FARES.

The first car was run over the Auburn (N. Y.) and Skaneateles electric line early in November.

The street railway system of Guadalazara, Mexico, has been purchased by a Pittsburg (Pa.) syndicate.

Work will be commenced on the Toledo, Fostoria & Findlay Electric Ry., early in the summer of 1901.

The proposed electric interurban between Greenfield and Kokomo, Ind., will not be built until next year.

November 13th, 2,400 ft. of trolley wire was stolen from the poles of the Calumet Electric Street Railway Co., of Chicago.

An ordinance requiring street cars to be run 17 hours per day failed to pass the Bay City (Mich.) council over the mayor's veto.

Fare boxes will be put in the cars of the Terre Haute-Brazil (Ind.) line, thus relieving motormen of the duty of collecting fares.

The Buffalo (N. Y.) Hamburg & Aurora Ry., which was opened October 5th, has established an hourly service between these cities.

There are said to be four separate companies contending for the rights of way for an electric line between Toledo and Adrian, Mich.

The Dallas (Tex.) Consolidated Electric Ry. has acceded to the requirements of the city and will use a 74-lb. grooved Johnson rail.

Pres. John M. Roach, of the Chicago Union Traction Co., proposes to erect two clubhouses for the use of employes and their families.

The Tuscarawas Railroad Co. has inaugurated a street railway mail service on its lines running between Uhrichsville, O., and New Philadelphia.

The Duluth-Superior Traction Co. properties for the first nine months of 1900 had gross earnings of \$324,830 and operating expenses of \$197,278.

A new street railway mail car has been put on the lines between Los Angeles and Garvanza, Cal., affording a service of seven mails each way per diem.

The new circuit line between McKeesport and Wilmerding, Pa., built by the United Traction Co., of Pittsburg, was put in operation November 22d.

William A. Boland was granted a franchise in Jackson, Mich., November 19th, by which the franchise of the Jackson Street Railway Co. is repealed.

The Stamford (Conn.) Street Railroad Co. has completed its extension to Glenbrook, and a regular service between the two cities has been inaugurated.

Gross earnings of the Cleveland Electric Ry. for October, 1900, were \$185,000, which was \$32,200 better than for October, 1898, and \$45,000 better than for October, 1899.

The Indianapolis (Ind.) Street Railway Co. will remove its system of feed wires in the down town district so as not to conflict with the work of the fire department.

Mr. Ira A. McCormick, general manager of the Cleveland Electric Ry., has made a number of improvements which have procured for him the hearty approbation of the local press.

The Millcreek Valley Street Railway Co., Cincinnati, O., has applied for permission to lay double tracks over the entire route between Glendale and Hartwell, in Hamilton County.

The first spike in the new electric railway being built by the Toledo (O.) & Western Railway Co. from Toledo to Sylvania, was driven by President Luther Allen, of Cleveland, November 9th.

Montana will have the longest electric railway in the world when the proposed line from Billings to Great Falls is completed. An important branch of this road's business will be the hauling of coal and ore.

The Twin City Rapid Transit Co., of Minneapolis, in its report for October shows gross earnings of \$240,793, an increase of \$11,584; net, \$131,291, an increase of \$7,095, and surplus, \$93,035, an increase of \$10,689.

The Tacoma-Seattle Ry. is making preparations for the rapid construction of its line. A saw mill with a capacity of 20,000 to 30,000 feet per day has been erected on the Puyallup reservation to get out ties and timber.

The Columbus, Lima & Northwestern Railway Co., recently incorporated, has secured control of the Detroit & Lima Northern, a steam road, which will soon be equipped for electric traction and extended through the Scioto valley.

A new trolley line, one mile long, has been completed at League Island Navy Yard, Philadelphia, for the purpose of saving the men a mile walk across the prairie, in winter. It is understood that no fare will be charged on the new line.

The completion of the Toledo, Fremont & Norwalk Street Railway Co.'s interurban line was celebrated by a sumptuous banquet at Toledo, November 10th. Officers of the line and their friends participated, and covers were laid for 35.

November 27th an ordinance was presented to the Chicago council asking permission for the Citizens Electric Street Railway Co. to build an electric line in Foster and Lincoln Aves. Nothing is known as to the interests asking this franchise.

The Twin City Rapid Transit Co., of Minneapolis, Minn., will make a special effort to keep both its interurban lines in regular operation during the winter. For this purpose several additional 25-ton snow plows have been purchased.

The Buffalo & Niagara Falls Electric Railway Co. proposes to remove its car barns from Gratwick to the Military Road, near Hertel Ave., Buffalo. A new brick and steel structure for the purpose will be completed by January 1, 1901.

The Chattanooga (Tenn.) Rapid Transit Co. has acceded to the property of the Chattanooga & Northside Street Railway Co. Bonds to the amount of \$110,000 have been issued on the purchase, and taken by C. P. King, of Philadelphia.

The construction of the proposed electric line between Mechanicsburg (Pa.) and Carlisle was commenced November 8th, and celebrated at Mechanicsburg with imposing ceremonies. The first spike was driven by Miss Janet Hufford, of Reading.

An agreement has been effected by the street cleaning commissioners of New York City and the street railway companies operating there, by which the latter will remove the snow from the principal streets covered by their tracks, during the winter.

William A. Boland, who has applied for a franchise for his interurban railway, in Ann Arbor, Mich., proposes as the rate of fare 1½ cents per mile. The franchise, if granted, will provide for the forfeiture of a bond of \$10,000 if work be not commenced within three months.

The Portland (Ore.) Railway Co. recently established a new wage rate by which first year employes will receive 17 cents per hour, second year employes 18½ cents, and third year employes 20 cents. This increase will affect 90 men, and is received by them with great satisfaction.

November 14th, the Rapid Railway Co., Port Huron, Mich., entertained the city officials of Port Huron, St. Clair, Marine City and Algonac. The party was taken over the line in a special car and then back to Port Huron where an elaborate dinner was served at the Hotel Harrington.

The Houghton County (Mich.) Street Railway Co. made a record by the rapidity with which its line from Houghton to Hancock was constructed. The first shovelful of dirt was excavated July 31st and the current was turned on for the operation of the completed road October 25th.

December 1st, Maj. R. B. Baer, receiver for the Galveston (Tex.) Street Railway Co., filed his report for the month of October with the clerk of the United States Court. The report is as follows: Operating expenses, \$16,102; maintenance of property, \$2,501; gross earnings, \$4,059; deficit, \$14,543; balance on hand, September \$123,022.08; surplus, \$108,479.

The Toledo, Fremont & Norwalk Electric Railway Co. has awarded the Massillon (O.) Bridge Co. the contract for a new 200-ft. bridge to span the Huron River at Monroeville, O. The bridge will be completed and operation over this portion of the company's line commenced early in January.

The Asheville (N. C.) Electric Co. has made a number of improvements at Riverside Park in anticipation of increasing traffic on the street railway lines next summer. A quarter-mile race track, baseball and football fields, a dancing pavilion, and vaudeville stage have been added to the attractions of the resort.

Regular service on the new line of the Mahoning Valley Railway Co. between Youngstown (O.) and Lowellyville was commenced November 13th. The formal opening was on the preceding day, when the general manager, Mr. A. A. Anderson entertained a party, taking the guests over the new line in his special car.

Mr. J. R. Wharton, manager of the Butte (Mont.) Electric Railway Co., advises us that on last Labor Day his company had over 12,000 people at its park, known as Columbia Gardens, and during the season 262,659 people were carried to the resort. The park was described in the "Review" for last August, page 437.

The Wisconsin Midland Railway Co. has been organized by the promoters of the Berlin-New London line, among whom are included Charles C. Pierce, of Chicago, and W. C. Lawrence and A. L. Hutchinson, of Weyauwega, for the purpose of building an electric line from Berlin (Wis.) to Weyauwega and New London.

The Ohio River Electric Ry. has been opened between Middleport and Racine, a distance of 14 miles. The route is a line of almost continuous towns and villages. Steamboat service has been their principal dependence in traveling heretofore, and for this reason the newly opened electric railway is of incalculable benefit.

As announced in our last issue the interurban line of the Ohio River Electric Railway & Power Co., connecting the towns of Pomeroy, Middleport and Racine was formally opened on November 14th. Mr. John Blair MacAfee issued special invitations for the occasion and the guests were entertained at a dinner served at the power house.

Contrary to American practice, where electric motors smaller than 5-h. p. are seldom used for driving machine tools, experience in Germany has shown that small motors for this purpose may be the more advantageous despite their low efficiency. Success has been obtained with alternate-current motors of 2 h. p.; with these no regulating resistance is used.

The State Association of County Auditors held its regular session in Columbus, O., recently, and declared in favor of raising all taxes for state purposes, except the school levy, by means of levies on franchises and corporations, thus making county taxation a strictly local matter. The position was also taken that machinery, power houses, etc., were taxable as real estate, and that street

railways should be taxed as chattels and returned by the annual board of equalization, rather than as realty and fixed by the decennial board.

Some months ago, on the statement of physicians that the long hours of standing were injurious to its motormen, the Pensacola (Fla.) Electric Terminal Railway Co. permitted its motormen to use stools. November 8th this rule was rescinded and the motormen at once struck. After two days a compromise was effected whereby the men won their point.

