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Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 66,750 copies—an average of 8344 copies per week.

The Ideal Shop

The publication of the official proceedings of the American Railway Mechanical and Electrical Association, with its accompanying diagram of a proposed shop plan drawn on the blackboard during the convention by W. O. Mundy, makes it appropriate to call attention to some of the merits of that plan. The plan provides for a repair shop having a long row of repair tracks placed at an angle to the wall of the building. The plan has a great many points to recommend it. In the first place, it does away with the objectionable transfer table, as the repair tracks leave by an easy curve to a main track running the length of the building on one side. This track may be either outside or inside the building, but preferably inside, as this would make it necessary to have only one or two entrance doors. With the transfer table there must be an entrance door for every track,

unless the transfer table is enclosed, which makes a very expensive arrangement as well as an unsafe one from an insurance standpoint. The arrangement of tracks diagonally with each one connecting to the main supply track also makes it possible to switch trailers and disabled motor cars on to repair shop tracks without having recourse to the awkwardness of maintaining a gang of car pushers or special winding drum apparatus for pulling in dead cars.

Excursion Rates and Regular Traffic

An important point was briefly touched upon at the Anderson meeting of the Indiana Electric Railway Association, namely, the effect that low excursion rates on certain days may have on the regular traffic of an interurban road. This is a matter about which it is difficult to theorize, and we should have at hand some exact figures covering a large amount of experience before drawing any conclusions. But it is well to remember in planning excursion rates on interurban roads that they may have an effect on the regular traffic. It is obviously false economy to put on a low rate excursion on Wednesday which will rob the regular business of Tuesday and Thursday which is carried at the full rate. With the low rates which are common on interurban roads great reductions in fare for excursions are not usually advisable. The interurban road is usually in a position where it gets the traffic anyway on special holidays and the like, provided there are special attractions. Reducing the fare, of course, means that more people must be handled and a greater operating expense incurred for given gross receipts. Unless the net receipts are to benefit by an excursion rate, it had better not be made. Excursion rates given on days when the traffic is bound to be extra heavy anyway may be a decided detriment by so overloading the traffic carrying capacity of the road as to cause general discomfort and dissatisfaction, with no corresponding gain in net receipts. The object of the excursion rate should be to encourage traffic which would not otherwise come to the road. There are a great many people in the world who like "bargain counters," and a reduction in fare, even if it be small, will attract them. The necessity for low excursion rates will depend very much on local conditions. If a road has a pleasure resort which will attract Sunday and holiday traffic, and at which special attractions can be occasionally given, this will be an inducement to travel which will largely take the place of low rates. If the lines of a company are absolutely without such attractions, it may be desirable to offer excursion rates at times when traffic would otherwise be very light. The plan adopted by the Indianapolis & Northwestern, as mentioned at the Indiana convention, just referred to, is to give a low rate on Sundays in summer, for the reason that there is no feature on the companies' lines which attracts extra travel on Sundays, so that Sunday in summer instead of being the best day would be the poorest day of the week were it not that the low rate was in force on that day. The necessity for this is partly, no doubt, due to the policy of the steam

roads in that territory of running very low rate excursions to Chicago and Indianapolis. Judging from the action taken by some of the large steam railroads last year, the very low rate Sunday excursion on steam roads is falling somewhat into disrepute, and considering the nature of some of these excursions, it is well that they should, as they are not conducive either to the morals of the towns through which the railroad passes or the good will of the better element in those communities. It is well for interurban railways to avoid this kind of thing and recognize that its regular and respectable patrons are to be catered to rather than the rowdy element.

Cold Weather Delays

The cold weather of the past two weeks in the Eastern States, as well as in the Middle West, has entirely demonstrated the fact that electric traction, as far as the heavier suburban and interurban lines are concerned, has turned the tables on steam traction as regards reliability of service and freedom from delays in extreme cold weather. There was a time when even the friends of electric traction were obliged to admit that for regularity of service in all kinds of weather, steam railroads had the advantage. We have come to look upon steam trunk lines as about as nearly infallible as human ingenuity and years of experience can make them. The experiences of this winter, which have exploded those ideas, cannot fail to come as a great shock to most of us. Among the steam railroads centering in New York and Chicago it has been no uncommon sight to see through trains standing in terminals for some time after their regular leaving time, simply for lack of a locomotive to take them out. This lack of motive power has not been confined to the more unimportant trains, as we have personal knowledge of cases where the best and most advertised trains of a road have been held up in this way. Even after these trains have secured a locomotive to haul them, no pretense has been made of maintaining regular speed. In fact, the condition of the motive power of most of the steam roads during the recent weeks of the present winter has been either laughable or pitiable—we do not know which. It is true in every clime that extremes in weather find the people of that locality unprepared to meet them with comfort, for the simple reason that these extremes of heat and cold are comparatively rare. As steam railroad men are but human, it is perhaps too much to expect that they be prepared to cope with the coldest weather which occasionally strikes them.

As regards the comparative ability of steam and electric traction to maintain service in extremely cold weather, there are some inherent advantages in favor of the electric motor. As the steam plant of the steam road must be carried on each locomotive, the chances for freezing of pipes, leakage of flues from overwork, etc., are increased with every degree of cold. The steam plant of the electric road is comfortably housed in a warm power plant, with sufficient reserve capacity so that a break-down of some piece of machinery is not as serious as on a locomotive. Further than this, the colder the weather the less danger of overheating the motors under a car, and this tends to counteract the additional work that is likely to be put on the motors in plowing through snow banks. The snow-fighting equipment of the modern electric road, whether city or interurban, is so complete as to make snow fighting as easy if not easier than on steam railroads. We do not claim that electric roads of the country have been able to give perfect service during the recent extreme cold and blizzards, but they have not

shown any such deplorable lack of motive power as the steam railroads.

Another Chance for Electricity

At a recent hearing before the Massachusetts Railroad Commission in reference to the delays in train service which have occurred during various heavy snow storms in the yard of the South Terminal Station at Boston, several expedients for betterment were discussed without arriving at satisfactory conclusions. It was pointed out that during 360 days of the year the trains at the South Station are handled practically on time, and the steam railway men present urged that the criticisms of the traveling public are hardly just in view of the small percentage of time in which the service is demoralized. For two years experiments have been made with apparatus designed to melt the ice and snow by applying steam to the switches and frogs of the complex interlocking system installed at the South Station, but little success has thus far been attained. It was further argued that the arrangement of tracks is the best that can be made under the circumstances, and that if a roof was built over the entire yard it would cause more serious delays than are now suffered from the snow, on account of the dense mass of smoke and steam which would fill the train shed under conditions of low temperature and heavy atmosphere.

Strangely enough, no one brought out the fact that the electrical equipment of the suburban lines entering the South Station would completely solve the problem, if used in connection with an extended roof built to cover the exposed interlocking which now suffers so severely from the storms. The smokeless and steamless atmosphere of an electrified terminal service is still unrecognized in many quarters, and there certainly appear to be few situations in the transportation world which offer better fields for electrical operation than the suburban lines radiating from the Hub. The South Station at Boston has enjoyed an enviable reputation as a well-nigh perfect piece of terminal work since its opening day a few years ago, and the stalling of its interlocking seems to be the only weak point of consequence that has developed in reference to the handling of something like 800 trains a day. We have no doubt that with electrical suburban service and suitable protection of the interlocking, the present difficulties would disappear, as far as they are dependent upon the causes enumerated.

The Size of Car Windows

For a long time it was the accepted practice in steam railroad coaches to place windows so as to bring a window exactly opposite each seat. In the past few years it has become a kind of fad among some steam railroads to build coaches and chair cars with wider windows, thus following a style of construction which has been adopted on some of the recent Pullman coaches, which have one wide window for each section instead of two narrower ones, as formerly. Electric railway companies have attempted to follow the wide window idea to some extent on both city and interurban cars, and the results have not always been satisfactory either to the public or the operating companies. Most street railway companies which have adopted cross-seated cars have adhered to the old standard plan of a window opposite each seat. We have in mind some companies which are among the most particular regarding details in car construction, which are very careful in planning new cars, to see that the windows and seats come exactly opposite, so that there will be no obstruction of any passenger's view. A few

companies have disregarded this rule and have adopted windows considerably wider than the distance between seat centers. Where such wide windows have been adopted, it has been thought advisable to have some distance between windows to admit of proper stiffness in the car framing. The way that this is practically worked out is that some seats have nothing but window space opposite them, while others come opposite a mirror or a panel, which fills the blank space between windows. If the car is used as a semi-convertible car, as most such cars are, this gives the passenger who is unfortunate enough to get a seat that is not opposite a window but very little view and correspondingly little breeze in hot weather. Of course, the passengers sitting opposite windows have a much better position than if they were in a car with a window for each seat. A wide window is difficult to raise and lower, and in case of sudden storms coming up may prove itself a nuisance. Moreover, the breaking of a glass in a wide window causes more expense and inconvenience than the breaking of a glass in a smaller window, and on account of the size of the pane, unless the windows are of very heavy glass, large windows are more likely to be broken than small ones. The chief argument in favor of the wide windows is the supposed greater elegance in the exterior appearance of the car. We are inclined to think, however, as time goes on and as styles change, that cars of this kind will seem worse out of date than those employing a more conservative type of construction.

Electric Railway Rates

There has been considerable discussion of late regarding rates of fare on interurban and other lines, and there has been a growing feeling that in the enthusiasm of competition with steam lines, rates had been cut rather too freely. Here, as in many other respects, the interurban line finds itself in a somewhat anomalous position. At its termini it finds street railway lines charging a uniform 5-cent fare for long distances into the suburbs, and practically compelling a similar policy on other lines in the same general district. On the other hand, in the strictly interurban part of a route, there is no such precedent, and the regulating factor is competition with steam roads. Hence, fares on the average higher than city fares can reasonably be charged. If interurban lines go into long hauls they are essentially on an ordinary railroad basis, and may even dip into interstate business, which still again complicates the situation. It is particularly hard to adjust local rates when a road runs from town to town, at the same time having urban termini, in which a uniform fare prevails. Many a manager has cudged his brains for a way out of his difficulties, and many Western lines have gone extensively into the mileage-book scheme, sometimes at rates decidedly too low. The fact is that with the extension of electric lines a point has been reached at which the ordinary basis of computing fares fails to be satisfactory.

The ordinary foreign plan of zones does not strongly appeal to the American mind unused to minute economies, although for many years variable fares were charged in suburban runs. A plan now honored only in Mark Twain's immortal rhymes. It certainly would be unwise to go back to the days of the "pink trip slip," and yet it had its merits. As the problem now works out in many cities, there is a species of irregular suburban area within which a uniform 5-cent fare is charged and a wide zone beyond in which another nickel is required. The urban area is generally generous enough in dimensions to make

the running time to its edge materially longer than the time on the suburban steam trains. As a result, the electric railway traffic falls off with startling rapidity beyond the urban area, and we could mention roads that, in spite of apparently favorable territory, have been brought to the verge of disaster through these conditions. Steam roads have little chance in the urban area, but in the first suburban zone, so to speak, they cut considerable figure; in the second zone, requiring still another nickel, they again gain, and so on. The thing to be desired in many instances is a system of rates so arranged that a simple commutation scheme can be carried out without making too sharp a transition at the urban district. Of course, the steam railways have worked out the commutation arrangements very completely, but have generally given over the urban area to the electric. It is not altogether simple for the electric roads to draw nice distinctions between commuters and non-commuters, and some easy plan of working would be most desirable. Merely as a suggestion in the direction of simplicity, how would the following plan work out? Suppose one were to establish a mileage rate that would serve equally for the collection of fares within and without the urban zone—that is, with the mile rate a submultiple of a nickel, say, $1\frac{1}{4}$ cents or $1\frac{2}{3}$ cents. Then for the urban zone, wherever established, an exact nickel's worth of mileage could be torn off, with whatever might be required in addition for exterior stations. If this mileage were sold in 100-mile books or strips, quite unrestricted, they would probably be very freely used, and would give the advantage of furnishing a universal commutation ticket. It would seem likely that such a device would be of material use in building up the outer suburban traffic of interurban lines, and would also serve for the longer runs. It amounts to a flat mileage rate on the interurban part of the line, combined with a graded commutation rate near the termini, regulated by the size of the urban area. We merely cast out the idea for what it is worth, not even knowing that it may not have been suggested. At all events, it is worth thinking about.

Snow Sweepers and Plows During Summer

The series of articles which has appeared in recent issues of this paper on snow-fighting appliances has called attention to the disposition of this apparatus during the summer. Practice differs on this point. Certain roads, after removing the motors, store their plows and sweepers during the summer. Other roads dismount the brooms, nose pieces or wings and utilize the cars for freight cars or "locomotives," while still another class uses the sweepers through the summer for cleaning the track. In many respects the average sweeper or plow is well fitted for freight haulage. The hard service to which this rolling stock is subjected in winter makes a very strong construction necessary, and with some additional ballast, if required for traction, the dismantled sweeper or plow makes a very efficient traction machine. The practice of using the sweeper in summer, however, to clean the track is growing, especially with those roads using a grooved rail, and in certain cases it has even been satisfactorily employed on girder rails laid in macadam. In such cases it is desirable to precede the sweeper with a sprinkler. An interesting instance of this practice is reported from Lima, Peru, where the passage of the electric cars raised so much alkali dust as to be disagreeable to the passengers and destructive to the equipment. Here the combined use of a sprinkler and sweeper eliminated the trouble.

THE NEW INTERURBAN LINE OF THE LANSING & SUBURBAN TRACTION COMPANY

BY I. L. DIXON

The attention of the street railway world was for several years directed with great interest toward the construction of an electric railway line between Lansing and St. Louis, Mich., for the promulgation of experiments upon the Arnold electro-pneumatic system of railway operation. An opportunity of great promise was, it was thought, offered for a practical test of the high-voltage single-phase alternating-current system of electric traction, in that this line was laid out through a country which did not seem to offer sufficient return to warrant the installation of a trolley line of the usual type of construction, involving direct-current power apparatus and transmission equipment. It was accordingly decided to make a trial of the Arnold system, which promised to make the road commercially practical by the elimination of the expense of rotary transformer sub-stations and the heavy feeders necessary in the direct-current system.

The line was completed in 1901, and, pending the experiments upon the completed Arnold single-phase motor, the road was opened for service and operated with steam locomotives. While the experiments were progressing nicely upon the proposed new alternating-current system, however, an end was put to this interesting new development by a disastrous fire in the car house and shop late in 1903, which, as noted in the Jan. 2, 1904, issue of this journal, destroyed all of the cars and experimental equipment which were to be used in connection with the new system. The fire proved a serious setback to the experimental work, and the company became involved in financial difficulties. As a result of this, and the increased desirability of instituting electrical operation, the company was reorganized in the early part of 1904, and the decision at once made to equip the road for operation upon the direct-current system, after the manner of usual practice in this work.

In April of last year, the company developing the interurban line which was then known as the Lansing, St. Johns & St. Louis Railway Company, effected a consolidation with the Lansing City Electric Railway Company, under the new name of the Lansing Suburban Traction Company, and provided for a complete reorganization of both companies for a new and more effective condition of united operation. Thomas M. Keeley, who had long been identified with early electric traction work in Chicago and other points in the West, and had been actively in charge of the experimental work upon the single-phase system, was selected as superintendent. Active steps were then taken to re-equip the interurban line for direct-current operation, and by making an arrangement for the purchase of direct-current power from the water power company supplying the city lines, the interurban division was opened for service about July 1, 1904. Subsequently, the Lansing city lines were greatly improved and in some instances practically rebuilt, the desire being to bring up the permanent way equipment of the new company to a very high standard.