A report for two years of operation of the Grove City & Green Lawn Electric Ry., Columbus, O., recently compiled by the manager, A. G. Grant, shows half a million passengers to have been carried in the two years. There have been no accidents of any kind except the killing of one horse and one cow. The gain in receipts of the second year over the first was 14 per cent.

Sir William C. Van Horne, chairman of the board of directors of the Canadian Pacific R. R., and his son, R. B. Van Horne, of Montreal, sailed from Philadelphia for Santiago, Cuba, November 8th, where they propose to secure options on all the horse and electric railways on the island in the interest of the Cuba Co., which has been organized in Philadelphia with a capital of \$20,000,000.

The entire street railway system of the Key West Electric Co. was tied up in November by a strike of conductors and motormen for higher wages and other advantages which the company refused to grant. The strikers were aided financially and otherwise by the cigar makers of Key West and remained out for about ten days, when the matter was settled by arbitration. The company reinstated all but four of the men.

November 14th Messrs. C. W. Wetmore and George R. Sheldon, directors of the Milwaukee Electric Railway & Light Co., arrived in Milwaukee and spent several days in inspecting the system. There had been no inspection of the property for over 18 months, and the non-resident directors expressed themselves as highly gratified at the extensive improvements that General Manager Beggs has carried out in that time.

Mr. H. G. Foltz of New York City, who recently applied for rights of way for an electric line between Lisbon and Salem, O., has abandoned his original project of extending the proposed line to East Liverpool, since it was announced that the Baltimore & Ohio R. R. will build a branch from Pittsburg to East Liverpool. Mr. Foltz is preparing to build between Lisbon and Salem at an early date.

Recent storms throughout Ohio have rendered the management of local street railways difficult, traffic on the Toledo, Fremont & Norwalk Electric Ry. being impeded for several days by broken wires, and trees blown across the tracks. The storm blew down the smokestack of the Akron & Cuyahoga Falls Rapid Transit Co., at Cuyahoga Falls, which crashed through the roof of the power house and damaged the machinery to a considerable extent.

The Chattanooga Rapid Transit Co. is threatened with competition in its Lookout Mountain service. The Rapid Transit company controls the inclines up the mountain and proposes to charge passengers coming to the incline on the Chattanooga Electric Ry. the same fare as is charged for the entire trip from any part of the city over the Rapid Transit lines. The Electric Railway company states that it may build a third inclined road up the mountain.

The North Jersey Street Railway Co. is being sued by Mrs. Rebecca Jenny, of Newark, N. J., for financial loss incurred by the death of her husband, Isaac Jenny, who was killed October 20th in a collision between a truck and a car on the company's line. In her complaint Mrs. Jenny alleges that her husband was doing a business of \$150,000 a year, out of which he made large profits, and she demands as redress for the loss of her share in this income the sum of \$75,000.

THE STREET RAILWAY SYSTEM OF WICHITA, KAN.

Wichita had an electric railway as early as 1887. This was purely an experimental line, however, built under patents issued to Dr. A. W. Adams, of St. Louis, Mo., and was never a success financially. In Dr. Adams' system, a hollow copper tube took the place of the trolley wire, it being put up in 18 ft. lengths, with an overhead switch at the end of each length, to cut the sections into circuit

successor to the Wichita Electric Railway & Power Co., found itself with miles of absolutely worthless lines. The rolling stock and power station were in wretched condition, and the owners being in financial straits could do nothing toward putting the property upon a better footing. The condition finally became so bad that the city of Wichita brought proceedings in the District Court to have the road declared a common nuisance and the company enjoined from operating the property. It was asserted by the newspapers that during the course of this trial, the judge had

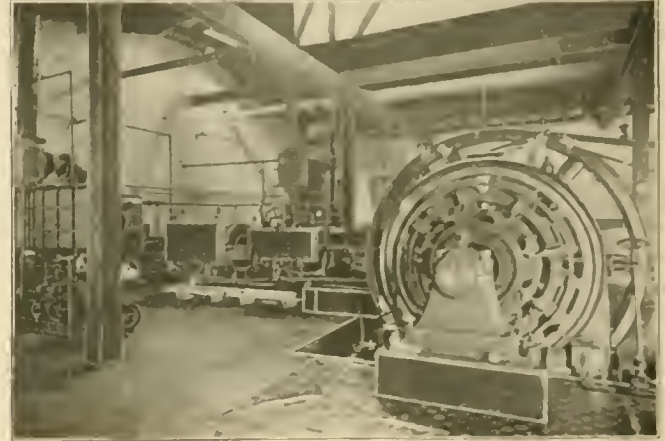


LOOP AT RIVERSIDE PARK.

as the car ran through them, and to cut them out when the car had passed.

In 1887, Mr. J. O. Davidson, president of the Riverside & Suburban Railway Co., who was backing the Adams experiments, purchased the Wichita & Suburban Ry., then being equipped electrically. He also bought the Valley Center Ry., operated by steam power, and consolidated the three companies under the name of the Wichita Electric Railway & Power Co.

Just previous to this period, Wichita, for some reason unexplained, attracted the attention of Eastern capitalists who purchased large real estate holdings and started a boom of gigantic proportions. City streets were extended out into the wilderness, the surrounding prairies were staked off into building lots in the



250-KW. WESTINGHOUSE GENERATOR.

to arrest proceedings every time cars passed on an adjacent street as the noise they made prevented ordinary conversation in the court room. The court granted the injunction but ordered it held non-operative for a reasonable time in order to give the company another opportunity to make repairs.

A solution of the difficulty was finally reached by the sale of the franchises and property to a new company, known as the Wichita Railroad & Light Co.

Under the new management a complete renovation has been made. Non-paying lines have been taken up; complete new rolling stock purchased and the power station remodeled and enlarged.

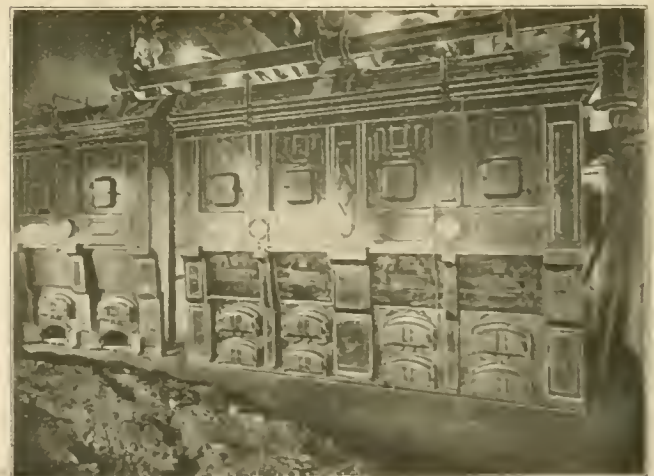
It is interesting to note what effect this action has had on the community. The building of the new line seems to have inspired



BRIDGE OVER ARKANSAS RIVER.

regulation "boom" fashion, and enough street railway mileage was built to fill the needs of a city with five times the population. Every promoter who laid out an addition in a cornfield, immediately proceeded to have a street railway built to his property. It is said the only income that some of these roads enjoyed was derived from enthusiastic wealth seekers who were willing to pay fare out and back in order to see the new addition.

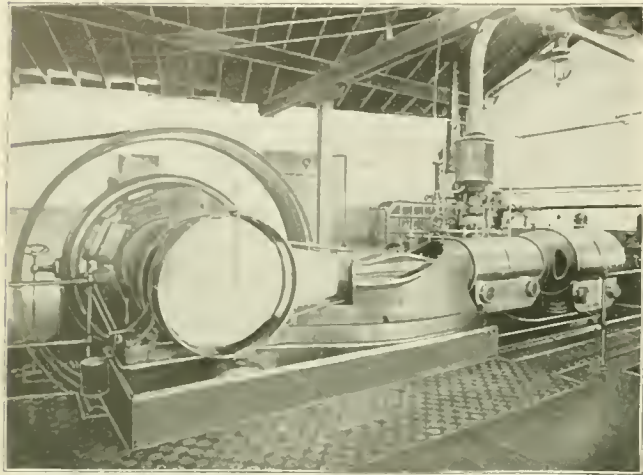
The boom ended as suddenly as it had commenced and when the fever had died away, the Wichita Electric Railway & Light Co.,



BOILER ROOM STIRLING BOILERS.

the people with a new energy. Improvement is the word on every hand and real estate values are undergoing a steady but healthy advance. The people for the first time realize the advantage of a first class street railway. Moreover the new company is confident it has made a profitable investment. When the present owners took charge of the property, the road was carrying less than 1,000 passengers per day. The average daily traffic is now over 3,000 passengers, and there is every indication the business will continue to grow.

The total amount of 18 miles of track, laid with 70, 50 and 35-lb. T rails on new 5 x 8 in. x 7 ft. white oak and long leaf yellow pine ties spaced 2 ft. c. to c. All special work including railroad crossings was furnished by the Paige Iron Works, of Chicago, and the Indianapolis Switch & Frog Co., of Springfield, O. Overhead work consists of No. 00 trolley wire, with Ohio Brass overhead material. In constructing the line it was necessary to rebuild two

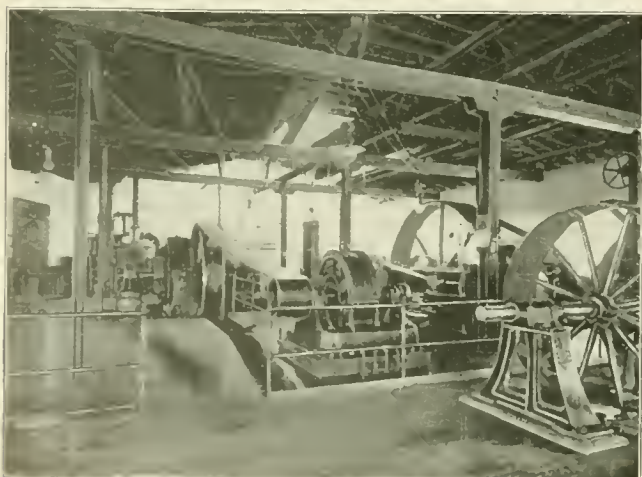


TANDEM COMPOUND ENGINE.

old bridges across the Little Arkansas River, and to build two new ones. One of these is shown in an accompanying engraving.

The rolling stock includes 22 new cars, of which 10 are open and 12 closed, mounted on Peckham 7-B trucks, equipped with G. E. 800 and G. E. 52 motors.

In the engine room is one Russell tandem compound condensing engine, with cylinders 16 and 27 x 24 in., direct connected to a 250-kw. Westinghouse direct current railway generators, and also driving a 120-kw. alternating machine, which supplies current to 181 enclosed street arc lights. In addition the plant has as a reserve unit, one Hamilton-Corliss condensing engine, with cylinder 24 x 48 in., belted to three D-62 generators, and driving one 120-kw. alternator from a 5-in. line shaft. Steam is supplied from one 300-h. p., and two 250-h. p. Stirling water tube boilers with forced draft, the fan being supplied by the American Blower Co., of De-



RESERVE POWER HOUSE EQUIPMENT.

troit. The station also contains one Cochran 700 h. p. open heater, and one Wheeler condenser. The Russell engine, the heater, and the condenser were furnished through the Arbuckle Ryan Co., of Toledo, O.

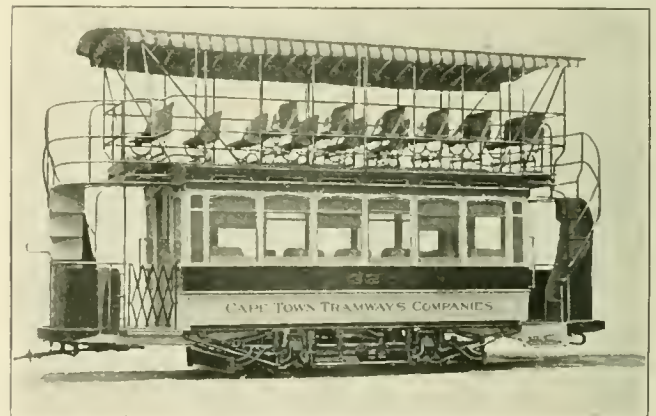
The officers of the Wichita Railroad & Light Co., are: President, Geo. F. Duncan; vice-president, John E. Burnham; secretary and treasurer, Edward Woodman; general manager, S. L. Nelson; superintendent and electrician, L. O. Williams; track superintend-

ent, W. R. Morrison. All the reconstruction work was carried on under the general supervision of Mr. Nelson, who was formerly superintendent of the Springfield (O.) R. R. Mr. Williams, also formerly of Springfield, had charge of power station work, and Mr. Morrison, late manager of the Bay Cities Consolidated R. R., directed the track construction and building of bridges.

NEW CARS FOR CAPE TOWN TRAMWAYS.

The accompanying illustration shows one of a lot of cars which have recently been shipped to the Cape Town tramways by the J. G. Brill Co. The details of construction embody the latest improvements in cars of this type. The bodies are 17 ft. long, with 5-ft. platforms, making the car 27 ft. over the dashers. The width of the sills is 6 ft. 10 in., and at the posts a trifle over 7 ft. 4 in. Stairways leading to the upper deck are of Brill pattern, which in connection with the hood protect the motorman, while they discharge the passengers on the lower deck directly at the entrance. There are 12 garden seats on the upper deck and the same number of spring cane seats and backs in the body. The lower seats are reversible excepting those in the corners, which have stationary backs.

The canopy is braced in all directions, thus giving a much greater stiffness and durability to this part of the car, which is always subjected to severe strains. The truck is the Brill No. 21 E, with the usual double journal springs and half elliptic on the extreme ends. The trim inside is of white ash with three-ply veneer



BRILL CAR FOR CAPE TOWN.

head linings. The Brill practice of using a very high railing is followed in this case, thus insuring the safety of the passenger when alighting, even though the car be in motion. The height of the car inside is 6 ft. 8 in., ample for men of rather more than the average height. There are two oil headlights, radial draw bars, angle iron buffers, a pair of Brill sand boxes and two "Dedenda" gongs. The upper deck is defended by heavy curtains at both sides and ends.

In connection with this order two cars 22 ft. in the body, of the same general type, were also purchased. The principal difference is that they are mounted upon a pair of "Eureka" maximum traction trucks, fitted with one G. E. 1,000 h. p. motor each. The larger cars are capable of making a much higher rate of speed, and will be valuable in the city and suburban service.

JOINT USE OF TRACKS IN RICHMOND, VA.

The franchise ordinance of the Richmond (Va.) Passenger & Power Co. provided that the council might grant permission for other companies to make use of the tracks. The council on November 27th granted permission for the Richmond Traction Co. to use the tracks of the Passenger & Power Co. on Main St., from 1st to 18th. In opposing the ordinance the attorney for the Passenger & Power Co. said: "If you put these two companies on Main street, it won't be a year or 18 months before one company or the other will feel the loss, and consolidation will be inevitable. There will be no competition to hold the companies down, and no 3-cent fare."

FOREIGN FACTS.

The Hyde (Eng.) Corporation is to construct and operate an electric tramway system.

A concession for building tramways in Scarborough, Eng., is asked for by the Scarborough Electric Tramway Co.

At a recent meeting the Chester (Eng.) Town Council voted to reconstruct the horse lines and equip them with electricity.

A street railway strike is in progress in the city of Lyons, France, and cars are run only under the supervision of the police.

The Lyndhurst (Eng.) Electric Lighting and Traction Co. has applied for powers to construct light electric railways in Lyndhurst and district.

Notice has been given by the Central London Railway Co. of its intention to extend its underground electric line from the Bank station to Liverpool St.

Electric traction in Dublin has proven so popular that application has been made by the United Tramways Co. for permission to build several extensions.

Two companies have been formed to build electric railways at Guadalajara, Mexico. One is composed of Pittsburg capitalists and one of Mexican investors.

A Local Government Board hearing is shortly to be given to decide upon the application of Radcliffe Corporation for powers to spend £80,000 on a street railway and lighting plant.

At Leeds, Eng., the Leeds postal authorities pay the tramway managers £500 per annum in order that postmen when on duty shall enjoy the privilege of riding free on the tram cars.

The General Electric Co., of Ireland, is applying for power to build and work light electric railways in the townships of Pembroke, Rathmines and Rathgar in the county of Dublin.

The Devonport (Eng.) Tramways Committee has instructed Mr. C. Chadwell, the borough engineer to prepare plans for the construction of electric tramways and to advertise for bids.

The Mono-rail suspension railway between Barmen and Elberfeld, Germany, was officially opened last month. This interesting installation was described in the "Review" for April 15, 1900, page 216.

The Cologne Street Railway Co. has gone out of existence. Just before dissolving the corporation the directors voted \$20,000 to be given to old employes that had been with the road for 10 years or more.

Mr. J. Clifton Robinson, an English engineer of prominence, depreciates the conduit system with an open slot, as being practically an open sewer, and advocates the overhead trolley under all circumstances.

Cable dispatches state that Mr. Frank W. Hawley, of New York, an electrical promoter, is now in London, and has offered to spend \$4,000,000 in the construction of electric surface lines in London, if franchises can be secured.

According to the London News Agency there is a strong possibility that an electric underground railway will be constructed between Victoria and Putney, Eng. The line will be called the King's Road Electric Ry.

From a report on electrical industries in Spain, published by the Spanish Government, it appears there are 443 electric power stations of all kinds in that country. The report adds that electricity is making steady progress throughout Spain, and that a large num-

ber of electric railways are now either under construction or contemplated.

The city authorities of Juarez, Mexico, have determined to secure electric traction in their city and have agreed to exempt the local horse-railway company from paying tax for five years if it will equip its lines with electricity.

At Grimsby, Eng., the telephone company is opposing the building of electric trams, because it is feared the tramway circuits will render the overhead telephone wires practically useless. It is to be hoped the Grimsby councilmen know better.

According to Mr. Monaghan, U. S. Consul at Chemnitz, Germany, Parisian capitalists are planning to build a tunnel under the Strait of Gibraltar, connecting Europe and Africa. An electric railway through the tunnel is part of the project.

The Bradford (Eng.) Tramways has proposed to new lines and extensions, which are all to be worked by electricity. The committee also asks power to convert existing routes now leased to different companies to the overhead electric system.