The total length of lines now operated by the new company amounts to 34 miles; this embraces the interurban line to St. Johns, 22 miles long; one from the city of Lansing to the Michigan Agricultural College, to the east, $3\frac{1}{2}$ miles long, and another extending to Waverly Park, 3 miles to the west, which, with the lines in the city and extending to North Lansing, made a total of 34 miles. The line to Waverly Park is a new addition, having been completed early in the summer of 1904 to a point within $\frac{1}{4}$ mile from the park entrance, where the line of the Grand Trunk Railway is to be crossed, although plans and preparations are now being made for a depressed crossing at this point, which will enable cars to run into the park without the ever-present danger of a grade crossing with the steam railroad. The company has recently completed plans for the extension of the Agricultural College line further east, to a resort known as Pine Lake, which will unquestionably prove another very profitable venture; construction upon this extension was begun Feb. 1, and the new line will be in operation by June 1.

THE INTERURBAN LINE

An excellent roadbed was built originally for the interurban line to St. Johns, a private right of way, 50 ft. wide, having



THE NORTHERN TERMINAL OF THE INTERURBAN DIVISION OF THE LANSING & SUBURBAN TRACTION COMPANY AT ST. JOHNS

been secured over the most direct route possible between the two cities. An especially favorable tract of country was encountered, so that few difficulties of railroad building were met. High land is traversed in general, and in only a few stretches is low land encountered; in one of these, a sink hole developed, but it was easily filled up, and soon settled to a firm bearing. Practically no hills are encountered, the steepest grade upon the system being the incline approach to an overhead crossing of the Pere Marquette Railroad, in North Lansing, which is a 4.3 per cent gradient. The section of the system to the south of St. Johns embraces an unbroken tangent $10\frac{1}{2}$ miles in length, which will greatly facilitate fast running.

The line to St. Johns is 22 miles in length from the center of the city of Lansing north to the end of the line in St. Johns. It leaves Lansing over the Michigan Agricultural College branch of the city lines, turning to the north to enter upon its own tracks a short distance east of the center of the city. In North Lansing the Pere Marquette Railroad is crossed by an overhead bridge, the approach to which is a timber trestle, built on a gradient of 4.3 per cent. The span across the railroad tracks is carried by a steel truss bridge, as shown in a view on page 347. At the north end of the bridge is located the car house and storage track yard where the various freight cars and the steam locomotive are kept. At a distance of $8\frac{1}{2}$ miles north of Lansing, the line passes through the small town of DeWitt, shortly beyond which it enters the $10\frac{1}{2}$ -mile continuous tangent

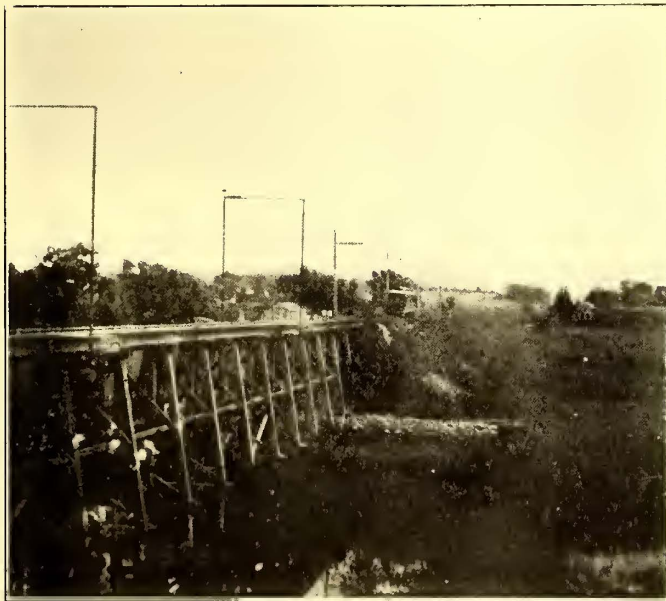
of the line, which extends nearly to St. Johns. Few bridges are required, as the country traversed is a fine high and dry section of excellent farming land.

The track has been laid to standard gage with 67-lb. T-rails of standard A. S. C. E. section, although over the railroad crossing trestle and bridge a 75-lb. T-rail is used for additional stability. The ties are of cedar and oak, set to 24-in. centers, and the ballasting has been carefully done with gravel, taken from a conveniently located gravel pit near DeWitt. Split switches and standard spring frogs are used in accordance with the best steam railroad practice, and the work of track repairs will be carried on in sections, which will be patrolled and cared for by individual crews. Three tool houses have been built for housing the section hand cars and track tools, and the work of maintenance will be carried out by three crews.

The trolley and transmission lines are carried upon side poles, set with centers 8 ft. from the center line of track. The poles used are of the best cedar, 35 ft. long with 7-in. tops, and were carefully selected for soundness. They are spaced 100 ft. apart, and are set with heel pieces and breasters for extra stability; in addition, upon curves they are heavily guyed to anchored poles.

The brackets are of special wooden construction, having been originally installed with a view toward providing extra insulation for the high-voltage line current to be used; but they were easily adapted to the requirements of standard direct-current construction. The original glass trolley wire hangers are being replaced by standard hangers of the Ohio Brass Company, with the well-known dirigo insulation; these are supported from the 5-16-in. seven-strand steel cables formerly used for sake of flexibility. The trolley wire, which is a 135,000-circ. mil wire of the General Electric standard grooved section, is supported beneath the hangers upon 15-in. Eureka clinch ears.

The transmission line by which the power is delivered in the form of 5500-volt three-phase alternating current from the power station in Lansing to the two sub-stations out upon the line, is also carried upon the side-pole line. The high-tension wires are carried upon Lock insulators, the wires being

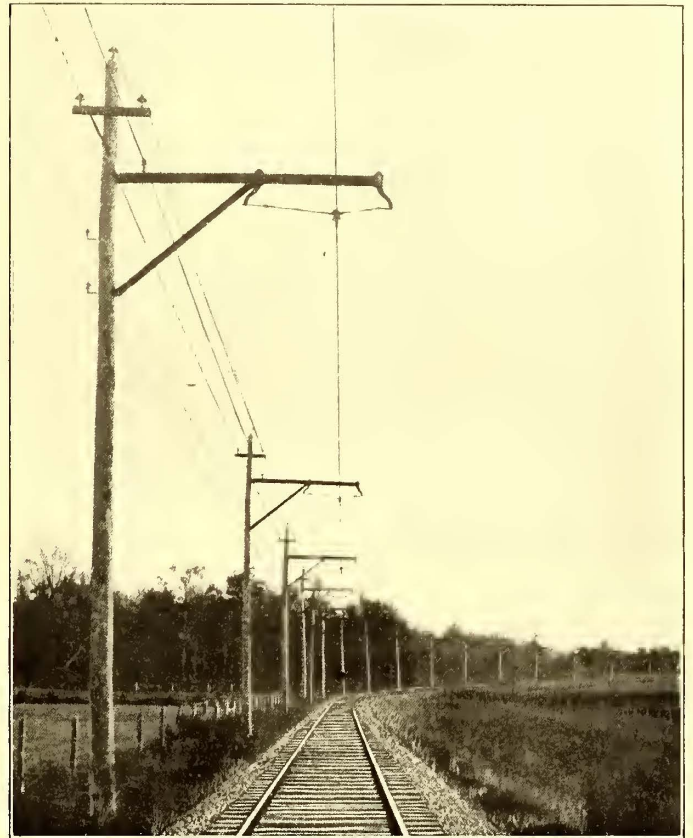


VIEW UPON THE INTERURBAN LINE NEAR DEWITT, SHOWING FILL AND TRESTLE

mounted in the usual triangular arrangement and spaced 28 ins. apart. The principal features of the line are shown in an accompanying view of the line construction. The 0000 bare feeder is carried upon the arms adjacent to the pole, while the telephone line is mounted on bracket insulators upon the opposite sides of the poles.

POWER EQUIPMENT

Current is supplied to the interurban lines, as well as to the city lines of the company, from two power houses which are operated by a private corporation doing a commercial power



TYPICAL LINE VIEW UPON THE INTERURBAN DIVISION, SHOWING SIDE BRACKET CONSTRUCTION

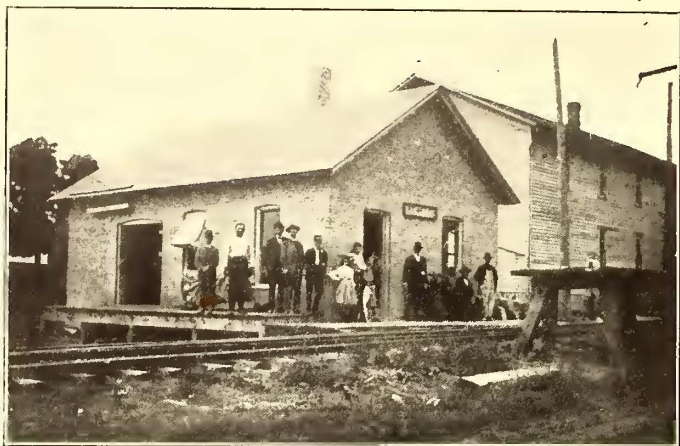
business in the city of Lansing. One of these is located in the central portion of the city, and is steam driven, while the other is a water-power plant with steam auxiliary, located at a dam upon the Grand River, where it passes through the southern portion of the city. This double source of power, which is supplemented by a storage battery plant, proves a very reliable supply.

In the city plant of the power company, the railway company has a 225-kw, 575-volt Westinghouse generator, which is belt-driven by a Corliss engine of the power company. This generator delivers directly to all of the city lines and to the Lansing end of the suburban line, there being no high-tension current handled in this plant on account of its location so near to the center of the business section. In this plant is also located the storage battery plant, which is arranged to float on the trolley system, and thus maintain a more steady average load upon the generating equipment. The battery consists of a set of 265 cells, giving thus a maximum discharge voltage of 650 volts. The battery was furnished by the Gould Storage Battery Company.

In the water-power plant at the river, the street railway company has a 300-kw General Electric rotary-converter set, which is belted to a line shaft, the latter being driven by the water wheels, or the steam auxiliary in case of low water in the river. This machine is operated as a double-current generator, the direct-current side being used to supply power to the railway system through the switchboard at the city plant, while the alternating-current side operates the transmission line. The direct-current source is handled and controlled at the switchboard of the city plant in the same manner as an additional dynamo would be if one were located there. The alternating-current side of the generator delivers three-phase alternating current at a potential of 360 volts to step-up transformers lo-

cated at that plant also. These transformers, which are of the air-cooled type, supplied by the General Electric Company, have a total capacity of 300 kw, and supply the transmission lines at a voltage of 5500 volts.

The switchboard in the city power plant is therefore the controlling point for the 550-volt local direct-current system, by



THE SUB-STATION AND DEPOT AT DEWITT, UPON THE INTERURBAN LINE

which the city lines are operated directly. This board contains the usual equipment of generator panels and a feeder panel for each section of the city lines. The feeder panels are equipped with I. T. E. circuit breakers, Weston ammeters and single-pole double-throw knife switches. The double-throw knife switches are used for transferring the load either to the city plant generator or to the water-power plant machine, this being a convenient means of dividing the city load between the machines in any desired proportion, or, in emergency, of throwing all of it upon either one.

The interurban line is divided into three approximately equal feeder sections, inasmuch as sub-station No. 1, which is located at DeWitt, is $8\frac{1}{2}$ miles north of Lansing, and sub-station No. 2, at County Farm Crossing, is $9\frac{1}{3}$ miles north of DeWitt. This arrangement was selected so that each sub-station should not be required to feed further than about 4 miles on either side of it, while the city power plant takes care of approximately 4 miles north from the center of the city; practically the longest single feeding distance is from sub-station No. 2, at County Farm Crossing, northward into St. Johns, a distance of 4 1-6 miles, all other sections being fed from both sides. Each sub-station is equipped with a 150-kw General Electric rotary converter, which takes current from the three-phase transmission system through step-down transformers and delivers it at 600 volts to the trolley system. The step-down transformers, which reduce the 5500-volt transmission current to 360 volts for use in the rotaries, are of the air-cooled type of the General Electric Company, and of 150-kw total capacity. Current is fed out upon the line in both directions from each sub-station by a 0000 bare copper feeder, which extends nearly to the extreme end of the section fed by it, feeding-in taps being made at frequent intervals.

ROLLING STOCK

Four new cars were purchased from the John Stephenson Company, of Elizabeth, N. J., for use upon the interurban line. They are of the semi-convertible type of car, and are 42 ft. long, equipped single ended, as turning "Y's" are provided at either end of the run for turning the cars around. Their interiors are attractively finished in oak, and are arranged with a smoking compartment, seating twelve, at the front end, and the main passenger section of the car, seating thirty, at the rear. The seats are of the Hale & Kilburn walk-over type, finished in rattan. The cars are heated by hot-water heaters, supplied by the Peter Smith Heater Company, which are located in the front vestibule compartments. Each car has also a toilet compartment, which is located next to the dividing partition between the smoking and main passenger sections.

The mechanical and electrical equipments of the cars are of the best and most modern. The cars are mounted upon type 36 Peckham M. C. B. trucks, and the system of air braking used is the Christensen straight-air type, supplied by the National Electric Company. Thirty-three-inch cast-iron wheels are used, having 3-in. treads and $\frac{3}{4}$ -in. flanges. Each car is equipped with four General Electric type 67 motors and type B-28 controllers. The auxiliary equipment consists of Milloy roller-bearing trolley bases, Knutson trolley retrievers, Ham sand boxes and Imperial arc headlights, manufactured by the Crouse-Hinds Electric Company.

A number of flat and box cars which were used in the construction of the road have been retained for the handling of freight upon the interurban lines. These cars are of standard construction as used upon steam railroads, and are adaptable to the heaviest classes of freight handling. Owing to conformity of gage, interchange of cars in freight shipments is thus made possible with any of the steam roads intersected in Lansing.

CITY SYSTEM

Several new cars have also been added to the former rolling-



ONE OF THE STANDARD DOUBLE-TRUCK CARS IN USE UPON THE INTERURBAN DIVISION, TURNING INTO THE CITY TRACKS TO ENTER LANSING

stock equipment of the city operating company for use upon the city lines. These embrace several Jewett open cars, one of which is illustrated in an accompanying illustration. Single-truck cars are in general use upon the city lines, although double-truck cars are operated over the $3\frac{1}{2}$ -mile line to the Michigan Agricultural College. The standard city car of the company is the single-truck car, 22 ft. to 26 ft. long, while upon the Agricultural College line, 42-ft. double-truck cars are used. The greater part of the older cars formerly used in the city

have been largely rebuilt and re-equipped to bring them up to the latest standards. The closed cars have been equipped with vestibules, in accordance with the Michigan laws, and a very pleasing appearance is the result.

The above new work has been carried out in the repair shops upon South Washington Street, where also the running repair work for both city and interurban lines will be carried on. The former shop equipment has been greatly enlarged and re-equipped to provide for the new work. New tools have been added, and it is proposed to carry on the entire work of electrical repairs there, in a department devoted to it.

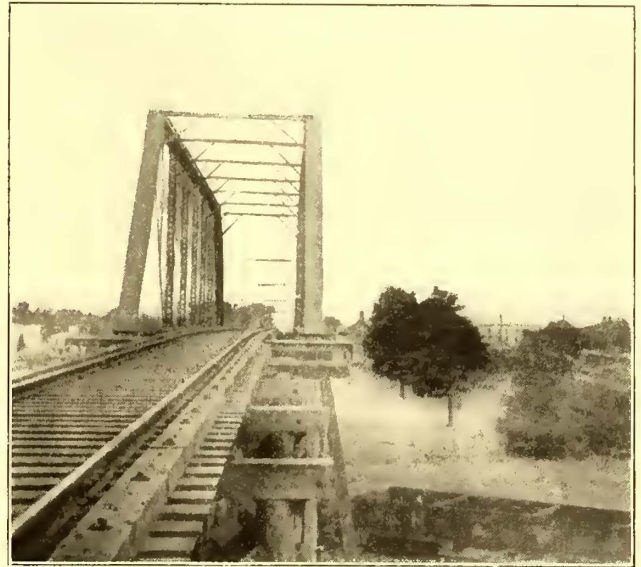
Extensive improvements have also been made to the track work of the city lines. In many places the track has been relaid and ballasted to provide a firm and easy-riding line. The city tracks are in most cases laid with 7-in. 80-lb. Cambria girder rails, to conform with pavement requirements upon the principal streets. Upon unpaved streets, such as upon the Waverly Park line, a 60-lb. T-rail is used, ballasted flush with the top of the rail. An accompanying illustration shows representative line and track construction upon Washington Avenue, the principal street of Lansing; also the inspection automobile used by General Manager Elliott and Superintendent Keeley is shown.