The city of Edinburgh, Scotland, has taken a step backward and let contracts for the erection of a cable power house to cost over £20,000. Upon the final vote in the Town Council the advocates of electric traction were defeated by a majority of four to one.

Tramway securities in Cape Town, South Africa, are evidently good investments. The Cape Electric Tramway, Ltd., has just paid its shareholders a dividend of 9 per cent., and an additional bonus of 3 per cent. The total surplus for the year ending June 30, 1900, was £56,204.

Shipments of mining and electrical machinery to South Africa that could not be delivered because of the South African war, are now going forward, and new orders from the Transvaal are coming in rapidly. The English press continues to regret that so many of these orders are coming to America.

The York (Eng.) City Council will meet this month to pass formal resolutions for taking over the local tramways, which are 3.5 miles long. The Council is to give the tramway company £12,000 for the tracks, lands and buildings, and the valuation of the rolling stock is to be settled by arbitration.

On November 15th the Town Council of Pontefract, Eng., adopted the proposal of the United Kingdom Tramway, Light Railway & Electrical Syndicate, Ltd., to establish a system of electrical trams connecting Normanton, Whitwood, Castleford, Glass Houghton, Pontefract, Purston and Featherstone.

R. F. Patterson, U. S. Consul at Calcutta, India, reports that the Calcutta Tramway Co. is preparing to change its lines from horse power to electricity. He adds that electricity is beginning to be extensively used in India, and there is an opening in that country for electrical machinery and goods that American dealers should take advantage of.

Most of the equipment for the new central power station of the Glasgow Tramways was ordered from the United States. Reports from Glasgow say practically all the material has been delivered before the contract time and the officers of the tramway company are loud in their praise of the way in which American contractors have carried out the work.

Since the Central London Ry. has been in operation, about six months, current traffic has been diverted from the old lines to a considerable extent, the Metropolitan company losing nearly £800 and the District company £1,000 per week. The effect on the stock of the old companies has been a decline in Metropolitan ordinary from 128 to 87; District 4 per cent guaranteed has declined from 135 to 90, the 4 per cent debentures from 137 to 110½, and the ordinary stock from 42¾ to 25. The Central London Ry. has inaugurated a uniform fare of 2d, and has the pleasantest and most convenient route.

PERSONAL.

MR. HENRY EVERETT, of Cleveland, sailed for Europe early in December.

MR. JOHN F. CONWAY has resigned as assistant general manager of the Brockton (Mass.) Street Railway Co.

MR. L. B. STILLWELL has been appointed electrical director of the Rapid Transit Subway Construction Co., New York City.

MR. IRVING P. LORD, president and general counsel of the Waupaca (Wis.) Electric Light & Railway Co. was a recent "Review" caller.

MR. F. HYLAND GRACE, formerly of Baltimore, Md., has been appointed assistant superintendent of the Norfolk (Va.) Street Railroad Co.

MR. THOMAS S. BELLAM, for many years treasurer of the Wilmington (Del.) City Railway Co., has retired from that office to devote his time to various private interests.

MR. W. D. RAY succeeds Mr. Bert Harter as electrical engineer of the Detroit, Rochester, Romeo & Orion Ry., a new inter-urban which will have 20 miles in operation in January.

MR. E. W. ASH who has been acting as Eastern representative of the Atlas Railway Supply Co., of Chicago, has been obliged to give up his position on account of ill health. Mr. Ash is now at Rohrsburg, Pa.

MR. NELSON GRABURNE, formerly connected with the Montreal (Que.) Street Ry., who has resided in Glasgow, Scotland, for the past year, has been appointed to an important position in an electrical company in Paris.

MR. N. W. GOODWIN, who, some years ago, was manager of the Detroit, Ft. Wayne & Belle Isle Ry., has been elected general manager of Detroit & Northwestern Railway Co. Mr. Goodwin's many friends will be glad to learn of his return to street railway work.

MR. SAMUEL LITTLE has resigned as president of the West End Street Railway Co., of Boston, and will retire from active connection with the company. Mr. Little became an influential factor in the old Highland company in 1872, and in 1893 succeeded Mr. Henry M. Whitney as president of the West End road.

MR. CHARLES E. YERKES has been elected president of the Lake Street Elevated Railroad Co. succeeding Mr. Howard Abel. Mr. Yerkes has not heretofore been connected with the railways of Chicago as an officer, though he has served as director and officer of some of the other companies in which his father has been interested.

MR. W. C. WEAVER, formerly general manager of the Ogden (Utah) Electric Ry. is taking a trip through the East on business. Mr. Weaver at one time was superintendent of the Northeast Electric Ry., of Kansas City, Mo., but a few years ago went to Ogden to take charge of the Ogden Street Ry. He was later made receiver of the road which office he held until the property was sold.

MR. D. H. LOUDERBACK has resigned as manager of Mr. Yerkes' London road and will return to America. London dispatches state that Mr. Louderback has been offered the management of the Metropolitan & District underground road which is to be equipped for electricity; this offer was declined because the illness of his wife prevented Mr. Louderback remaining in England, but the directors are said to have given him the indefinite refusal of the position.

MR. H. F. J. PORTER, of the headquarters staff of the Bethlehem Steel Co., delivered two lectures last month before classes of the Brooklyn Institute of Arts and Sciences. November 20th the subject was "The Development of the Forging Industry," and on

November 27th it was "Modern Methods of Making Steel Forgings." November 24th the first named lecture was repeated before the German Technical Society of Philadelphia. On December 8th Mr. Porter exhibited samples of turnings made by tools treated by the Taylor White process at the winter conversazione of the Franklin Institute.

MR. SAMUEL MCCLINTOCK HAMILL, president of the Siemens-Halske Electric Co., and a prominent officer of the General Electric Co., was married on November 27th, to Miss Maria Woodward Baldwin, of Baltimore. After the ceremony, which was performed at Grace Church, Baltimore, Mr. and Mrs. Hamill held a reception at the home of the bride's parents and immediately started North on the wedding tour. They will make their home in Schenectady, N. Y.

MR. HOWARD ABEL has resigned as president of the Lake Street Elevated R. R. and secretary and treasurer of the Northwestern Elevated R. R. and the Union Elevated R. R. and will go to London to take up the work on Mr. Yerkes' underground road in which Mr. D. H. Louderback has been engaged, he having been compelled to go to New York on account of Mrs. Louderback's health. Mr. Abel leaves Chicago on December 15th and will sail on the "Majestic" on the 19th.

MR. ASA M. MATTICE has been appointed chief engineer of the Westinghouse Electric & Manufacturing Co., and will enter upon his duties in December. Mr. Mattice was for 10 years up to a year ago principal assistant to E. D. Levitt of Cambridgeport, Mass., and has been actively connected with the design of all the large machinery coming from Mr. Levitt's office during that time. He was assistant to Admiral Melville at the beginning of the new navy, and had an important part in designing the machinery of the Maine, San Francisco, and other important war vessels.

MR. B. J. ARNOLD, the prominent electrical engineer and contractor of Chicago, recently had a narrow escape from serious injury while traveling from Chicago to Kenosha. He was a passenger on the Northwestern train which was wrecked by an explosion at the Northwestern station on December 3d, and had just left his seat to go to the smoking car when a heavy piece of the boiler crashed through the train just at the place he had occupied. Mr. Arnold is an officer of the Kenosha Street Railway Co., and was accompanied by a number of his brother officials. After the excitement attending the explosion had died away one of these gentlemen remarked, "That accident came pretty near making the little road at Kenosha an orphan."

MR. W. E. HARRINGTON, general manager of the Camden (N. J.) & Suburban Railway Co., has resigned his position and will take a well earned vacation before again resuming active work. Mr. Harrington was born in Wilkesbarre, Pa., June 3, 1866, and received a technical education at the University of Pennsylvania. From 1888 to 1896 he superintended the construction of electric lines at Atlantic City, N. J., Wheeling, W. Va., Camden and other cities, spending a portion of this time in the employ of the General Electric Co. and the Cutter Electric & Manufacturing Co. of Philadelphia. While with the Cutter Co. Mr. Harrington invented and perfected the full line of I-T-E circuit breakers which are extensively used in this country and Europe. In 1896 he was made general manager of the Camden roads and during the next few years he entirely rebuilt these properties and placed them upon a paying basis. Mr. Harrington is the author of several papers and treatises dealing with electrical subjects and street railway operation.

THE JERSEY CITY, HOBOKEN & PATERSON (N. J.) STREET RAILWAY CO. at its annual meeting elected the following directors: David Young, of Newark; John F. Shanley, of Newark; Dennis McLaughlin, of Jersey City; E. F. C. Young, of Jersey City; William B. Gourley, of Paterson; Randal Morgan, of Philadelphia; Gen. William C. Heppenheimer, of Jersey City; Chandler W. Riker, of Newark; Charles A. Sterling, of Orange; John R. Lee, of Paterson; Gen. Bird W. Spencer, of Passaic; William C. Shanley, of Newark; Edward L. Young, of Jersey City; A. P. Hexamer, of Hoboken; and J. E. Hulshizer, of Jersey City. All but six of these are new men. This company was

organized a year ago and is a consolidation of the North Hudson Street Ry., Paterson Street Ry., Paterson Central Electric Ry., Saddle River Traction Co., Palisades Railroad Co., White Line Traction Co., Paterson, Passaic & Rutherford Electric Ry., Jersey City, Hoboken & Rutherford Electric Ry., and Paterson Horse Ry.