A similar high grade of city construction was installed for the terminal of the interurban line upon the streets of St. Johns. An illustration shows the track and overhead line work upon Main Street in that city. The track is here also laid with 7-in. 80-lb. Cambria girder, and the line work is supported by span-wire construction, for which neat iron poles are used. At the north end of the line a Y turning track and side track is installed for turning cars, and also for accommodation of freight and baggage cars.

TRAFFIC

The interurban line to St. Johns traverses a well settled farming district, which, although it cannot be said to be densely populated, is capable of originating a large amount of passenger and freight traffic. It is an excellent farming country, and is peopled by a splendid class of prosperous farmers. Owing to the fact that heretofore there was no railroad communication to the district in the vicinity of DeWitt, there has, of course, been little development there; but since the opening of this new line the growth which has taken place is remarkable. A very

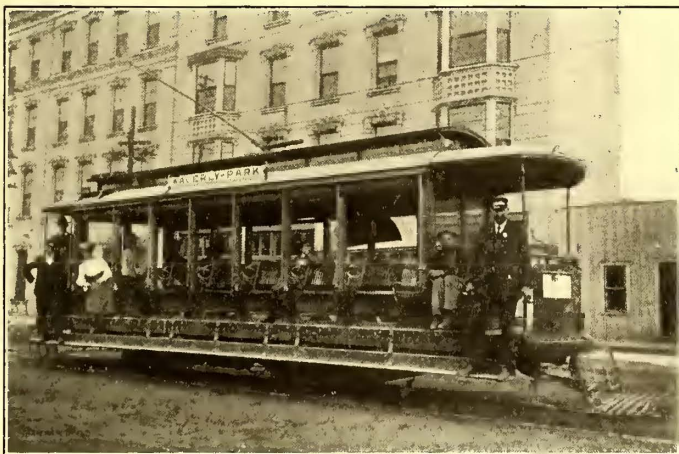
by the freight department. Through mail between Lansing and St. Johns is handled in pouches, and also local mail to and from DeWitt in both directions. An interesting feature of the development of the mail service is to be noted in the arrangement that has been made with the company to deliver local



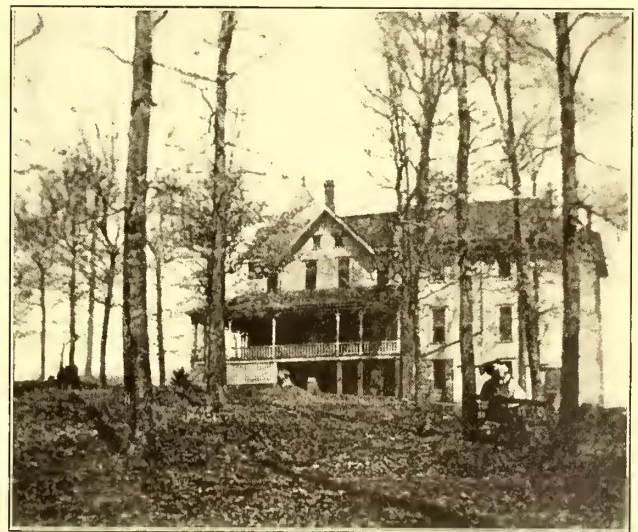
THE OVERHEAD CROSSING OF A STEAM RAILROAD, UPON THE INTERURBAN LINE AS IT ENTERS LANSING

pouches of mail to the various rural free-delivery carriers, who meet the car carrying mail, at specified road crossings, up the line.

While there would appear to be little opportunity for the development of park attractions upon the interurban line for increase of traffic, yet two resorts have proven available which will prove of value in creating traffic. Merle Beach, which is one of them, is a pleasant resort upon a lake located about a mile to the west of the line, some distance north of DeWitt. Regular stops are made at the road crossing nearest to this



ONE OF THE STANDARD OPEN CARS USED IN THE CITY SERVICE ON THE WAVERLY PARK LINE



THE HOTEL IN THE PARK OWNED BY THE COMPANY AND REACHED BY ONE OF ITS LINES

encouraging local business traffic has originated and, in addition, a large amount of freight traffic has been worked up.

A regular freight service has been instituted in addition to the half-hourly passenger service, and last fall an important development was made by the company in the handling of farm products in large quantities; many carloads of sugar beets were delivered by the company from local shipping points along the line to the large beet-sugar factory in Lansing, and also large amounts of apples, grain and other farm products were handled

point, and a 'bus from the hotel at this resort meets all passing cars for passengers; in this way a considerable amount of traffic has grown up, owing to various attractions of this resort. Also a winter attraction has been developed at Alvard Lake, which is a small lake passed by the line still further north of DeWitt. The railway company has established an open skating rink upon this lake, which will be continued throughout the winter if weather permits. The lake is lighted by lamps supplied from the railway feeders, and a casino has been installed

for the accommodation of patrons. An excellent business has resulted from this venture.

The larger park above mentioned, known as Waverly Park, is the development of a park property which was purchased by the



THE BASEBALL GROUNDS OF THE COMPANY AT WAVERLY PARK, WHICH ARE EFFECTIVE IN CREATING A LARGE AMOUNT OF TRAFFIC

new company and opened to the public, with many improvements, on Aug. 1 last, the opening day being welcomed by the city in the form of a holiday. This is a very prettily located park site of 73 acres, 20 acres of which have been improved for actual park purposes. The land is located upon the Grand River, southwest of the city, so that the advantages of boating and bathing are available. The park has a large hotel, open-air theater, dancing hall and fine new baseball park and grand stand; representative illustrations presented herewith show some of the park attractions. The buildings and grounds are electrically lighted by a private isolated plant upon the grounds.

The attractions at Waverly Park are in general operated by outside effort, through arrangement with the railway company. Excellent attractions are provided, and it is arranged to provide the very best of accommodations, the result of which has been very gratifying in the amount of traffic created in this way. During the winter, dances and parties have been made a special feature of the park by the company, and also a gun club has been organized with a large membership, which will have its headquarters at the park. Better access will soon be provided for entrance of cars to the park, as a subway will be built next spring under the line of the Grand Trunk Railroad, next to the park grounds, so that cars may then approach directly to the grounds; it is expected that this subway will be completed by May 1.

The line to the Michigan Agricultural College, to the eastward, is also a valuable source of revenue. This line traverses the most important part of the east end of the city, besides

being upon a direct line to three of the important railway depots of the city, and also to the Industrial School for Boys, a State institution. The Agricultural College, 3½ miles east, is an important source for traffic, as it is visited by large numbers of excursionists, particularly in the summer; also the vicinity of the college has grown to be a very densely populated section, and the easy communication thus afforded with the city of Lansing in the way of a frequent service will be productive of further growth.

The proposed extension of the line from the Agricultural College, 7 miles further to the east, will open up another important district and reach a very popular summer resort known at Haslett's Park, or Pine Lake. This lake is one of the principal resorts in that section of the State, but is inaccessible at present except by a steam railroad which gives very poor passenger service. This lake occupies a space of 360 acres, and is surrounded by numerous summer cottages, hotels

and club houses; also the Spiritualists' organization have made that resort the meeting place for their annual conventions, which brings large crowds to the lake in the summer. In addition, the lake abounds with excellent fishing, which furnishes unlimited sport for the angler. Active work has already begun upon the Pine Lake extension, the contract for construction having been let to the L. E. Meyers Company, Chicago, Ill., and it is expected that it will be opened for traffic by June 1. The extension will be built upon private right of



A VIEW OF THE WATER FRONT AT WAVERLY PARK ON A TYPICAL SUMMER DAY



OVERHEAD LINE AND TRACK CONSTRUCTION VIEW IN THE CITY OF LANSING

way from the college to the lake, and conform in general to the construction used upon the interurban line to St. Johns.

The various park enterprises which have been developed by the company, as well as also the greatly increased service and progressive methods which have been inaugurated, have been

productive of wonderful results. The population has responded very favorably to the increased and well maintained schedules upon the city lines, and the park attractions, the first of any account that the city has ever had, have been greatly welcomed. The results cannot be better shown than by stating that, in the first seven months of operation by the new management, the growth in business upon the city lines amounted to 142 per cent.

The president of the Lansing & Suburban Traction Company is Barney Mills, of Port Huron; George G. Moore is vice-president; Myron W. Mills, treasurer; J. R. Elliott is secretary, general manager and purchasing agent, and Thomas M. Keeley, superintendent and electrical engineer.

THE CLEVELAND LOW FARE EXPERIMENT

Considerable space has been devoted in the last few issues of this paper to accounts of the progress of the Cleveland low fare experiment. The results of a month of fair trial under two plans indicate that both methods were failures and that the frequent claims that low fares will attract considerable additional traffic have no foundation. The history of this important trial is summed up in a letter addressed to the City Council of Cleveland on Feb. 15 by President Horace E. Andrews, of the Cleveland Electric Railway Company, and the lessons taught are so valuable that his letter is given in its entirety below :

MR. ANDREWS' LETTER

To the City Council of the City of Cleveland:

Gentlemen—Pursuant to the permission granted this company, several experiments have been conducted to determine the revenues obtainable in Cleveland under lower rates of fare for street car service, and in accordance with statements made through the press by representatives of the Cleveland Electric Railway Company, we beg to submit the results of the tests so far tried.

The statements are in as condensed form as possible, but the details which go to make up the figures presented are on file in the office of the company, and will at any time be placed at the disposal of any committee representing the city government or any accountants who may be named for the purpose of investigating the correctness of the information which follows:

The company has endeavored to get at the facts, with no intention of attempting to prove or disprove contentions that have been made as to the actual results produced by lower fare. It does not intend, and cannot afford, to be otherwise than absolutely frank with the public, nor can it afford to deceive itself. The relation between the public and a public service corporation is a mutual one. A street railway company cannot be injured or its success impaired or hampered without injury to the public. The company has endeavored, and is endeavoring, to give the highest degree of service to its patrons, and is at present seriously handicapped by the lack of adequate terminal capacity in the center of the city, and because it has been denied the privilege of building crosstown lines and many additional miles of track through already-developed territory in Cleveland.

The results of the tests which have been made lead to the conclusion that fare as low as 3 cents is only financially possible within a zone considerably inside of the city limits. We realize that the so-called 3-cent-zone test was not satisfactory to the public nor to the company, and was not a conclusive test of 3-cent fare. The results obtained were sufficient, however, to indicate that if 3-cent fares were made applicable to the entire city the reduction in the earnings of the company would be so large as to be disastrous.

The gross earnings of the company for the seventeen week days preceding the 3-cent-zone test were as follows:

Jan. 3—Tuesday \$13,313.24	Jan. 13—Friday \$12,598.70
4—Wednesday .. 13,081.72	14—Saturday 15,014.24
5—Thursday 13,228.10	16—Monday 13,195.32
6—Friday 12,397.19	17—Tuesday 13,424.71
7—Saturday 14,391.49	18—Wednesday .. 13,256.77
9—Monday 12,882.68	19—Thursday 13,342.05
10—Tuesday 12,798.01	20—Friday 12,679.01
11—Wednesday .. 12,387.16	21—Saturday 14,914.42
12—Thursday 13,191.17	

The gross earnings of the company for the twelve days of the 3-cent-zone test were as follows:

Jan. 23—Monday \$12,477.64	Jan. 30—Monday \$12,590.45
24—Tuesday 12,268.74	31—Tuesday 12,318.79
25—Wednesday .. 11,434.22	Feb. 1—Wednesday .. 12,215.39
26—Thursday 12,279.74	2—Thursday 12,477.74
27—Friday 11,757.96	3—Friday 11,628.77
28—Saturday 14,654.44	4—Saturday 14,460.09

It will be remembered that the reduced rate of fare was in effect for only thirteen hours of each day, during which time the loss over the earnings of the seventeen week days preceding was 5.74 per cent, or \$764.47 per day. This decrease was shown when the 3-cent fares collected were 18½ per cent only of the fares collected on the entire system. If the low rates of fare had been in effect for the whole twenty-four hours of each day, the percentage of loss would have been greater.

The only lines of cars which were operated wholly on a 3-cent basis, with transfer upon a 5-cent cash fare or an eleven-for-fifty ticket, were the Willson Avenue line and the Fairfield line on the South Side, both of which lines show an abnormally large percentage of transfers under ordinary conditions, the percentages being, on the Willson Avenue line, 81, and on the Fairfield line, 42.

The percentage of transfers issued on all the lines operated by the company is normally 30, and was, during the 4-cent test, when the fare for a ride with a transfer was greater than for a single ride, 23.

The results obtained on the Willson Avenue line show a loss in revenue of 13.4 per cent. If the same rate of fare had been in effect during the entire day, instead of during thirteen hours only, the loss would have been 15.5 per cent.

The results on the Fairfield line show a loss in earnings of 16.26 per cent, indicating a loss, if the same rate of fare were in effect during the entire day instead of thirteen hours, of 20.78 per cent.

As stated above, these two lines issue and collect an abnormal number of transfers, thus making the average fare collected considerably higher than it would be on the lines of the company as a whole under the rates of fare charged during the test; i. e., 3 cents for a single ride and 5 cents or an eleven-for-fifty ticket for a ride with a transfer.

If the results obtained on the Willson Avenue line were applied to the whole system of lines operated by the company for twenty-four hours daily, and if operated upon the same rates of fare of 3 cents for a single ride, and 5 cents or an eleven-for-fifty ticket for a ride with a transfer, and assuming that 80 per cent of the passengers pay 3-cent fare and 20 per cent pay 4.7 cents for fare and transfer, the percentage of decrease would be 29.05, or a loss of \$3,600 per day in gross earnings as compared with the earnings under the present legal rates of fare. This result would be altered if lower fares stimulated traffic. The actual stimulation, however, during the 3-cent-zone test was only 1 per cent, and during the 4-cent test 1.38 per cent.

The 4-cent test was begun on Monday, Feb. 6, and was discontinued on the following Monday at midnight.

The gross earnings of the company for twenty days in January, at the regular rates of fare, were as follows:

Jan. 3—Tuesday \$13,313.24	Jan. 13—Friday \$12,598.70
4—Wednesday .. 13,081.72	14—Saturday 15,014.24
5—Thursday 13,228.16	15—Sunday 8,710.83
6—Friday 12,397.19	16—Monday 13,195.32
7—Saturday 14,391.49	17—Tuesday 13,424.71
8—Sunday 8,516.13	18—Wednesday .. 13,256.77
9—Monday 12,882.68	19—Thursday 13,342.05
10—Tuesday 12,798.01	20—Friday 12,679.01
11—Wednesday .. 12,587.16	21—Saturday 14,914.42
12—Thursday 13,191.17	22—Sunday 9,358.99

The gross earnings of the company for the eight days of the 4-cent test were as follows:

Feb. 6—Monday \$11,398.93	Feb. 10—Friday \$11,459.18
7—Tuesday 11,618.29	11—Saturday 13,510.57
8—Wednesday .. 11,750.17	12—Sunday 7,519.98
9—Thursday ... 11,725.72	13—Monday 11,380.75

The decrease in earnings during the 4-cent test, as compared with the earnings of the twenty days in January given above, was 10.87 per cent, or \$1,375.74 per day, or, at 365 days per year, \$502,145.10.

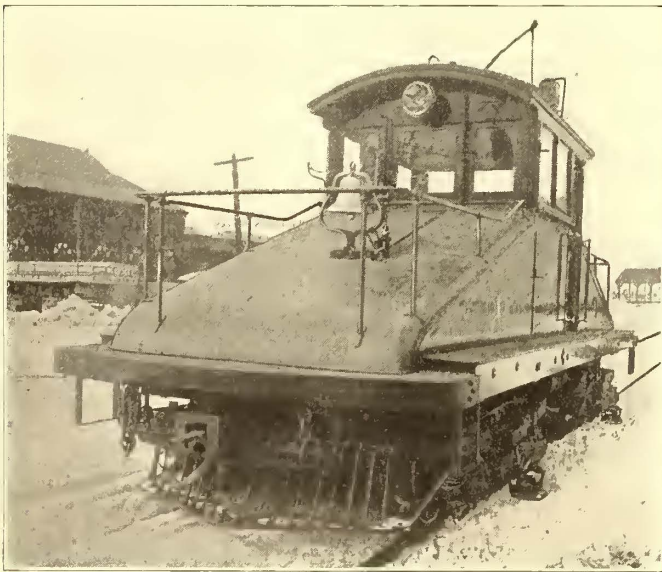
The tests conducted have cost the company in the neighborhood of \$25,000 in decreased receipts and increased operating expenses, but it believes that the information gained justifies the cost, and it will be glad, if desired, to make further experiments in lower fares, which, in the light of the experience already obtained, will produce a reasonable revenue, and will file with the Council the information gained. Respectfully submitted,

THE CLEVELAND ELECTRIC RAILWAY Co.,
By Horace E. Andrews, President.

A NEW SHIFTING LOCOMOTIVE FOR THE BROOKLYN RAPID TRANSIT COMPANY

One of the most important features of the work in a large car repair shop is the moving of cars into the shop and out, when completed, and the shifting to various departments or locations, as is required for facilitating the work; this, if easily accomplished, is often of great assistance in the work. Even in the case of electric railway cars, it is not always possible to move them by their own power, owing to repairs under way upon their motor equipments, while the practice of moving them about by means of a steam locomotive or of retaining a standard motor car out of service for this purpose is undesirable in many ways, involving, in the former case, serious fire risks and the troublesome boiler maintenance problem, and, in the latter, the tying-up of a comparatively large investment where it is not warranted. Special motor cars have been, in various instances, designed for this work, but none has met the requirements as well as does the interesting electric locomotive illustrated below.

The Brooklyn Rapid Transit Company, since the opening of



END VIEW OF THE ELECTRIC LOCOMOTIVE, SHOWING WIDE RUNNING-BOARD AND AMPLE PROVISION OF RAILINGS AND GRAB-HANDLES FOR SWITCHMEN

its large elevated division repair shops at Thirty-Ninth Street and Third Avenue, Brooklyn, and the inauguration of the work of reconstruction of its elevated rolling stock, has met the above problem in an aggravated form. This large shop, as was referred to in the article descriptive of the reconstruction work in the Aug. 13, 1904, issue of this journal, has eight longitudinal tracks, which will accommodate upward of 100 cars, about seventy being kept there under repairs all the time; from this and the fact that eight to ten completed cars are turned out per week, an idea may be gained of the magnitude of the work carried out at this shop and of the amount of shifting of cars which naturally arises. This problem proved to be of such importance in the furtherance of the shop work that an interesting departure was made in the building of an electric locomotive especially designed for the shifting of cars, as is here illustrated and described. It has been in service now upward of two months and its operation has proved more than satisfactory in all respects.

The locomotive is illustrated in the accompanying photographs and drawings of its details of construction. In general outline it resembles some of the earlier models of electric locomotives that have been built in certain cases for special classes of work. The sloping ends of body were chosen to enable the

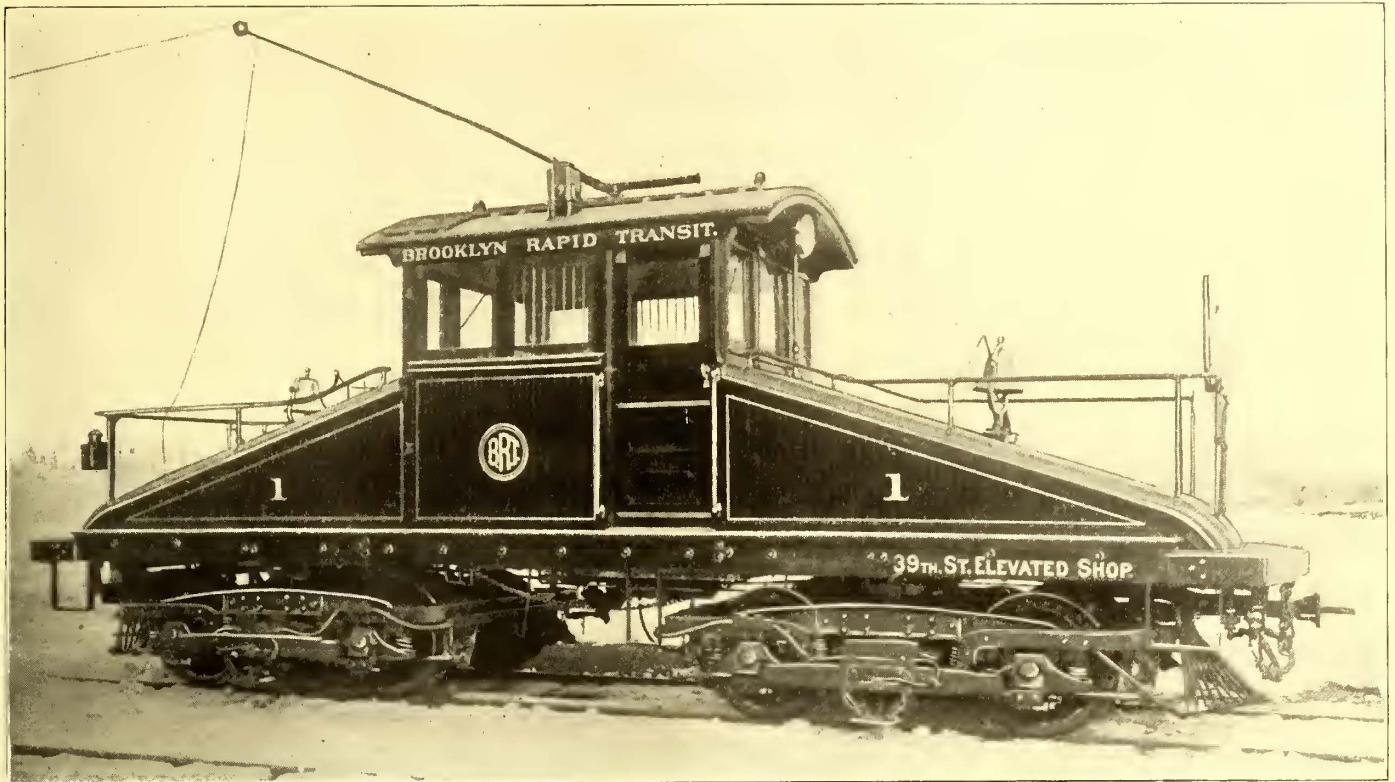
operating motorman to have a clear view direct to the draw-bar at either end for facilitating movements in coupling to cars; this is in fact one of the prime requisites of this special type of car for switching. Another important feature of its construction is to be noted in the generous width of running board provided upon either side for accommodation of the switchmen and assistants. The general appearance of the body impresses one with the idea of strength, compactness and adaptability to service requirements; also, while no efforts were made to beautify the car, a very pleasing outline and attractive appearance are nevertheless the result of the design.

The body of the locomotive was built along as compact lines as possible, in order to provide easy handling qualities. As may be noted from the drawings, the length of the under frame is 30 ft. 4½ ins. over buffer beams, giving thus the total wheel base of 20 ft. 7 ins. The cab has an interior length of 7 ft. 4 ins., but only 6 ft. of width, while the under frame has a total width of 8 ft. 7 ins., in accordance with the elevated car body standard width upon the system. The latter feature of the design was for the purpose of providing a wide and convenient running board along either side, which is so necessary for the switchmen and the assistant handling the trolley rope. Thus while the cab is compact, still ample room is provided for the motorman and assistants as may be necessary.

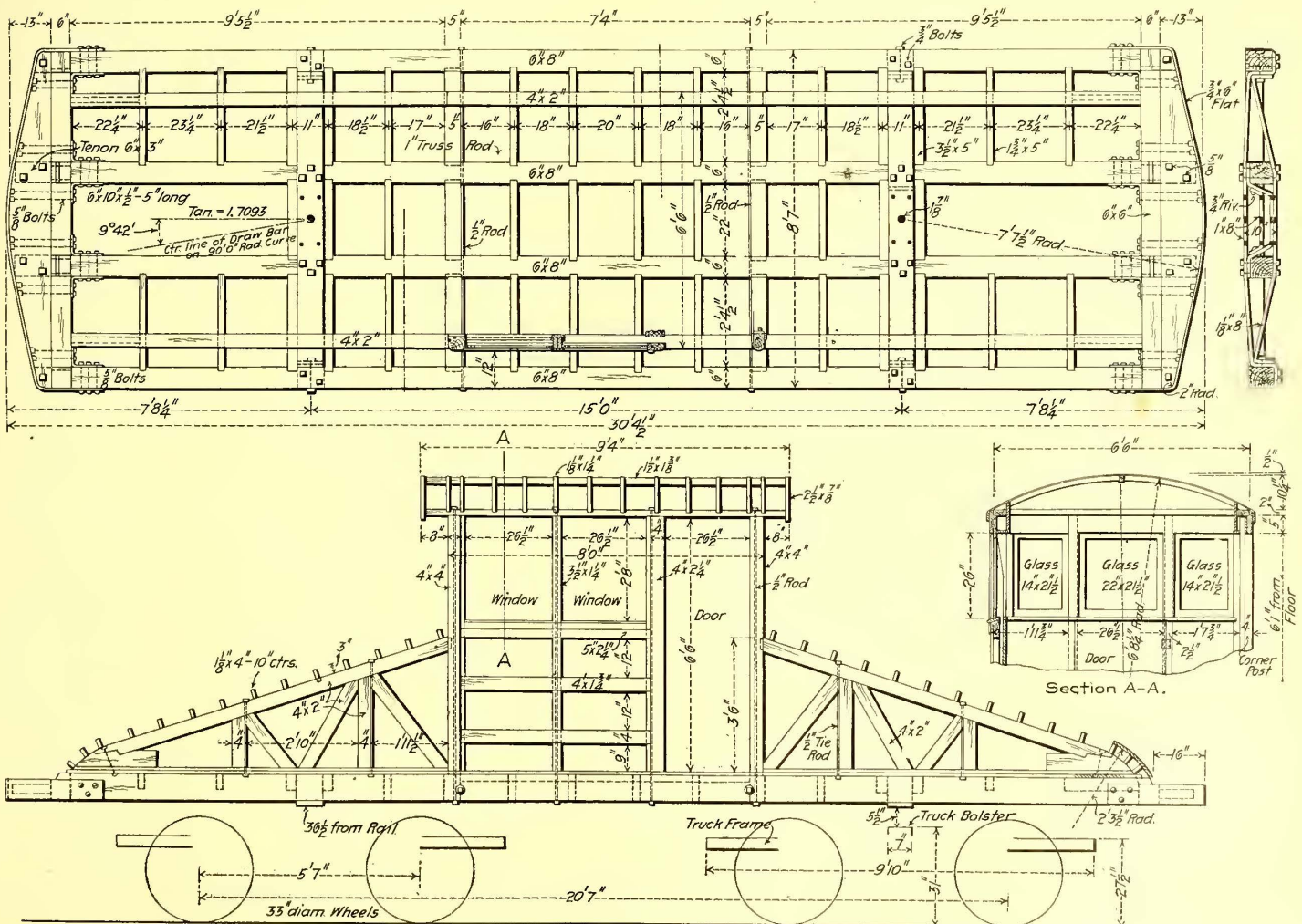
The under framing of the locomotive body is, as may be noted from the detail drawing, of very strong construction, in order to withstand the shocks of heavy switching service and hauling work. The side and center sills are of 6-in. x 8-in. timbers, with very rigid end attachments to the buffer beams. The other under frame details and details of bolster construction are also shown in the drawing. The draft gear and connections to the bolsters are in accordance with the new standards of construction of the company, the draw-heads used being of the Van Dorn automatic type. The frame work for the body and upper works are also illustrated in the drawing.

One of the most interesting features of the construction of the locomotive lies in the fact that all details of its equipment were taken from discarded motor and car equipments, or from unused or waste stock at the shops. The trucks are of a type now no longer in use upon the elevated lines, and the motors, of which there are four, one of 90 hp capacity upon each axle, are from a group that were discarded two years ago, although these happened to be in good condition and available for the purpose. Likewise the pilots, or "cow-catchers," as also the bells, are relics of the recently discarded steam locomotives, while the air compressor and governor for the air-brake system are of an odd size, having been taken from an old shuttle car that was used in the elevated service about four years ago, and thus not interchangeable with standard equipment. This is an interesting feature of the construction of the locomotive and one of great importance, as by this means the resulting cost was reduced to only that of the carpenter work and assembling, fitting, painting, etc., amounting to only one-fifth of its estimated completed value.

An interior view of the cab shows the general arrangement of control apparatus and auxiliaries. The motors are controlled in pairs, each by their original series-parallel controllers; the two controllers are connected mechanically, as shown, by an ingenious operating mechanism, which keeps both control and reverse staffs absolutely in step under all conditions. The control and reverse handles are also reversible, so that the motorman may operate from either side of the cab, and for this purpose the air-brake valve is duplicated upon both sides of the cab also. The circuit breaker is located in the cab, as shown, being provided with a rope leading from its handle around to one side, so that, in emergency, a quick stop may be made by opening the breaker. The large switches shown in the middle of the cab roof are the double-throw switches, by which the motor and auxiliary circuits are thrown either onto



GENERAL VIEW OF THE ELECTRIC LOCOMOTIVE RECENTLY BUILT BY THE BROOKLYN RAPID TRANSIT COMPANY FOR SHIFTING PURPOSES AT ITS LARGE ELEVATED DIVISION OVERHAULING SHOPS AT THIRTY-NINTH STREET



DETAILS OF BODY AND UNDERFRAMING OF THE NEW ELECTRIC LOCOMOTIVE FOR THE BROOKLYN RAPID TRANSIT COMPANY

the trolley pole circuit or to the third-rail shoes, for operation thus either in the shop yard or upon the elevated structure.

The spaces underneath the sloping front decks at either end provide valuable storage facilities for the auxiliary apparatus. Under one end is located the air compressor, pump governor, main reservoirs and piping for the air-brake system, all of which apparatus is of the Christensen automatic type. Underneath at the other end are located the resistance units required in the motor control circuits. This disposal of the auxiliary apparatus gives the maximum amount of room below the under frame. The spaces beneath the sloping decks also serve to carry the ballast that was found necessary to bring the total weight of the locomotive up to 25 tons for adhesive purposes in hauling; the ballast consists of a pile of old rails at each end near the lowest point of the deck.

The auxiliary equipment consists of the standard New York

SHOP METHODS AT THE REPAIR SHOPS OF THE DETROIT UNITED RAILWAY COMPANY

This article will supplement those presented in the two preceding issues of this journal relative to the new repair shop plant of the Detroit United Railway Company, Detroit, Mich. This shop installation has embodied in its layout of buildings and grounds an excellent arrangement for facilitating all classes of work, and one that brings its various departments into a most harmonious relation. As its mechanical facilities and its working equipment are the result of a careful study of all details of the work, a reference to the shop methods pursued there may be of interest.

As has been noted in the preceding articles upon the Detroit shops, the shop installation is intended to take care of all the heavy overhauls and general, as well as detail, repairs to all cars operated upon the various lines of the company; this will include both emergency and special repair work of all kinds, and to all portions of car equipments, and, in addition, the periodical thorough overhauls and renewals of car equipments which are made every eighteen months to two years upon all cars. On account of the large number of cars operated—over 1200 in all—it is evident that this is a problem of considerable magnitude and one that requires very particular treatment. In fact, on account of the difficult nature of the electrical maintenance work, in its special relation to the conditions ordinarily met in street railway operation, there is, in all probability, no more difficult maintenance problem to be found upon any of our steam railroads, and its successful and efficient handling under the severe conditions of city, as well as interurban service, is only the result of great care and study of the requirements of the work.