OBITUARY.

MR. W. H. LAWRENCE, president of the National Carbon Co., of Cleveland, died at his home at Dover Bay, O., on November 23d. Mr. Lawrence was also president of the Brush Electric Co., and the Sperry Electric Railway Co.

MR. GEORGE L. CARRINGTON, of Albert Lea, Minn., has recently died. Mr. Carrington was engaged in promoting an electric railway for Albert Lea and Austin, and was identified with many projects for the improvement of these cities.

MR. MARCUS DALY, the "Montana Copper King," and owner of the street railway at Anaconda, Mont., died November 12th, at Hotel Netherland, New York. He was born in Ireland, was 60 years of age at the time of his death, and had made the major part of his vast fortune during the past 20 years.

MR. JOSEPH O'NEILL, the first superintendent of the Youngstown (O.) Street Railway Co., a position which he held for 15 years, died at his home in Youngstown, November 26th, after a protracted illness. Mr. O'Neill was born at Lockport, N. Y., 49 years ago, and went to Youngstown when 17 years old.

MR. JAMES AFFLECK, secretary and treasurer of the Eighth Avenue Railroad Co., of New York, and vice-president of the Ninth Avenue Railroad Co., died at New York on November 24th. Both of these roads are leased to the Metropolitan Street Railway Co. Mr. Affleck became associated with New York street railroads in 1874, under Mr. George Law, New York's pioneer street railway capitalist.

NEW PUBLICATIONS.

AN EXPERIMENTAL STUDY OF THE CORROSION OF IRON UNDER DIFFERENT CONDITIONS. By Carl Hamblechen.—This is a thesis submitted for the degree of Bachelor of Science in Electrical Engineering, University of Wisconsin, June, 1899, and published as No. 8, Vol. 2, of the Bulletin of the University of Wisconsin. Price, 30 cents.

MUNICIPAL PUBLIC WORKS. By Ernest McCullough. Published by the author, Lewiston, Idaho. Paper, 154 pages; price, 50 cents.—This work is intended as an elementary manual of municipal engineering, and appears to be admirably suited for the purpose. It treats of streets, sewage, water supply, street lighting and fire departments, plans and surveys, municipal ownership, and the city engineer. The author has had a wide experience in consulting work and appreciates the needs of smaller cities and towns.

THE "MECHANICAL WORLD" POCKET DIARY AND YEAR BOOK FOR 1901. Published by Emmott & Co., Ltd., Manchester, Eng.; 4 x 6 in., 330 pages; price 6 pence. This is the 14th annual edition of the "Mechanical World" pocket book for engineers, and the editor's preface states that much new matter has been incorporated in this issue. Considerable space has been given to the subject of Electrical Power Transmission. The usual tables to which an engineer has occasion to refer are included and also the results of much experimental work.

SPECIFICATIONS FOR STEEL BRIDGES. By J. A. L. Waddell, C. E. Mem. Am. Soc. C. E., etc. Published by John Wiley & Sons, New York; 16 mo., 178 pages, cloth; price \$1.00.—This book comprises six chapters of the author's pocket book for bridge engineers, "De Pontibus," prepared with the view of meeting the demand by draftsmen and computers for the specifications of "De Pontibus," that work being too expensive to use for speci-

fication only. Some slight modifications have been made to bring the publication up to date. The chapters included are: General Specifications for Steel Railroad Bridges, Viaducts and Elevated Structures; Specifications for Railroad Draw Spans; General Specifications for Highway Bridges; Specification for Highway Draw Spans; General Specifications for Manufacturers; Shipment and Erection of Steel Bridges, Viaduct, etc.; Compromise Standard Systems of Live Loads and Their Equivalents. Tables, diagrams and a comprehensive index complete the book.

GRADE CROSSINGS IN OHIO.

The railroad commissioner of Ohio has recently directed that the Sandusky & Interurban Electric Railway Co. put in derailing switches at its crossing with the Baltimore & Ohio R. R., the latter being required to erect crossing gates. It is believed that this is the beginning of a policy looking to better protection of such crossings.

MORE WIRE THIEVES.

Six boys have been prosecuted for stealing bonds from the tracks of the Milwaukee (Wis.) Electric Railway & Light Co. December 4th they all pleaded guilty, sentence was suspended.

A negro found with copper bonds identified as having been taken from the tracks of the Chattanooga Rapid Transit Co., is in jail at Chattanooga.

FLEXIBLE MICANITE PLATE.

The Mica Insulator Co., of New York and Chicago, after months of experimenting has brought out a new flexible sheet insulation which it calls "Flexible Micanite Plate," style "C." The company believes that for insulating transformers, armature and field magnet cores, armature slots and commutator shells, this is a most important improvement.

From tests carried out by Prof. Samuel Sheldon, Polytechnic Institute, Brooklyn, N. Y., it was demonstrated that the material would withstand 1,500 volts alternating current per mil of thickness before breaking down. Its resistivity per cu. in. in millions of megohms, at 30° C. was about 1,110; at 100° C. about 123.

MILWAUKEE IMPROVEMENTS.

At the meeting of the directors of the Milwaukee Electric Railway & Light Co., held recently in New York, it was decided to increase the common stock of the company from \$3,500,000 to \$15,000,000, the amount of preferred stock remaining unchanged at \$4,500,000, this additional capital being required to carry out the plans of Mr. John I. Beggs for the improvement and extension of the system. It is contemplated that the company will spend about \$2,000,000 annually for the next five years, the newly authorized common stock being issued as required to meet the expenditures. The improvements include additions to the power house, the erection of car houses, and extensions to the lines.

For the 12 months ending Dec. 1, 1900, the gross cash receipts of the Milwaukee Electric Railway & Light Co. from railway and lighting business were \$2,191,300, a gain of \$214,167 over 1899 and of \$429,860 over 1898. For the same period the gross receipts of the Milwaukee Light, Heat & Traction Co., which operates most of the suburban lines of the Milwaukee system, were \$291,819, a gain of \$59,310 over 1899, and \$191,214 over 1898.

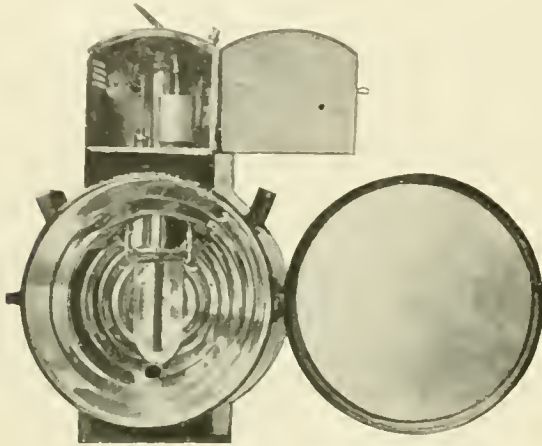
These two companies own and operate 219.29 miles of track and their taxes for the year, 4 per cent on the receipts of the Railway & Light company and 2 per cent on the Light, Heat & Traction company, amount to \$93,401.

The action of the directors in adopting the recommendations of Mr. Beggs is a very gratifying recognition of his ability in managing the properties.

The Galveston (Tex.) City R. R. has been granted an extension of its franchise for the term of 50 years and \$200,000 will be expended for new equipment.

AUTOMATIC ENCLOSED ARC HEADLIGHT.

The W. R. Garton Co., of Chicago, is just putting on the market a new enclosed arc headlight for street cars for which most desirable features are claimed. The headlight has a dimming device so that the arc may be turned down when the car enters business streets. There are also adjustable buffers which permit the angle of the shaft of light to be changed. The lamp connects directly across the street railway circuit, using a minimum current of 1 ampere, with a voltage across the arc of about 280 volts. The arc, although 1 $\frac{1}{4}$ in. long, is remarkably steady and gives a splendid light. The "Multiplex" reflectors are used with these headlights. The



LEA ELECTRIC ARC HEADLIGHT.

lamp is entirely self-contained. The small amount of resistance required is placed in an apartment at the back of the lamp, instead of being placed on the platform of the car, and is easily accessible. The lamp is entirely automatic in action, it requiring no hand feed, as in some headlights. A door in the upper portion of the lamp allows ready access to the working parts. The trimming is easily performed by removing the inner globe and taking out the carbons through the bottom of the lamp. One set of carbons will burn 100 hours. These lamps are made by the Lea Electric Manufacturing Co., of Elwood, Ind., for which the W. R. Garton Co. is agent.

CELEBRATE OPENING OF NEW STREET RAILWAY.

The opening of the Collinsville, Caseyville & East St. Louis Electric R. R., November 24th, was celebrated by a banquet given by the citizens of Collinsville to the promoters of the road and other guests. The banquet was held in the Commercial Hotel, Collinsville, and 40 guests were present, those representing the street railway company being Messrs. D. M. Browning, Thomas L. Fekete, and George D. and W. G. Burroughs. The program of toasts included responses by W. G. Burroughs, Hon. H. S. Foreman, Dr. J. L. R. Wadsworth, Judge D. M. Browning, J. A. Yates and J. J. Fagin. Rapid transit between Collinsville and East St. Louis was inaugurated under the happiest auspices.

DENVER TAX CASE.