METHOD OF HANDLING CARS

One of the first of the many provisions that have been made for all details of the work may be noted from inspection of the drawing in the preceding article upon these shops, in that a storage yard is provided to take care of cars as they come to the shop for work upon them or which are ready to leave. As indicated in the shop layout plan, on pages 260 and 261 of the Feb. 11 issue, this storage yard, which is located at the Monroe and St. Aubin Avenue corner of the grounds, contains fifteen storage tracks, all of which are served by the shop transfer table. An entrance track in this section of the yard also leads out to the adjacent street car tracks, as indicated, whereby easy access is made for cars to and from any portion of the company's system; an additional point of entrance is possible through the end track which connects with a cross track leading down St. Aubin Avenue to the eastbound track of the adjacent loop line on the street below. The total storage capacity of this yard is forty-five city cars, allowing three cars to a track, or thirty interurban cars.

When a car is to be taken into the shops for general overhauling it is first delivered by means of the transfer table to the stripping room at the west end of the buildings upon the Monroe Avenue side, which department is, in general, the starting point for all work of repairing. The stripping room is essentially an inspection department, where all features of the equipment of a car are examined for work needed. In the process of examination, all seats, window sash, doors and other removable fixtures of all kinds are taken out of the car, not only for facilitating the work, at the beginning, of examination as to repairs needed, but also on account of the fact that this enables the parts to be more readily delivered to the other departments in which repairs will be made upon them. Storage space is provided in the stripping room in the form of shelves upon the east wall, in which the parts removed are placed until time for delivery to the repair departments or to the paint shop.

This method of starting the work combines the advantages resulting from concentrating the work of taking out the re-



INTERIOR VIEW IN CAB OF THE BROOKLYN ELECTRIC LOCOMOTIVE, SHOWING CONTROL APPARATUS

automatic air-brake system, the air for which is supplied by a special size Christensen air compressor and governor, which were, as above noted, taken from an abandoned shuttle car. In connection with the air system, there is an air whistle, operated by foot valves in the floor of the cab, and also one of the bells is operated by compressed air. The coupler equipment is the standard Van Dorn automatic type as used upon the elevated division. The car is well equipped with grab handles and steps for the convenience of the switchmen, and is provided with a complete set of signal flags, tail lights, lanterns and also roof markers for traveling upon all lines by day or night.

Especial interest is attached to this accomplishment of the mechanical department of the Brooklyn Rapid Transit Company, as this is the first electric locomotive that has been built in its entirety by a railway operating company. Furthermore, additional interest is involved in its entire adaptability to heavy service, as while intended specifically for use upon the elevated divisions, it is largely used for handling standard steam road freight equipment. Not only the many desirable features of its design, but also its success in operation, reflect great credit upon the officials responsible for the design.

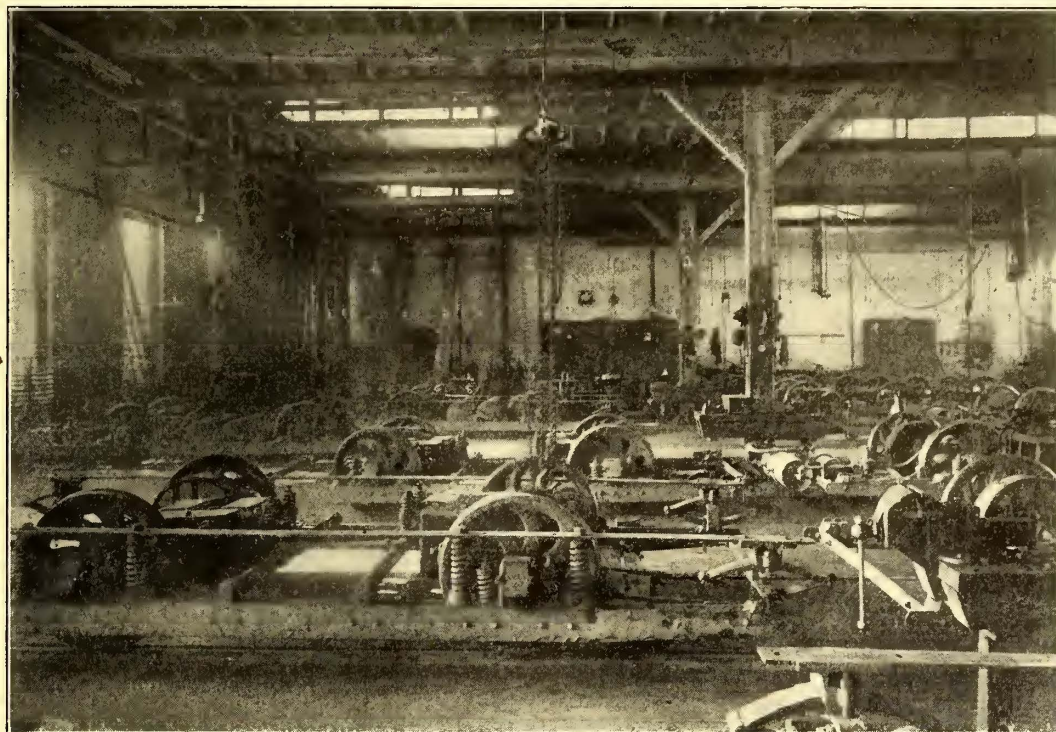
movable equipment of the cars prior to the work of repairs to a single gang of experienced strippers, with those resulting from the possibility of the shop foreman to thus carefully inspect the equipment, as it is removed, and determine the character and extent of repair work needed upon each part. This combined stripping and inspection process is the regular procedure in car and locomotive repair work upon steam railroads, being there also found to offer many advantages in that better facilities are provided in this way for examining the equipment than can in any other way be obtained. The location of the stripping room in a convenient and well lighted room makes both stripping and inspection process much more convenient than if this work were done upon one of the tracks in the erecting shop, where equal lighting facilities could not possibly be obtained. In addition, the dust and dirt that naturally rises from the stripping process is in this way kept confined entirely to one room, and thus is not liable to spread to other depart-

spected for wear and renewed if necessary; the motors are here removed for repair work, or their field coils and armatures replaced from stock in the electrical department as is found to be necessary. The same procedure is carried out in the handling of wheels, which are removed at this time if necessary for replacing or for repairs of any description.

For handling the truck work to the best advantage, crane runways, with traveling pneumatic or chain hoists, are located over each of the parallel tracks in this shop, by means of which the repair work is greatly facilitated. Armatures are lifted out or in with ease in this way, and also assembling work is likewise greatly facilitated. As may be noted from the view in this shop, in many cases the track has both a chain hoist and a pneumatic hoist over it; both the chain and the pneumatic hoists used are of 1-ton capacity. The runways are plain 8-in. I-beams, carried upon roof beam supports 5 ft. to 6 ft. apart. Over one end of the fourth track from the west end of the shop

is located a stationary 10-ton pneumatic hoist, which is used for lifting trucks with motors in place for certain classes of work.

Six of the tracks toward the east end of the truck shop are equipped with pits for facilitating inspections and light or emergency repairs to the trucks or motor equipments which do not require disassembling the equipment. There is not as much call for pit work in a shop of the scope of these, yet the pits as here used are a great convenience. One of the pits is equipped with wheel-grinding apparatus for the truing of "flatted" wheels without removing them from beneath the car. The grinding machines, which are located in adjacent pits, consist each of adjustable emery wheel stands, one beneath a removable section of the pit track on either



VIEW IN THE TRUCK DEPARTMENT OF THE NEW REPAIR SHOP PLANT OF THE DETROIT UNITED RAILWAY COMPANY

ments, as, for instance, the paint shop, where it would interfere with the work and be liable to do considerable damage.

The next step in the work of the mechanical repairs is that of removing the car body from the truck and delivering it to the erecting shop for repairs, and the truck and its equipment to the truck shop. On account of the fact that in many classes of equipment used in this city the trucks are entirely interchangeable, it is possible to transfer a body which is to undergo repairs onto another truck which has previously been gone over and repaired, and thus permit the body to be moved about the shop upon a completed truck equipment. Another method of procedure is to deliver the car body to the erecting shop upon a dummy truck and the truck proper to the truck shop for repairs independent of the work upon the car body.

THE TRUCK SHOP

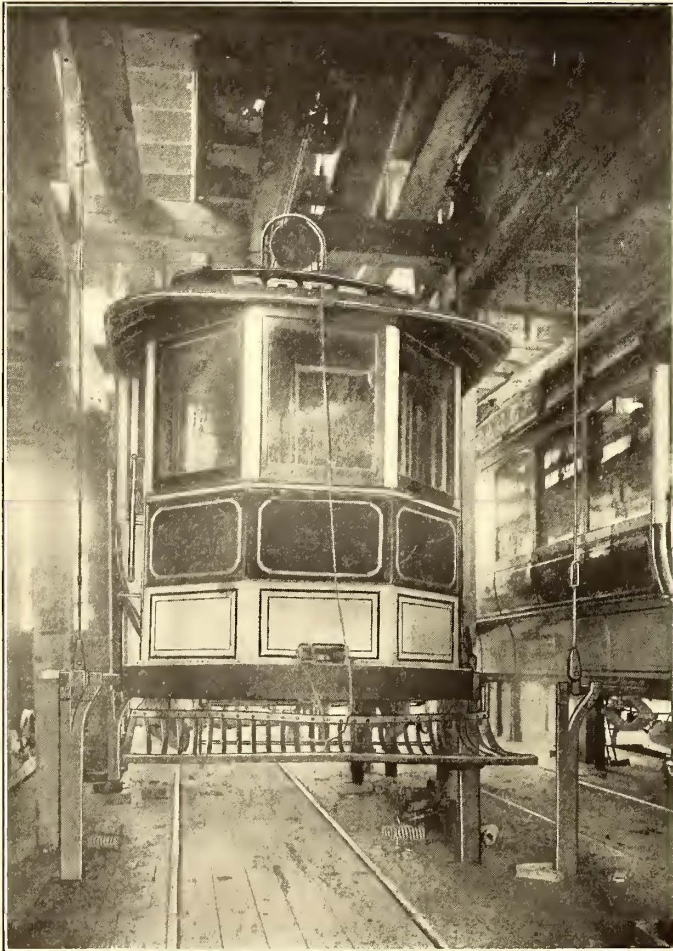
A representative illustration is presented above of the interior of the truck shop, showing the general character of the work carried on in that department. This shop occupies a section of the building upon the Monroe Avenue side 180 ft. x 70 ft. in size, and has fifteen tracks for the accommodation of the work. It is especially well adapted for work of this nature, as it is well lighted and is conveniently arranged. In this shop the trucks are carefully gone over and all wearing parts in-

side. The emery wheel spindles are driven through belting from a Westinghouse type 12a railway motor at the rear end of the pit, the belt connection allowing the necessary vertical adjustment up beneath the car wheels. The car wheels are, in grinding, rotated in the opposite direction from the emery wheels by the car motors themselves. This apparatus was designed by the officials of the railway company and has proven very satisfactory in operation.

Another interesting feature of the truck shop equipment is to be noted in the car-hoisting apparatus which are illustrated in an accompanying photograph. There are two car hoists, located on adjacent tracks, which consist essentially of electrically-driven elevators located above the roof beams, by which the car bodies may be lifted off of their trucks for repair work. As mentioned before, the use of interchangeable trucks under certain standard classes of car equipments is one of the desirable practices in this city, and by it truck work is in all cases greatly facilitated. In the case of a car coming to the shop for truck or motor equipment repairs, while the body is in too good a condition to warrant the expense of overhauling, it is only necessary to replace this truck by another one which has been previously gone over and is in good condition, whereupon the car is enabled to immediately go back into service; this is in

many cases a great saving in time of keeping equipments out of service, and is, it is thought, a means by which the amount of spare equipment necessary for the satisfactory operation of the road has been greatly reduced from that which would otherwise be necessary.

The car hoist consists of an elevator mechanism located in a protecting housing above the roof beams, and arranged with four car lifting slings or hooks. The mechanism does not differ materially from that of usual elevator construction, a drum being used for the two lifting chains at either end of the car. It is driven by a direct-connected railway type motor, which is con-



THE CAR HOIST IN THE TRUCK SHOP FOR LIFTING CAR BODIES OFF OF TRUCKS

trolled from the floor by a car controller conveniently located for the operator. An interesting sling construction is used for the actual lifting connection, as shown in the view. These consist of 6-in. x 1-in. bars, which are arranged to play up and down through an opening in the floor between guiding rollers; at the top are riveted projecting struts which are hooked beneath the car body sills for hoisting. This construction, while very simple, is amply strong for the maximum requirements.

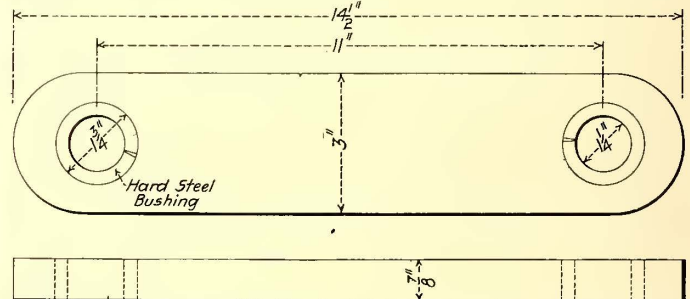
An interesting practice is carried out in the truck repair work in the construction of swing links for the trucks of double-truck cars. It was formerly found that the wear upon the swing links, between the frames and bolsters of the trucks, was sufficient to seriously lower the car body in relation to the truck after the wear of only a year or so; this lowering of the body required in practically all cases the links to be replaced by new ones, at a considerable expense, in order to properly adjust the height of the car body. The practice is now to equip all swing links with steel bushings in the bolt holes, which bushings may be removed when seriously worn and replaced by new ones. The accompanying drawing shows in detail the construction of one of the swing links for a standard type of truck used upon one of the interurban lines. The bushings are,

as may be noted, made of $\frac{7}{8}$ -in. x $\frac{1}{4}$ -in. steel bars, which are shaped in the blacksmith shop into rings of size sufficient to form a press fit in the holes in the links, and give an interior diameter of hole of $1\frac{1}{4}$ ins. It is evident that when worn these bushings may easily be driven out and replaced by new ones. A hard grade of steel is used for the bushings, while, as a result of this, a much more tough grade of soft steel may be used for the links proper. This practice has been found very economical and satisfactory. The links of this construction have all been made in the blacksmith shop, and all repairs are made upon them there also.

A feature of the equipment of the truck shop is to be noted in the air compressor, as shown in the general interior view, which is used for supplying the high-pressure compressed air to the storage air-brake system. The compressor, which was supplied by the National Electric Company, is of the two-stage belt-driven type, having a capacity of 125 cu. ft. of free air per minute. It is driven by a Walker type-75 railway motor, belted to the countershaft upon the side wall, as shown; the drive to the compressor is through belts running to each of the two fly-wheels. Two large storage tanks are installed in the corner of the room for maintaining a supply of air for the charging of storage tanks upon cars passing on the adjacent street railway track, and also supplying compressed air for use in the shops. For the latter service the pressure is reduced from 300 lbs. maintained in the storage tanks, by means of reducing valves, to a pressure of 80 lbs. for distribution in the shops; the shop supply is piped to various departments, where it is used in hoists, for cleaning, the driving of air hammers and drills, etc.

THE ERECTING SHOP

Coincident with the delivery of the truck of a car from the stripping room to the truck shop, the car body is removed either



METHOD OF USING REPLACABLE HARDENED BUSHINGS IN BOLT HOLES OF SWING LINKS FOR INTERURBAN TRUCKS

upon its own truck or upon a dummy truck to the erecting shop, where any necessary repairs are made either to the frame or to the exterior or interior finish. It occasionally happens that new sill or frame work is necessary, while in many cases repairs to the floors, windows, platforms and other features of the equipment are required, which are here done to the best advantage. It may be stated that frame work repairs are found very light upon the smaller city cars, although such work has developed upon the heavier interurban cars to a small extent.