The Denver (Col.) City Tramway Co. in 1896 took the position that it was a railroad company and as such not liable to have its property assessed by the county. The state tax board's assessments were uniformly somewhat smaller than those of the county board, and the company has since 1896 paid on the state valuation. The city sued for the difference and on November 26th the lower court decided in its favor, ruling that the Tramway company was operating a street railway and not a railroad, and that it must pay the taxes as assessed by the county. The Tramway company has appealed the case.

The Skowhegan (Me.) & Norridgewock Railway & Power Co. will ask the Legislature to permit it to abandon its railway.

CURTAIN FIXTURES.

The Curtain Supply Co. desires to call the attention of the trade to the fact that it has purchased from the Adams & Westlake Co., the E. T. Burrowes Co., the Forsyth Brothers Co., and the Davis Car Shade Co., the foundation patents on curtain fixtures covering, among other styles, all the different forms of roller-tip fixtures, including both the rigid and movable heads, and that it is therefore able to supply its customers with any style or type of fixture desired, at reasonable figures, free from any claim or fear of litigation for infringement.

INTERURBAN WILL ENTER CINCINNATI.

The Southern Ohio Traction Co. will secure a direct entrance into Cincinnati, running cars to Fountain Square over the tracks of the Cincinnati Street Railway Co. before January 1, 1901. Although it has been arranged with President Kilgour of the latter company that the Southern Ohio's cars shall run over the tracks of the consolidated company into Fountain Square, the route has not as yet been determined. The Southern Ohio has already the right of way through College Hill.

PROJECTS IN MICHIGAN.

A score of companies are seeking franchises in Michigan for proposed interurban lines, which, if but half of them be constructed, will become formidable competitors of the steam roads. William A. Tateum, of Grand Rapids, has recently visited Allegan, Otsego, Plainwell and Kalamazoo in the interests of a company projecting an electric line to connect Grand Rapids and Kalamazoo; surveys have been started in Benton Harbor to the proposed line to run from St. Joseph and Benton Harbor to South Haven, to connect with the line to be built by Charles H. Chapin, of Chicago, between Benton Harbor, Mich., and South Bend and Goshen, Ind. A second interurban between Benton Harbor, St. Joseph and South Haven is projected by a company of German capitalists of Chicago.

A COMPLETE CATALOG.

The Mayer & Englund Co., of Philadelphia, announces that in compiling its new railway supply catalog, which is just coming from the press, no effort or expense has been withheld that would make the work the most complete and valuable hand book of electric and steam railway supplies ever issued; and the binding and artistic make-up are in keeping with the contents. The book contains 528 pages.

It is the desire of the Mayer & Englund Co. that every manager, superintendent and purchasing agent in the world who is interested in getting the best materials shall have a copy of the book. It will be sent upon application.

The Consolidated Railway Co., of Bay City, Mich., will erect a new car barn 100 x 206 ft. Bids were received December 6th.

The Columbia (S. C.) Electric Street Railway, Light & Power Co. has ordered four new double truck cars for its suburban lines.

December 4th, work was begun on the Hartford City-Muncie (Ind.) electric interurban. F. G. Bonnell, of Muncie, is the principal promoter.

The Brooklyn Rapid Transit Co. was assessed for \$43,000,000 capital for 1899, which it seeks to have reduced, the capital at the beginning of that year having been only \$20,000,000. The additional stock was issued at various times during the year.

It is announced that the litigation between the Atlanta (Ga.) Railway & Power Co. and the Atlanta Rapid Transit Co. and the city has been compromised. Various differences concerning the joint use of tracks by the two companies have been reconciled, and the Transit company and the Georgia Electric Light Co. will not oppose the granting of a franchise for power and lighting to the Railway & Power Co.

SERVICE STRIPES IN PITTSBURG.

It is announced by General Manager Schoepf, of the Consolidated Traction Co., Pittsburg, that beginning January 1, 1901, the employes will wear service stripes on their uniforms. A blue strip indicates one year's and a gold stripe five years' service.

INCREASED FARES ON OHIO INTERURBANS.

The Dayton (O.) & Xenia Traction Co. and the Rapid Transit Co. of Ohio, have by agreement raised the fare on both lines operating between Dayton and Xenia to 45 cents for the round trip. A rumor was recently in circulation to the effect that the Dayton & Xenia and the Rapid Transit companies would be consolidated January 1, 1901, but the report at present lacks the confirmation of either company.

STEEL TIES FROM OLD RAILS.

An experiment is being carried on by the Lake Shore & Michigan Southern Ry. that will be watched with interest by street railway engineers. The idea is to form steel ties by rerolling old steel T rails, flattening out the head and making practically an

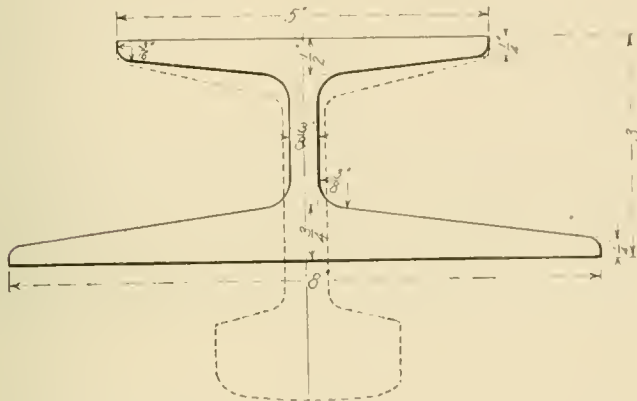


FIG. 1.

I-beam shape, 3 in. deep, with a top flange 5 in. wide and a bottom flange 8 in. wide. Fig. 1 shows the cross section of a worn 80-lb. rail in comparison with the cross section of a steel tie it is proposed to roll from it.

The statement is made that upon a short stretch of track near Sandusky, O., built with the new ties, the results have been so



FIG. 2—FASTENINGS FOR REROLLED STEEL TIES.

satisfactory as to warrant further tests upon an extensive scale. Roadbed so constructed is reported to hold the surface, line and gage of the track fully as well or better than with oak ties, the cost of labor per mile for laying track is no greater and the cost of maintenance is less. Scrap rails are utilized and it is believed

by converting old rails into ties their usefulness can be prolonged 25 or 30 years, at the end of which time the ties will still be worth as much in the form of scrap as were the rails from which they were rolled.

The fastening device for holding the rail to the new tie consists



FIG. 3—TRACK LAID WITH STEEL TIES.

of clips of ordinary form held by bolts passed through the upper flange from below, as shown in Fig. 2. To prevent longitudinal motion projections are left on the lower face of the lower flange of each tie, under each rail seat, as will be seen from Fig. 2. For the accompanying half-tone cuts we are indebted to the Railway Age.

CANADIAN DECISION ON STOKERS.

In the Supreme Court of Canada, on December 8th, an important decision was rendered, of which The (Jones) Under Feed Stoker Co., Chicago, advises us as follows:

The action has been pending in the Canadian courts for some two years. The American Stoker Co. of New York, sold an equipment of under-feed mechanical stokers to the Dominion Cotton Mills Co., of Montreal, and the General Engineering Co., of Toronto, which is the owner of the Jones patents, charged the American company with infringement of patent on these machines, and sued it in the Exchequer Court. The Toronto company won, but a later judgment, bearing on Section 8 of the Patent Act, went against it. The section was construed to mean that when a foreign patent lapses the Canadian one also becomes void. This point was carried to the Supreme Court, and the decision is that the section should not be construed in that manner.

This judgment in favor of the Toronto company disposes of the question of the ownership of the Jones patents and puts an end to litigation between the two companies. Both companies had engaged eminent counsel, and were determined to make it a test case. A similar action is pending in the United States courts, and the decision will have an important bearing on the result.

A bill introduced in the Georgia Legislature requires street railway companies to provide separate coaches for white people and negroes.

Since the article on page 707 was printed the promoters of the Youngstown-Sharon consolidation have organized the Youngstown & Sharon Street Railway & Light Co., under the laws of New Jersey, with \$5,000,000 capital. An order for 1,350 tons of steel was given to the National Steel Co., and 40 cars have been ordered of Jackson & Sharp.

A collision between an electric car on the Southern Ohio company's lines at Dayton and an engine on the Cincinnati, Hamilton & Dayton R. R., occurred at 9:30 p. m., November 30th, resulting in injuries to the motorman of the traction car and the engineer of the locomotive, both of whom will recover. Either a slippery rail or a defective brake is believed to have rendered the electric car unmanageable and caused the accident.

ECHOES FROM THE TRADE

THE HARRISBURG FOUNDRY & MACHINE WORKS have recently installed a Cross oil filter made by the Burt Manufacturing Co., of Akron, O.

JOHN BLAIR MACAFEE, Philadelphia, has recently completed the construction of the Ohio River Electric Railway & Power Co.'s road and plant.

THE KNELL AIR BRAKE CO., of Battle Creek, Mich., has received orders for several sets of brakes from New Orleans, La., Council Bluffs, Ia., and Omaha, Neb.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia, has the contract to install a storage battery for the Baltimore & Ohio R. R. at the power house of the tunnel electric line.

SOUTH AFRICA offers a desirable field for the activities of our exporting manufacturers and many of them have filled important orders there within the last few years. Locomotives, cars, rails and other railroad supplies have been furnished to the Cape Government Railways.