This shop is 94 ft. x 82 ft. in size and is amply large for the work. It is well lighted by both side window and skylighting. The floor is finished flush with the level of tops of rails, with one exception; in this shop the work of installation of the new style of fender is being carried out, as will be referred to later on; for this work one of the tracks is provided with a pit which permits easier access to the lower side of the front platform, for mounting the necessary supports and brackets for the fenders, and also the arrangement of the tripping mechanism. Cars are usually also brought back to this shop after the painting process for the final reassembling of window sash, doors, etc., back into the cars when dry.

The erecting shop will be made an important factor in the

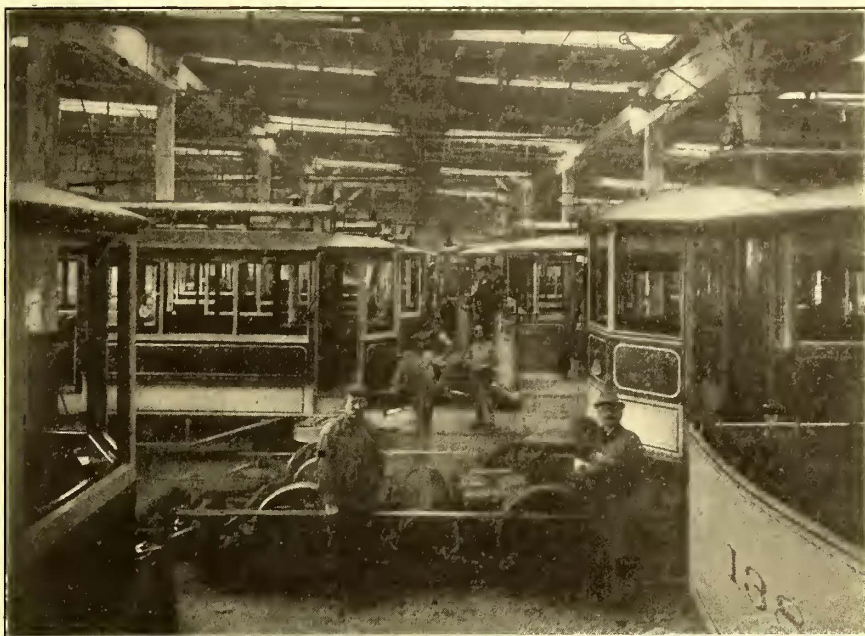
shop work of this company, and it will no doubt exert an important influence upon future practice in this country. Where a company expects to undertake heavy repairs to cars, or even the work of heavy repairs, involving changes of frame work, etc., the provision of an erecting or assembling department, carefully devoted to the requirements of car building, is of great importance. The Detroit United Railway Company has done considerable car building, including both local city cars and inter-urban cars; nine of the double-truck cars used upon the Wyandotte division were built in the repair shops, as well as also 124 of the standard single-truck closed cars, of the type illustrated on pages 357 and 358, and the parlor car of the company, known as the "Yolande."

THE PAINT SHOP

After leaving the erecting shop, or if no heavy work is found necessary after stripping, the car is taken to the wash room, where it is thoroughly cleansed from dirt and grease preparatory to the painting process. The wash room is a single-track department opposite the stripping room, and provided with a concrete floor sloped so as to give adequate drainage, which permits the free use of the hose in washing. It is the practice to go over the cars very thoroughly with the hose, and subsequent sponging and brushing, to bring them to as clean a state as possible. The room is well ventilated for quick drying, and also extra radiators are installed in this room to give the heat necessary for drying the work quickly after washing in the winter or in damp weather, this being an important feature for quick and effective wash-room work.

The next step for the cars is to the paint shop adjacent, where the touching-up and final varnishing is given the bodies

sash, doors, seats, etc. A separate department is provided on the second floor of the wash room for the work of varnishing window sash, doors and other parts of cars, as well as also the sign painting. Excellent facilities are here provided for this work, one of the principal advantages being that of excellent lighting. The window sash and doors are brought here after



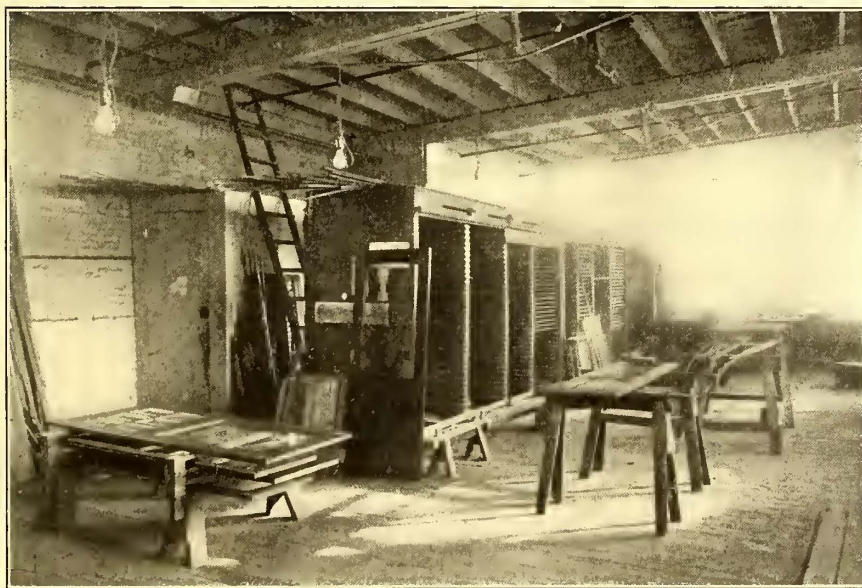
GENERAL VIEW IN THE PAINT SHOP OF THE DETROIT SHOP PLANT

washing by means of an elevator at the rear of the wash room. An important special provision is made for the handling of varnished work, in the form of drying racks, by which the doors and sash are mounted for drying after varnishing. The drying racks are shown in an accompanying engraving; those used for doors are to be seen in the left foreground. The first door is mounted upon a pair of horses, by means of four three-cornered wedges, in such a way that only the corner of one edge of the door rests on each supporting wedge, and thus no flat support is brought against a varnished surface. Above this is laid a bridge in such a way as to support the next door above it without contact with the door underneath; the next door rests upon similar wedges upon this bridge, and in this way doors may be piled to any height desired.

The sash drying storage consists of a series of cabinets with similarly arranged means of supporting each individual sash separately. The partitions are provided with three-cornered cleats, as shown, which are mounted in such a way as to support the newly varnished sash between them by their edges only; this is possible without bringing more than the corner of each edge of the sash in contact with the supporting strip, and thus prevents marring of the freshly varnished surface. These cabinets have curtains which may be drawn

down over the fronts to keep out any possible dust that may find its way into this department, thus insuring the drying to the best possible advantage. This cabinet has adjustable partitions, which may thus be moved along to accommodate different widths of sash.

An important feature of the paint shop equipment is the painters' supply room, a paint storage department, which is maintained for most economically handling the oil, color, varnish, brushes and other supplies for the painting of cars. This



VIEW IN THE VARNISHING DEPARTMENT, SHOWING METHODS OF SUPPORTING DOORS AND WINDOW SASH IN DRYING

preparatory to the completion of the work. Cars are generally scraped preparatory to painting, and filled wherever necessary; after this they are rubbed down carefully and then given a final painting. The standard color used in Detroit for the city cars, as may be noted from the accompanying views, is a yellow with dark trimmings, which gives the cars a very bright and attractive appearance; the standard color for the inter-urban cars is a dark red or wine color. The work of varnishing of car interiors is greatly facilitated by the removal of the

store room, of which an interior view is presented herewith, occupies a space, 12 ft. x 52 ft. in area, between the erecting and woodworking shops. All construction in this room is fire-proof, the floor being of concrete and the ceiling of brick, arched between I-beams. The best of facilities are provided for properly handling the supplies. The dry colors are kept in bins underneath the counter in the middle of the room, while



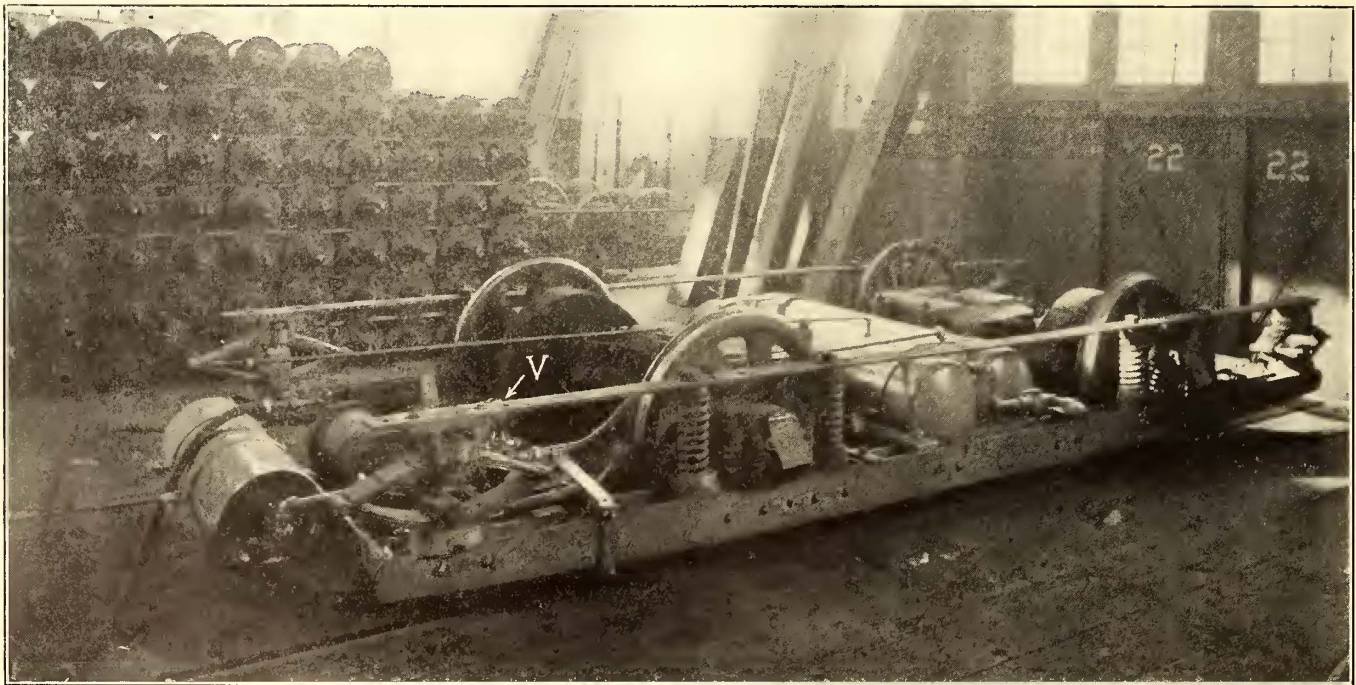
THE FIREPROOF PAINT STOCK AND SUPPLY ROOM FOR USE OF THE PAINT SHOP DEPARTMENT

shelving is provided for can paints, sandpaper, etc. Barrels of oil are set upon pedestals over large tray-like pits in the floor so that accidental leakage may not easily cover the entire floor and thus offer serious fire risk. This store room is

voirs being applied to each car, which carried 300 lbs. pressure. The car-braking system was a straight-air equipment of usual construction, taking its service air supply from an auxiliary reservoir, into which air is fed at 40 lbs. by a reducing valve from the storage tanks. The high-pressure supply was furnished by a compressor in the power station at Birmingham, the cars being charged at least once per trip.

The results from the storage-air system, as here tried, were very satisfactory and led to further applications to cars of both the city and interurban systems. During 1900 and 1901 the company made an extensive series of tests of the workings of the system, under varied conditions of service, weather, etc.; with various minor changes and improvements, it proved very reliable, and as a result it was adopted as the standard system of air braking for the lines of the company. Later on, when the decision was made by the company to apply air brakes to its entire rolling stock equipment, the storage-air system was accordingly adopted, and has now been applied to all of its double-truck cars and to many of the single-truck equipments. The remainder of the single-truck cars are now being rapidly equipped, from three to five trucks being completed per day.

An accompanying photograph illustrates a typical application of the storage-air equipment to the truck of a single-truck car, this one having been photographed when just completed and ready to be placed in service. As may be noted, the two high-pressure storage tanks are carried in the middle of the truck upon cross frame members between the motors. The tanks are connected together by the charging hose line which projects upon either side, ending in hose couplings next to the outside, for charging at car houses. The auxiliary or service reservoir is hung beyond the end of the frame at the leading or forward end of the car, the air supply to this reservoir being piped from the high-pressure tanks through a reducing valve,



VIEW OF ONE OF THE STANDARD TRUCKS USED UNDER THE SINGLE-TRUCK CARS AT DETROIT, SHOWING APPLICATION OF THE STORAGE AIR-BRAKE APPARATUS

equipped with a color grinder for facilitating the preparation of paints.

STORAGE AIR BRAKES

Detroit is looked to as practically the birthplace of the storage air-brake system. Its first application was upon the cars of the Detroit & Pontiac Railway, a 26-mile interurban line between the two above cities, which is now a part of the Detroit United Railway. This system was equipped in 1898 by the Magann Air Brake Company, two high-pressure storage reser-

as shown at *V*. The connections to the motorman's valve in the front cab of the car are made through flexible hose couplings, as are shown projecting over the service tank at the front in the illustration. A connection is made from the storage tanks to the high-pressure gage in the cab through the $\frac{1}{4}$ -in. pipe, which is pivoted back toward the middle of the truck so that the tilting of the car does not bring undue stresses upon the connections.

The operation of the brake system is, as is usual in the stor-

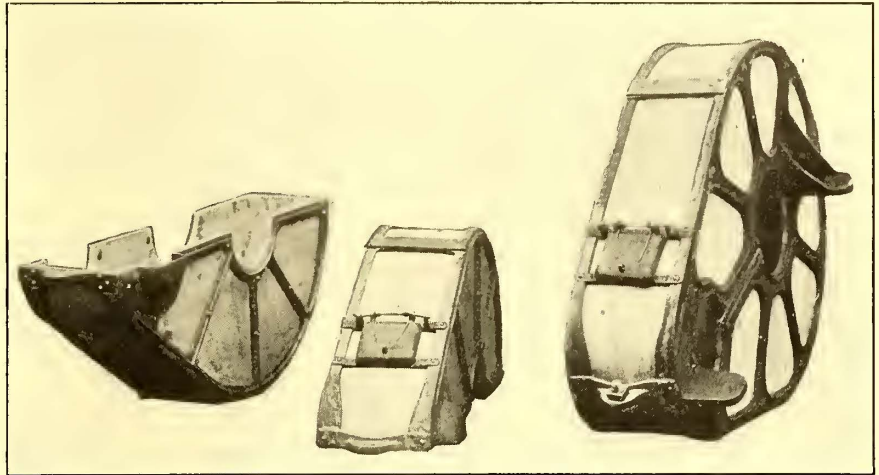
age-air system, upon the "straight-air" principle, the service air being admitted directly to the brake cylinder or released, as desired, by a "straight-air" motorman's valve in the cab. The brake cylinder used is of the duplex type, as was thought to be necessary on account of the limited space afforded by the arrangement of leverage adopted; this permitted its application with ease to the very small amount of room found available. The cylinder is set crosswise of the car and operates the brake beams through a differential or toggle system of levers, by which the proper amount of brake-beam travel is obtained.

The application of this apparatus necessitated various changes in details of the truck, one of the most important of which was the lengthening of its wheel base by approximately 6 ins.; this was necessary to admit of the two storage tanks between the motors, the former arrangement of motors not furnishing sufficient space. The other changes involved very little additional work; the securing of both the storage tanks and the service tank to the frames was easily accomplished by special shaped bars for clamping directly to the available supporting parts. The arrangement of the brake cylinder is rather novel for the small amount of space required, while the arrangement of the entire equipment, in general, is commendable for its simplicity. All of the apparatus used in the equipping of the cars, which is of the well-known Christensen type, was furnished by the National Electric Company, and is being installed upon the cars by the railway company.