A SUIT against the Toronto Railway Co. by the Canadian General Electric Co. for infringement of patents on series controllers has been decided for the latter company. The Toronto Ry. is restrained from making any more of the controllers and damages for infringement will be assessed later.

THE SUIT of the Thompson-Houston Electric Co. against the Brooklyn Heights R. R. for infringement of the series-parallel controller patents of the former company has been decided and the Brooklyn Heights road directed to remove the 48 infringing controllers made by the Sprague Electric Co. which are now in use.

THE CURTAIN SUPPLY CO., of Chicago, has published its catalog "C," which describes and illustrates latest novelties in curtain fixtures, as well as all kinds and patterns of curtain fabrics. The company reports that its foreign business has kept pace with its trade in this country, and recent shipments have been made to Australia, France, Belgium, England, South America and Mexico.

THE WESTINGHOUSE AIR BRAKE CO., of Pittsburg, has issued a 22-page pamphlet describing the new Westinghouse motor-driven air compressor, which the company announces has been put on the market to supply the growing demand for small electrically-operated air compressors adapted to supply compressed air for street car brakes and train signals as well as for various other industrial uses.

A NUMBER of the technical schools have recently placed orders with the B. F. Sturtevant Co., of Boston, for the installation of mechanical draft apparatus at their boiler plants, and in several cases the fans have been so arranged as to permit experiments comparing the chimney with the fan. This may be taken as an indication that the advantages of mechanical draft are being recognized by experts.

ROSSITER, MACGOVERN & CO., of New York, are carrying on a tremendous business in second-hand electrical machinery. The concern in addition to the home trade is shipping goods to all parts of the world, particularly to Cuba for which island Mr. C. E. Dustin, president of the company sailed last month. Mr. Frank MacGovern recently returned from an extensive trip abroad in the interests of the firm.

THE AMERICAN BLOWER CO., of Detroit, in addition to its standard line of fans and blowers, makes a full line of vertical and horizontal high speed engines which have been developed with

the requirements of blower service particularly in view. The company is therefore able to supply complete the engines and all apparatus required for ventilating, heating or cooling work. The engines are described in the company's new catalog, No. 116.

PRESIDENT C. F. QUINCY, of the Q. & C. Co., says of the Paris exhibit of his company: "The principal reason for our exhibiting at Paris was for the benefit of our foreign trade and to largely increase our own agents abroad as well as the trade in general. We feel that our exhibit at Paris has been a considerable success. We know of many direct sales that have come from same, and it has encouraged our agents and resulted in much better work by them."

THE SPEER CARBON CO., of St. Marys, Pa., reports that the demand for its self-lubricating motor brushes has grown to such an extent that it is compelled to increase the capacity of the plant. It is putting in new machinery, etc., and is going into the manufacture of electric light carbons for open arc lamps, and carbon specialties. The goods are giving excellent satisfaction wherever used and the Speer company intends to keep up the quality in the future as in the past.

W. T. VAN DORN has recently issued a new illustrated pamphlet showing the latest designs of couplers for street and elevated railway cars. Copies will be sent to those interested on application. At to the maintenance charges with the couplers, James S. Doyle, master mechanic of the Metropolitan Street Ry., New York, and formerly with the Metropolitan Elevated, Chicago, states that in five years' service on the latter road the pins were renewed once and the bars shortened twice.

THE PAIGE IRON WORKS, of Chicago, announces that in order to obtain increased facilities for handling its business the plant on Ontario St. burned on October 27th will not be rebuilt but new shops will be erected at Harvey, Ill. The new buildings, which are to be completed by January 1st, will be in direct connection with the Illinois Central, Chicago Terminal Transfer, Grand Trunk and Big Four railroads. New and improved machinery and increased storage room will give much better facilities for the manufacture of switches, frogs, crossings and other special work. The Chicago office is at 917 Monadnock Block.

THE POWER PUBLISHING CO., World Building, New York, has published a "Gas Engine Edition" of the Power Quarterly in response to a demand for recent copies of Power containing matter on this subject. The Quarterly contains a complete synopsis of the gas engines in foreign countries, as shown at the Paris Exposition, including a description of a gas engine operated by blast furnace gas, a description of the leading American gas engines, editorials on the efficiency of the gas engine and its commercial advantages, and other matter relative to the industry. Copies can be had for 25 cents, upon application to the publishers.

W. T. VAN DORN, Monadnock Block, Chicago, maker of the Van Dorn car coupler, has invented a system for cleaning hot air furnace pipes in residences and flats with compressed air. The air is furnished by a portable air compressor having hose connection. When the hot air pipes in a house are to be cleaned, an air tight connection is placed over the open register in each room and a supply of air at high pressure is forced through the pipes, carrying all dust and refuse that may have lodged therein down into the basement where it is caught in a suitable receptacle.

THE FILER & STOWELL CO., Milwaukee, Wis., reports business very brisk. It has just shipped the Republican Iron & Steel Co., Youngstown, Pa., one horizontal cross-compound engine, extra heavy frame, with cylinders 44 and 82 in. in diameter

and 60 in. stroke and a maximum capacity of 6,500 h. p. There is now on the floor ready to ship one engine of 6,000 h. p., for the National Steel Co., Youngstown; this is a cross-compound, about the same size as the one first mentioned. The company is also shipping one cross compound to Chicopee Falls, Mass.; this engine has 26 and 52-in. cylinders and is rated at 2,000 h. p.

THE LABORATORIES of Geo. W. Lord, maker of Lord's boiler compounds, have been running double time for the last few months. Export business in these chemicals has increased enormously during the past year, a recent order filled being one for 300 barrels of 500 lb. each from a general mill supply dealer in Australia.

THE LARGE ADDITION to the machine shop and the new building provided for the brass foundry, boxing and brass polishing departments of the Bullock Electric Manufacturing Co., of Cincinnati, are nearing completion. When occupied they will so increase the floor space, and improve the facilities, that the capacity of the works will be nearly doubled. Many large contracts have been recently received from both home and abroad, and the company states that the present outlook for business during 1901 is even better than during the past four years. It has recently issued bulletin No. 37, which gives a list of the purchasers of Bullock apparatus, shows numerous views in the works and the various types of machines manufactured.

THE UNDERFEED STOKER COMPANY OF AMERICA, 218 La Salle St., Chicago, has one of the most effective advertising folders of the season, one of its chief merits being the terseness of the reading matter. One side of the folder is blank and upon the other appears 12 half-tone reproductions from photographs showing the plant of the Northwestern Straw Works, of Milwaukee, Wis., which is equipped with the Jones underfeed mechanical stokers, made by the Underfeed Stoker Co. The photographs were taken on October 18th, at intervals of 10 minutes, from 1:05 p. m., to 2:55 p. m., and although four return tubular boilers were in full operation there is no trace of black smoke, the only sign of activity being a faint cloud at the top of the short chimney.

W. C. STERLING & SON, of Monroe, Mich., are making daily shipments of cedar poles, ties and posts by the car load. The firm reports that this year's demand for poles and ties promises to exceed that of any previous year, for more miles of new electric railways, steam railroads and telephone lines are being built than ever before. Oak ties are becoming scarce and cedar ties are fast taking the lead as a substitute. Cedar is also superseding chestnut and other woods for trolley and telephone poles. The wide trade that W. C. Sterling & Son supply is shown by the statement that last month they made deliveries to 36 telephone companies, 18 electric light plants, 27 electric railways, two telegraph companies, and six gas pipe lines. Among recent customers are the Dover Construction Co., which is building an electric railway between Findlay and Fostoria, O.; Chase Construction Co., of Detroit, building between Dayton, O., and Greenville; Jackson (Mich.) & Suburban Traction Co.; American Railway Co., building from Joliet to Chicago; Smithurst & Allen, of Philadelphia, building between North East and Erie, Pa.

Deegan & Co., of Philadelphia, have been awarded the contract for the construction of the Elkton (Md.) & Chesapeake City Electric Ry. The line is to cost \$126,400, and will be completed by Jan. 1, 1902.

A street railway freight service between the cities of Gadsden, Ala., Alabama City and Attalla will be inaugurated. The freight car has been completed by the Southern Car Co., of Gadsden, and dynamos and other machinery necessary for its operation will be purchased by Marcus Foster, jr., of Gadsden.

A car despatcher by the name of Stringer, in the employ of the Portsmouth (Va.) Street Railway Co., was wounded in a fight with R. A. Woods, a motorman, December 1st. A dispute arose at the company's barns, and Woods attempted to cut his adversary's throat. Stringer will recover, and Woods is under arrest.

TRACK MATERIAL QUOTATIONS.

The demand for steel rail continues strong with no recent changes in prices. It is estimated that the mills have now on their books for 1901 delivery between 300,000 and 600,000 tons. Heavy standard sections are quoted at New York and Chicago at \$26; light sections, \$25.50 to \$28. At the Eastern mills girder rails are quoted \$38 to \$38.50.

G. S. Baxter & Co., of New York, are selling yellow pine ties as follows: 7 x 9 in. x 8½ ft., 61 cents; 6 x 9 in. x 8 ft., 56 cents; 6 x 8 in. x 8 ft., 50 cents. Lindley Bros. & Co., Menominee, Mich., quote standard cedar ties at 26 cents; hemlock at 20 cents.