Another illustration shows the method of charging the car tanks when in service. As the cars stop in passing their car house, which in most cases is the charging station of the line,

Other charging stations are provided for nearly every line, being installed usually at the car houses.

An interesting development in connection with the use of the storage-air system is to be noted in the recent completion at the shops of a portable compressing equipment. This outfit consists of a standard high-pressure Christensen compressor, direct-driven by a Walker 75 railway motor, together with the necessary storage and cooling tanks; these have been

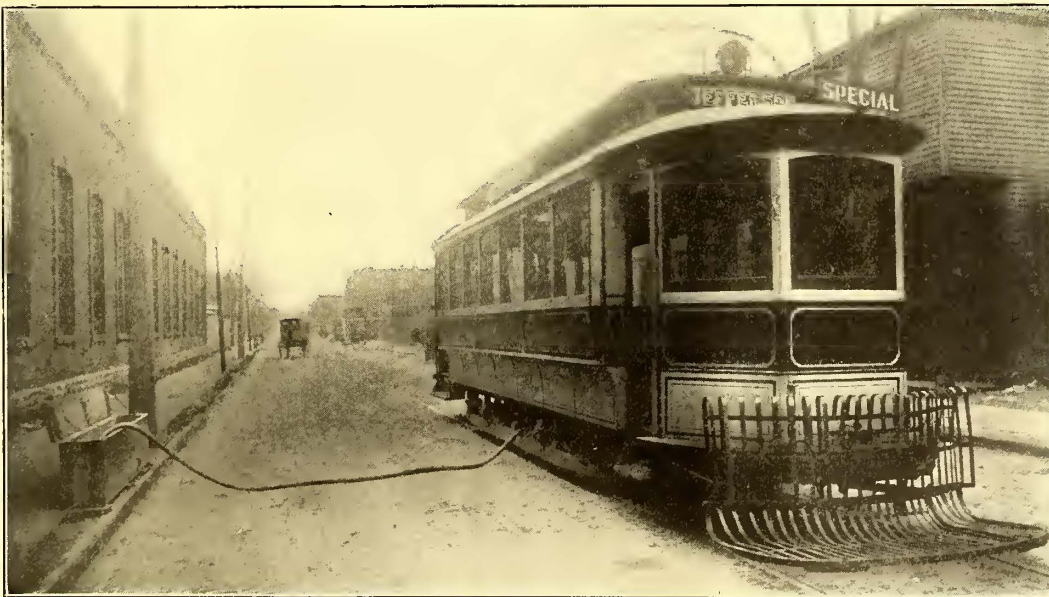


DETAIL VIEW OF THE NEW TYPE OF REINFORCED WOODEN GEAR CASE NOW IN USE AT DETROIT

installed upon a specially built box car so that it may travel from point to point upon the lines of the company, as may be desired. The car is a double-truck closed-body car, resembling the style of baggage car used in Detroit, and is equipped with motors so that it may travel under its own power, being geared to a fairly high speed for rapid traveling. One of the prime purposes of this car is to provide a charging station for emergency cases and for use at points where it is deemed inadvisable to maintain a compressing equipment; this will occur at certain points in Detroit, particularly upon short lines where only a very few cars are operated. In this way the compressor car will be run to the car house in question once or twice a day to fill up the stationary charging tanks there, and thus in this manner cover several different car houses; the resulting saving in air-compressor equipments at these less important charging stations will be evident.

WOODEN GEAR CASES

One of the important departures in mechanical practice which were adopted by this company has been the use of wooden gear cases to supplant those of all-metal construction. This was tried some years ago in an attempt to not only cheapen the cost of gear case renewals, but also to provide immunity from the damage to motors which occurs when the all-metal gear cases are broken accidentally. Several forms of the wooden gear case have been tried experimentally at Detroit, with the result that the form of case with a light metal reinforcing frame work was eventually adopted and is now being applied for all renewals. The experience with the plain all-wood case was



ONE OF THE SINGLE-TRUCK CARS, EQUIPPED WITH STORAGE AIR BRAKES, TAKING SUPPLY OF HIGH-PRESSURE AIR

the charging hose is carried out from the protecting box at the side of the street and hooked on to the charging coupling upon the nearer side of the truck and the high-pressure supply turned on by means of a cock in the street box. The time taken for charging the storage tanks to the pressure carried, namely, 300 lbs., is very short, varying from thirty to forty seconds, according to the pressure remaining in the storage tanks. The station shown in the view is the charging station at the Monroe Avenue shops, the high-pressure supply being obtained from the air-compressor outfit, above referred to in the truck depart-

not entirely satisfactory, principally for the reason of its inherent lack of strength; the reinforced case offers the advantage of freedom from warping and has sufficient strength of its own to withstand very considerably more severe usage.

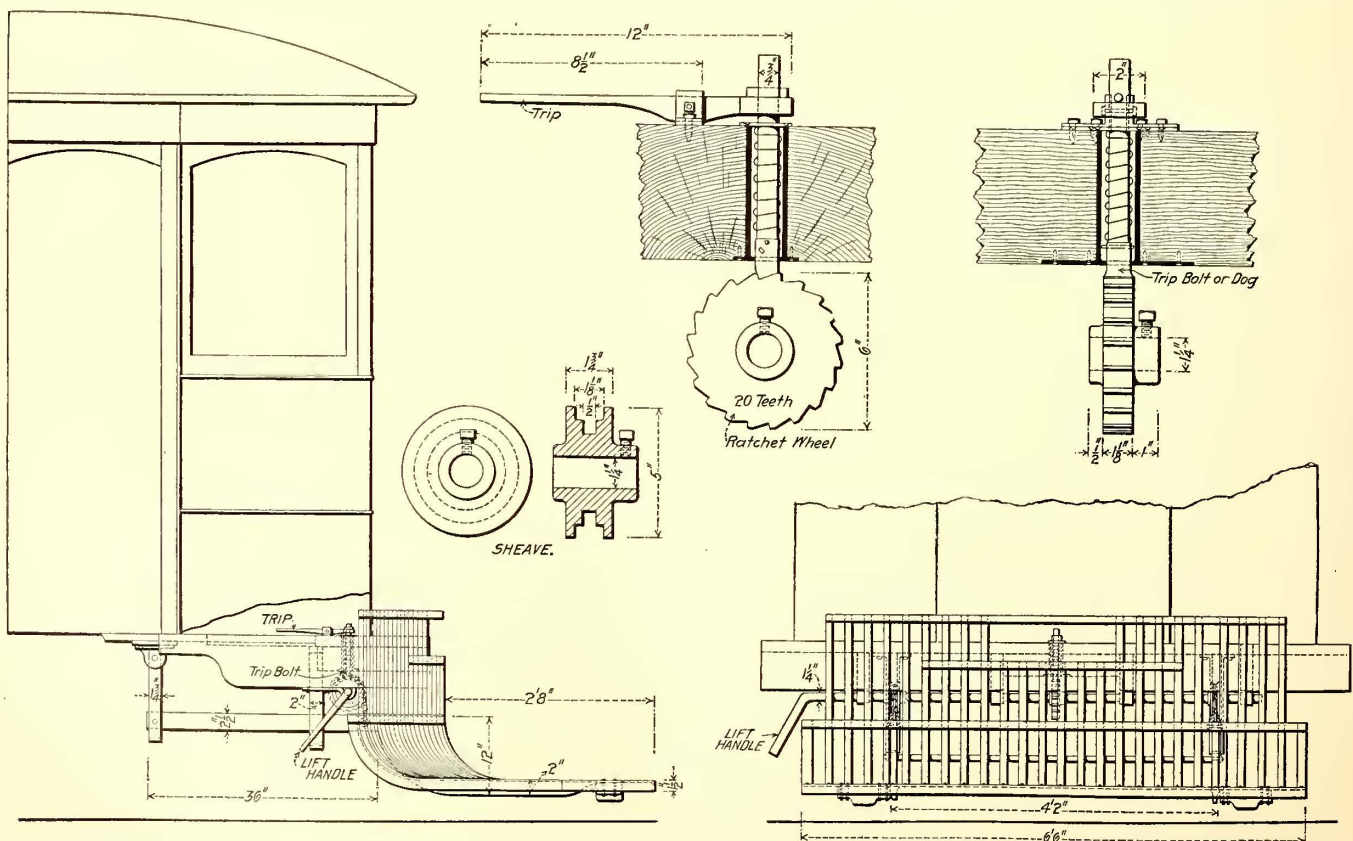
The accompanying illustration presents an excellent idea of



THE PRESENT FORM OF DROP-FENDER AS APPLIED TO ONE OF THE STANDARD CITY CARS OF THE DETROIT UNITED RAILWAY COMPANY

whitewood, which is riveted firmly to the frame work. The edge pieces are of 1/4-in. elm, which are steamed to a shape corresponding to the contour of the frame and slipped in place first; the side pieces, which are of whitewood 3/8 in. thick, are afterward set in place and securely riveted, which results in holding the edge pieces in place without further fastening. The spring oiling door is easily applied by means of the malleable casting, which, in addition to forming the door, provides also additional cross bracing between the side frames, as shown.

The advantages found in the use of the wooden gear case at Detroit embrace not only those of less cost, but also those of much less weight and less space occupied, while, in addition, the danger of bending of an armature shaft by broken pieces getting between the gears, as when an all-metal case is broken, is hereby practically avoided. The nature of the wood sides is such as to hold the parts together to a limited extent, even if the case meets an obstruction upon the street and is badly broken. The weight is, of course, less than a quarter of that of the metal case, while the cost is said to be less than a third; the wooden cases are found to cost less than \$5 each, ready to apply to the car. They are not painted, but are put in service just as they are finished in the machine shop, and are found to work very satisfactorily in that condition; the impregnation of the wood sides with the grease from the gears is found to amply protect the wood from the effects of moisture. One feature that contributes very largely to the low cost of manufacture of the case is the small amount of machining or finishing that is necessary in preparing the side frames for assembling; practically all that is necessary is to grind the lugs and supporting faces smooth and then drill the holes for the rivets. The preparation of the wooden parts involves as much cost, if not greater, than that of the metal reinforcing frames.



DETAILS OF THE QUICK-ACTING DROP-FENDER AS APPLIED TO A STANDARD CITY CAR, SHOWING FOOT TRIP AND DETAILS OF RATCHET MECHANISM

the construction of this type of gear case. It consists of four side frames of light malleable iron construction, the two half sides being tied together and thoroughly braced by the cross metal strips, which are riveted at frequent intervals to projecting lugs, as shown. The wooden filling is of thin elm and

DROP FENDERS

Another interesting departure is to be noted in the new style of drop fender which is being built and applied by the company to its cars of all classes, both single and double truck. This fender is considerably different from any other style of drop

fender, and involves interesting and important features. The prime requisite sought in the design of this fender was that, while it should be normally carried in a position elevated from the track, it could, when needed, be dropped instantly to such a position in close proximity to the rails that a person cannot fall and be rolled beneath it and the car.

The details of the fender and its application to one of the ears are clearly shown in the accompanying photograph and drawings. The lower portion of the fender consists of a scoop-shaped frame 6 ft. 6 ins. wide, with a forward projection of 2 ft. 8 ins. This portion is built up of twenty-four steel straps 1½ ins. wide, which are riveted to shaped side pieces for supporting and stiffening, as shown. The bar forming the front edge is a 1½-in. angle, which is shaped as indicated. The actual support of the fender is through the lifting and tripping chain, which acts upon a 1¼-in. square bar forming the supporting frame work; this bar is pivoted to a trunnion underneath the platform and 1 ft. back from the front of the car. The upper portion serves merely as a spring cushion to prevent a person falling into the fender from striking heavily against the buffer beam of the car.

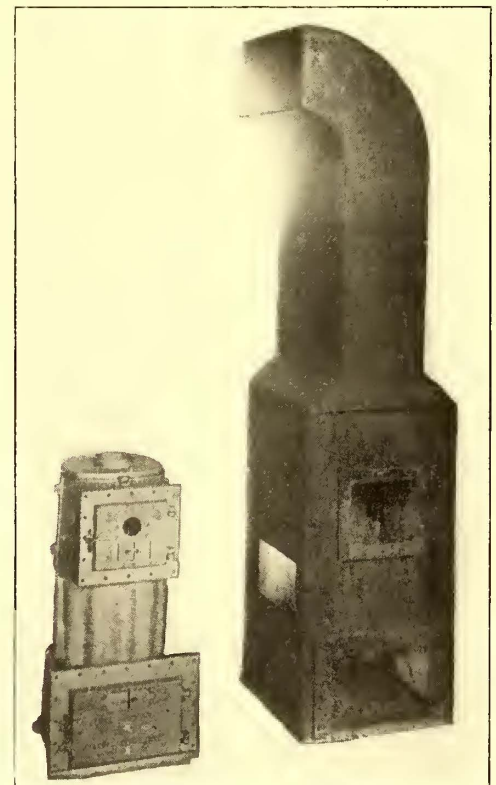
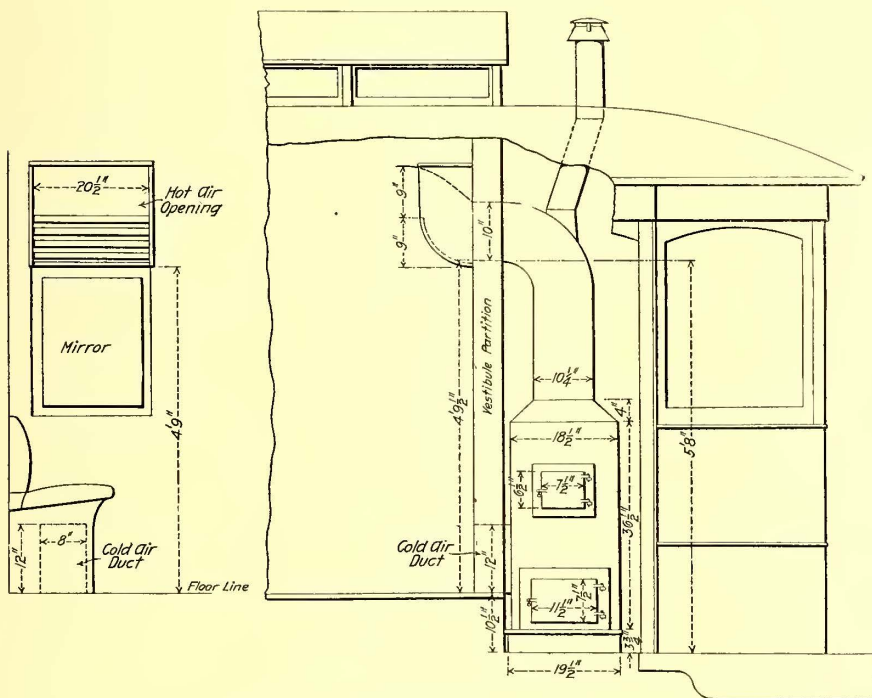
The details of the tripping and lifting mechanism are shown enlarged in the drawing. The lower portion of the fender is normally held in a lifted position by means of the trip bolt or

to be noted in the provision of a spring frame work which is found to very materially soften the fall of a person if thus caught. This spring frame work is separated from the lower portion of the fender, and may be lifted on or off of the end buffer of the car, as may be desired, four supporting clips being provided for the purpose.

All of the work of construction of the fenders is being carried out by the company at the shops. The various parts are made up in quantities, the frames being forged to standard templates and the detail parts made to standard for interchangeability. The assembling of the various sections of the fender frames is carried out in the smith shop, special jigs having been fitted up for facilitating the riveting of the strips to the frames, as well as for the punching of rivet holes in the metal bands, and reflects much credit upon the manufacturing facilities that are provided in the new shop.