TIME IN DETROIT.

The city council of Detroit prefers local time and though the number of factories and other concerns that have adopted standard time is growing, the Detroit street railways announce that they will continue to use local time until the council otherwise directs. The corporation council has rendered an opinion that unless otherwise specified in the ordinance the mention of an hour in a city ordinance means that hour standard time, standard time being the legal time of the state. The question of what time is meant arises in limiting transfers and workmen's cheap tickets.

The Duluth (Minn.) Street Railway Co. has purchased 12 new double truck cars to be operated between Duluth and West Superior, Wis. The cars are equipped with the Baker steam heater and all modern improvements. The company has completed the work of relaying a large part of its tracks with heavier rails.

NEWS NOTES.

RIGHTS OBTAINED.

PALMER, MASS.—The Palmer & Monson Street Railway Co. proposes to construct a double track extension from Forest Lake Park to a point on the Thorndike road. A private right of way has been secured. D. F. Burritt, general manager.

PHILLIPSTON, MASS.—The Phillipston Street Railway Co. has secured most of the rights of way for its proposed line, surveys have been completed, and a number of the contracts let. M. K. Kendall & Co., 6 Oliver St., Boston, have been awarded the contract for the overhead work, and the contract for the construction of track, including culverts, retaining walls, and grading has been awarded to Arthur Hodges, 8 Exchange Place, Boston. This line will be 1½ miles long and will include Phillipston, Templeton and Athol on the route. The president of the company is Patrick H. Hirsch, of East Templeton.

NEW HAVEN, CONN.—The Fair Haven & Westville R. R. Co. has been granted a franchise by the council of New Haven for its proposed extension to the Yale field, and has also secured permission to double track its Congress Ave. line. Walter A. Graham, superintendent.

ROME, N. Y.—The Rome City Street Railway Co. has secured a franchise to extend its line over several streets in that city. J. W. Brown, general manager.

CHILlicothe, O.—The county commissioners of Pickaway county, O., have granted a franchise through that county to the Chillicothe, Mt. Sterling & Columbus Electric Railway Co. The building of this road has been a matter of some doubt heretofore, but affairs are shaping themselves in such a manner now that it is believed its construction in the near future is a certainty.

COLUMBUS, O.—The Columbus-Portsmouth Electric Ry. will run from Columbus through Shadeville, Lockbourne, South Bloomfield, Ashtabula and Chillicothe to Portsmouth. Floyd McCormick, of Columbus, is the principal promoter, and is rapidly securing the necessary rights of way.

GENEVA, O.—P. W. Tuttle and C. W. Goodrich have secured all the rights of way for their proposed electric line from Geneva through Jefferson and Andover to Meadville, Pa. All preparations have been made for the construction of the road, which will be commenced at once. The company's headquarters will be located in Geneva.

CLEVELAND, O.—Captain E. J. Kennedy, of Cleveland, is securing rights of way for the proposed extension of the Cleveland, Elvria & Western Electric Ry., from Berea to Medina, and has obtained options on private rights of way for over half the distance.

RICHMOND, VA.—Judge J. L. Haner, of Cleveland, O., is interested in a project to build an electric line between Richmond and Petersburg, and has, it is announced, secured options on the franchises and property of the old Richmond & Petersburg Electric Railway Co., which was chartered by the Virginia Legislature several years ago. This company surveyed the route and built a short piece of track. It has until March 3, 1901 to complete the line and operate cars between Richmond and Petersburg. Judge Haner proposes to complete the line before that date.

GRAND RAPIDS, MICH.—Press reports state that Lon's C. Howard, of Grand Rapids, has secured franchises for the proposed electric railway to connect Grand Rapids, Lowell, Saranac and Tonia and that the Grand Rapids & Eastern Traction Co. is being organized to build and operate the line. A power house will be located at Lowell and a substation at Cascade.



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BLUFFTON, IND. J. M. Gore, who is promoting the Indiana-Ohio Electric Ry., has announced that eastern capitalists have furnished the necessary funds for the construction of that line, and work will be commenced at once. Franchises have been secured for a proposed extension from Defiance to Hicksville, O. A proposition is under consideration for a branch of the Indiana & Ohio line to connect Defiance, Bowling Green and Fremont.

URBANA, O. The Urbana, Mechanicsburg & Columbus Electric Railway Co. has obtained a franchise in Columbus for a line to be built on Dublin Ave., Spring, Water and Gay Sts. This company holds franchises through Franklin County, and its proposed extensive system is to be in operation by October 1, 1901. H. A. Axline, president, and Calvin McDonald, secretary, Columbus.

NEWPORT NEWS, VA. The Hampton Roads Railway Co., which proposes an electric line to run from Newport News to Phoebus and Old Point Comfort, as was published in the "Review" bulletin October 25th, has secured a franchise from the council of Phoebus, which has not, however, as yet been accepted. If the objectionable provisions in the franchise shall be set aside the company will build without delay between Newport News and Phoebus. W. J. Nelms should be addressed.

KANSAS CITY, MO. J. P. Gibson, of Philadelphia, and George Gibson and C. W. McGahan, of Kansas City, are promoting a 100-mile electric line to connect Kansas City and St. Joseph. The road, as proposed, will pass through Platt City, Parkville, Dearborn, Faucett and Camden Point. All rights of way have been secured with the exception of about three miles near Camden Point, and the survey, preliminary to the incision of the line, has been commenced this week. It is proposed by the company to run trains every two hours night and day, between St. Joseph and Kansas City, and to reduce the fare now charged on steam roads between these points by over one-half. The line will be entirely in Missouri and will have no connection with the Kansas City Leavenworth line. The company proposes to establish several parks and places of amusement along the route. J. P. Gibson, it is reported, represents an eastern company and will furnish the financial backing for the enterprise.

ST. CHARLES, MO. The city council of St. Charles has granted a franchise to the St. Louis, St. Charles & Western Railway Co. The promoters, who operate a line between Wellston and Pattonville, propose to build a highway bridge to connect the two lines.

MARSHALL, TEXAS. A. R. Wheeler & Co., of St. Louis, Mo., have been granted a 50-year franchise for the construction and operation of an electric street railway system, in Marshall.

NEW BEDFORD, MASS. The New Bedford & Onset Street Railway Co. has secured franchises through Mattapoisett and Wareham and will survey the proposed route at once, preparatory to the construction of the line. H. H. Crapo, New Bedford, may be addressed.

BIDDEFORD, ME. The Atlantic Shore Street Railway Co. has been granted permission by the railroad commissioners to build an electric line

from Biddeford to York Beach, where connections will be made with the Portsmouth, Kittery & York Street Railway Co. C. A. Bodwell, of Sanford, general manager, may be addressed.

GLENS FALLS, N. Y. The Warren County R. R., of which J. A. Powers, of Lansingburg, is one of the principal promoters, has obtained a franchise from the board of county commissioners to build and operate a street railway through Glens Falls.

GENEVA, ILL. The Aurora & Geneva Electric Railway Co. has secured an entrance into Geneva and has now rights of way as far as the county court house. The line will be completed and in operation in the early spring.

CIRCLEVILLE, O. Adam G. Grant, of Grove City, O., has received a franchise in Circleville for an electric railway to run from the Franklin County line to Morgan Station. The road will be an extension of the Columbus & Grove City Ry.

J. M. Wilson, representing the Columbus & Southern Electric Railway Co., received a franchise in Circleville for the proposed line to Washington Court House.

WARRENSBURG, N. Y. A syndicate headed by Joseph Powers, of Troy, and Addison B. Colvin, of Glens Falls, is preparing to build connecting links in a chain of electric railways whereby a continuous trolley trip from Albany and Troy to Warrensburg, 65 miles north, will be possible. Rights of way through Glens Falls have been obtained and the proposed line will run from there to Lake George and thence north. Thirty or 40 miles of single track, overhead trolley line will be built to connect the existing lines between Albany and Warrensburg, and later, a long extension to Schroon Lake is projected. The electric power dam being built across the Hudson eight miles above Glens Falls at a cost of \$1,000,000 will probably supply power for the operation of the Powers-Colvin line. Lines between Troy and Greenwich have already been acquired by the promoters.

WALTHAM, MASS. The Waltham Street Railway Co. has secured rights for the extension of its line from Prospect St. to the Watertown line and has petitioned for locations through Linden, Beaver and Quince Sts. Fred C. Hinds, 58 State St., Boston, may be addressed.

INDIANAPOLIS, IND. Two franchises have been granted by the commissioners of Marion County. The first, to Nathaniel N. Morris and G. C. Webster is for an electric railway on the National road from Indianapolis to the county line, to be in operation by March 1, 1902. The second, secured by representatives of the Union Traction Co., of Anderson, is for an electric line from Danville along the Rockville road to the county line. Charles L. Henry, Anderson, may be addressed.

BANGOR, PA. It is announced that contracts will be awarded within 60 days for the construction of the Bangor, East Bangor & Portland Street Railway Co.'s proposed line. This company was mentioned in the "Review" bulletin November 22d as having been incorporated to build a nine-mile line through Northumberland County. All rights have been secured and the company is now receiving bids for the construction of the road and the power house. E. P. Buzzard, of Bangor, may be addressed.





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