CAR HEATING

An interesting stove arrangement for the heating of ears is made use of in Detroit, as indicated in the accompanying drawings. As all cars are operated single ended in this city, it has



DETAILS OF THE HOT-AIR SYSTEM OF CAR HEATING AS APPLIED TO THE DETROIT CARS, AND DETAIL VIEW OF THE SPECIAL STOVE AND FLUE

dog acting upon the ratchet wheel at the middle of the lifting shaft. When it is desired to drop the fender it is only necessary for the motorman to step on the trip lever, which allows the fender to drop by its own weight, and this it does so quickly as to be practically instantaneous. When it is desired to return the fender to its lifted position the motorman works the lift handle up one-quarter of a turn in order to wind the lifting chains upon the sheaves, which returns the fender to its normal elevated running position. The ratchet wheel normally holds the lifting shaft from unwinding, although the trip dog is shaped so as to release its load with the least possible effort when desired.

Much care and thought has been devoted to this fender construction, with the result that a very satisfactory type has now been secured. A recent departure, which is not indicated in the drawing, has been made which provides additional security for those unfortunate enough to be caught by the fender. This is

been found very convenient to install the stoves in the motorman's vestibules and deliver the heated air through register openings into the ear proper. This arrangement is illustrated in the drawing, while the photograph shows the style of stove used and the casing which serves as the hot-air flue.

The style of stove used is a special design of the "Jewell" anthracite coal burner, which was furnished by the Detroit Stove Works to meet the requirements of this service. Both the fire door and ash door plates are finished flat and provided with bolt holes for bolting to the openings in the hot-air flue, as shown. The lower left-hand opening in the case connects through the vestibule partition to the space under the ear seats, so that the cold air intake is from the lower portion of the ear body; the outlet, or hot-air delivery, is at the upper curved end, which projects through into the upper portion of the car. The diagrams and further details of this arrangement are clearly shown in the drawing. It may be added that the window sash,

opening toward the heater casing, is filled with a mirror instead of the ordinary glass in this case.

This arrangement is found to afford many advantages, one of the most important of which is the saving of available passenger space by locating the stove in practically waste room in the vestibule; this is made possible by the fact that cars are operated single-ended in this city, so that it is not necessary to keep the front vestibule free for use of passengers. Furthermore, it keeps the dirt and dust, which are unavoidable in caring for the fire, entirely out of the car and where it is easily attended by the motorman. The results in actual heating of the car has in all cases proven very satisfactory, a very even temperature being maintained in the car and with the least possible trouble.

The foremen in charge of the above departments are as follows: Truck shop, Wm. Melchoir; air-brake work, F. Curtain; paint shop, Wm. F. Lampson, and chief inspector, H. Savage. As stated in the preceding article, all the mechanical work comes under the supervision of Sylvester Potter, master mechanic, who reports to F. W. Brooks, assistant general manager of the company. Mr. Potter is a man of wide experience in shop work, having been engaged in such work for many years. Credit is hereby acknowledged to Mr. Potter for the interesting information contained in the articles descriptive of the shop plant and its management.

THE CENTRAL PASSENGER ASSOCIATION MEETING

It is understood that at a meeting of the Central Passenger Association held at Chicago last week, objection was made to the manner in which some of the steam roads in the district, notably the Clover Leaf and the Wheeling & Lake Erie Railway, are ignoring the policy of the association and making alliance and interlining business with electric roads. However, no formal action was taken in the matter.

Alliances between the steam and the electric roads are becoming quite common. In fact, this kind of alliance has been entered into by some of the strongest steam roads in the country, and in a number of cases contracts with traction companies have been made which extend over a period of years. The railroads are not in a position to abrogate these contracts even if they wanted to. If the association had insisted upon obedience to its rules covering this point, the railroads having such agreements would have been compelled to withdraw. Another feature enters into the situation. It is the fact that a number of the leading steam roads, particularly in the East, have adopted the policy of buying up competing traction lines, making them the short-haul carriers in their own systems. These companies could not very well refuse to have dealings with the electric lines.

A short time ago the Canton-Akron Railway Company decided to abandon the plan of operating its city system on a ten-minute headway, as it was found that the patronage did not warrant such frequent service. A fifteen-minute headway was therefore instituted. The change met with such strenuous opposition, however, that the company has announced in an open letter that it will make a thirty days' trial of a new schedule giving fifteen-minute headway on all city lines. In this communication it was stated that the fifteen-minute headway represented a saving of four cars a day, or \$1,800 per month, over the old ten-minute headway. It is claimed that for the twelve-minute headway as many cars will be required as for the ten-minute headway, but the company expresses a willingness to give this schedule a trial, so that it can be demonstrated by actual figures whether the same can be maintained at a reasonable profit. It is announced that if the results show that the service cannot be maintained at a profit, the company will take action to protect its interests.

SUMMER RESORTS

BY R. T. GUNN,

General Manager of the Lexington Railway Company and former General Superintendent Norfolk Railway & Light Company

This article will deal primarily with the seaside resort, but as the pleasure parks of the inland cities doubtless experience the same difficulties and encounter the same problems, in construction and operation of both parks and railways tributary to same, it may not be uninteresting to persons operating either class of resorts to hear of the other fellow's experience.

The resort of a few years ago is a thing of the past. Nothing in this country has shown its advance any plainer than the resort of to-day, and it marks the tendency and progress of our progressive country.

The first parks opened by the street railways were experiments, and, as a rule, were furnished poor talent, not only in the amusements, but also in designing. No one is to be blamed for this condition—the possibilities of the resort had not been demonstrated, there was not enough in sight for good talent for the amusements, and it was all guess work from the railway's standpoint. Now we have the light of a few years experience to guide us, and mistakes (a great many costly ones) are to be remembered and a repetition of them avoided. Perhaps the most costly mistake made by the parks of early days was the character of attraction offered and the class of people catered to. The average park then was patronized by the rough and tough element—unprotected ladies and children dared not go. Perhaps the Chicago World's Fair was responsible for part of this. It had the name that "everything goes on the Midway," and how many of us can remember the "leaders" on the billboard as that time, reading "Direct from Coney Island," and the smaller places naturally imitate the larger ones.

Speaking of Coney Island calls to mind an article in the last August "Century Magazine," by Albert Bigelow Paine, on "The New Coney Island." It is the greatest advertisement the resort ever had—by a leading author, in a leading magazine—and it is certainly interesting reading, giving an accurate account of the "Old Coney" and bearing out the statement made in this article of its character and describing vividly the new; giving in detail the transition from the old, with its hard reputation, to the new, where any person can go with perfect propriety and safety to a "clean and beautiful garden of delight," as he very aptly puts it.

Speaking from experience, the Ocean View, Va., resort, about which this article is supposed to be written, has had, comparatively speaking, a history similar to that of Coney Island. Ocean View is situated on Chesapeake Bay, looking out on the Atlantic Ocean, between Cape Charles and Cape Henry, 10 miles from Norfolk proper. The Ocean View division of the Norfolk Railway & Light Company runs from Norfolk (where it connects with the city division, issuing to and accepting transfers from same) to Ocean View, the line being double-tracked with a loop on each end for handling trailers. Three miles of single track is operated between Ocean View and Willoughby Pier, where a ferry is maintained to and from Old Point Comfort, 4 miles across Hampton Roads.

The geographical situation of Ocean View is such as to make it logically the future summer home for Farther Norfolk, as well as for residents of Old Point Comfort, Hampton and Newport News.

Ocean View, like any other resort situated near seaport cities, has a varied class of people to cater to. Sailing and steam vessels are constantly coming to Norfolk harbor for coaling and cargo from all over the world, the great Lambert's Point coal piers being only 4 miles from the heart of Norfolk, not mentioning the coaling piers of the Chesapeake & Ohio Railway at Newport News. The crew from a vessel which has been out of sight of land from three to five months is pretty apt to become boisterous when first visiting a resort, but a good

and sufficient police force will work wonders in handling even the roughest element.

We will pass over the early days of Ocean View, except for comparison and to show how apparently insurmountable difficulties may be obliterated. The gambling devices, fakirs, Sunday drunks, entertainments which bordered on the limit are all things of the past and gone. In their stead is a place (with three times the attendance) clean, morally and physically, with its healthful and harmless attractions. Where the weeds once grew rank is a beautiful lawn. Nothing perhaps has done so much to improve and elevate the place as the landscape gardener. His flowers and foliage beds tastefully arranged, the grass kept trimmed to the proper length, cause the visitor as he alights from the car and enters the grounds to utter an exclamation of pure joy and pleasure. The sincerest compliments have not all been letters sent or speeches made to our general manager, but the smile of the child or mother is well worth our efforts to please. And while mentioning efforts to please, at one time it appeared that no efforts made to please were appreciated, but old "Public Opinion," ever ready to condemn but slow to praise, finally came around, and now it is the proper thing to admit that Ocean View is what it is and to bestow unstinted and sincere praise. And during the condemnation and praise alike our management has lost no opportunity to do everything possible to please. This probably has done more than anything else to make the place a success.

SUNDAY BARS

A few years ago it was decreed that the State of Virginia must not allow intoxicating liquors to be sold on Sunday. A law was passed by the Legislature, becoming effective last summer, 1903.

There was naturally a great deal of speculation as to the effect of such a law on summer resorts. The wise ones predicted that it would ruin the Sunday excursion business. And right here was where our general manager displayed his good judgment by issuing orders that the law must be obeyed to the letter; that the management would not stand for any attempt at evasion of the law on the part of the concessionaires. It made no difference what the other resorts did, we were to close for good and all, and we did. Now, contrary to all prediction, we began to haul more people every Sunday from that date, and continued to do so for the remainder of the season.

SUNDAY NIGHT CONCERTS

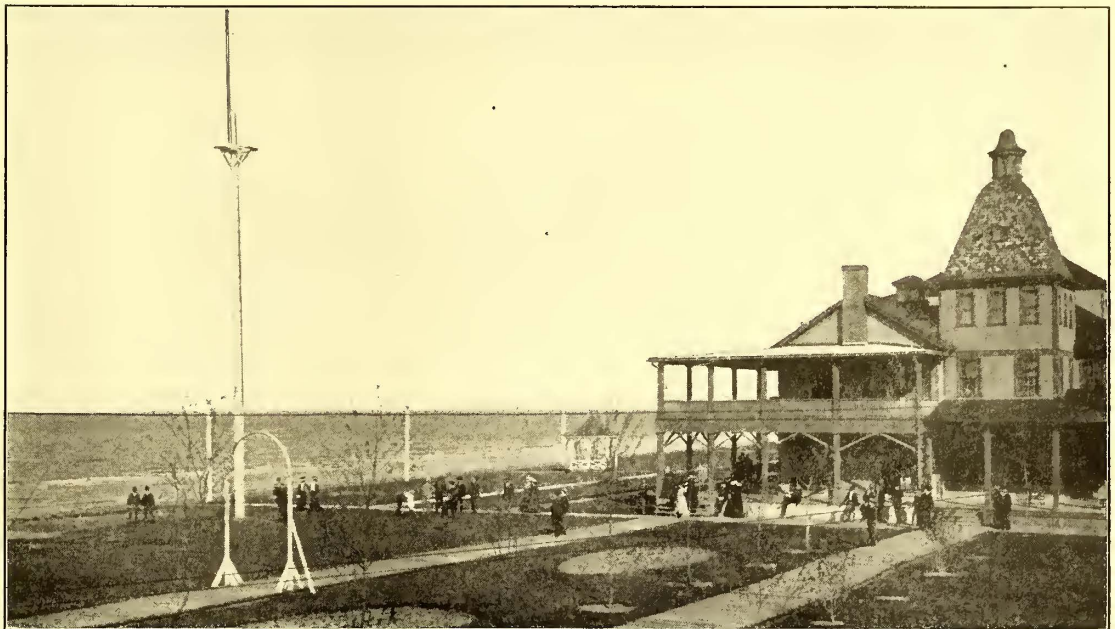
When the summer of 1904 came we inaugurated a series of night free band concerts in addition to the usual Sunday afternoon concert. As soon as this was properly advertised, a great deal of the Norfolk public would wait until the excursion crowd, which was on the grounds during the afternoon, left, and then they would come at night en masse. It made great street car riding until 11 p. m.

Referring again to the character of the crowd patronizing Ocean View, the women and children are most in evidence. This is especially noticeable at the Sunday night concerts. It is worth while to watch the crowds at this time, the children stretched at full length on the lawn around the band stand, the

elderly persons assuming more dignified attitudes by occupying the seats, of which there are an abundance, and over all, absolute order and quietude, which goes with perfect peace, comfort and content. Parents know it is absolutely safe for children to come alone if they choose, and stay as late as they please, that perfect order is maintained and that disturbances will not occur.

POLICE FORCE

A good strong police force is the ounce of precaution which saves a pound of trouble, and we endeavor to see that difficulties are prevented, rather than to have arrests afterward and the attending notoriety. The force is composed of a chief and a squad of men under him. While they wear Ocean View police badges, they are sworn officers of the law under the jurisdiction of the Norfolk County Court. These men wear metropolitan uniforms, including helmets. The presence alone of a "blue coat" is a sort of quietus on the would-be rowdy, and while the strict discipline may drive away a certain element, we feel that we are better off without them. If a person persists in getting noisy he is hustled off the grounds at once, and if he then isn't satisfied, he is sent to jail and prosecuted in the courts. The



OCEAN VIEW HOTEL AND GROUNDS

force receives its instruction from the chief, who, of course, is coached by the management as to what his duties are.

WHITE PAINT

Is quite a factor in making the place attractive. The color scheme is straw and white, nature furnishing the green. Even the fences surrounding the property are white. The buildings, including the hotel and theater, are painted straw and trimmed in white. A liberal use of paint has added to the beauty of the resort and causes very favorable comment. While this costs considerably, it seems to us to be filling a long felt want. Improvements are being made from year to year which cannot fail to appeal to the taste of the visiting public. Along the line of improvements probably the greatest one for next year will be in

THE LIGHTING SCHEME

The factor that electric light is in a summer resort cannot be overestimated. The old resort with its few "red" incandescents, called "lightning bugs" by the public, is forgotten by the visitor who now sees the grounds with over fifty arc lamps of fully 2000 cp each, along with hundreds upon hundreds of incandescent lights burning right up to candle-power. The incandescent service is three-phase alternating current, furnished from the main power house in Norfolk over a 10-mile 10,000-volt transmission line, 200 kw capacity being furnished at the

grounds. The difference in ratio of transformation between the step-up and step-down transformers compensates for line loss and allows us to use the same voltage lamps as in service in Norfolk.

The arc lights are furnished from a machine located near the resort. This was deemed advisable on account of the fact that a pumping station had to be maintained there, and it cost little beside the fuel to operate this generator, as the boiler capacity was sufficient and no additional labor was necessary. The benefit to be derived from this arrangement was that in case of accident to the main power house or transmission line, the grounds would not be left entirely in darkness, and total darkness in a resort with several thousand persons might be a very serious matter. As the two plants are 10 miles apart, and the usual summer storm is local, lightning is not apt to cause trouble in both plants at once. The emergency, however, has not yet arisen, as the incandescent service was only off for a total of five minutes during the entire season of 1904. A very elaborate scheme for improvement in the lighting is now being figured on and will be installed for the next season, as the resort justifies the expenditure for a great deal of light.

THE OCEAN VIEW HOTEL

For those visitors who wish to remain several days or weeks at the seaside, the hotel furnishes accommodations. Its loca-



STREET SCENE—CARS LOADING FOR OCEAN VIEW



A SCENE ON THE BEACH AT OCEAN VIEW

CHARACTERISTIC ILLUSTRATIONS PUBLISHED IN "STREET RAILWAY CHAT"

tion is good, facing the ocean, having an unobstructed view. It is under the direct management of Charles Consolvo, who also manages the Monticello Hotel in Norfolk, one of the finest hotels in the South. Almost adjoining the hotel are the bath houses, the bathing along the beach here being the best and safest in the South Atlantic Coast. The fact that no accidents occur here speaks well for the beach and also for the management.

THE CASINO

Possibly the greatest attraction Ocean View has is its theater. For a clean, bright, well arranged and comfortable (even in the warmest weather) playhouse, it cannot be surpassed. It is painted white throughout and brilliantly lighted, and has an ample stage, well equipped. The Casino will seat 1200 people. The ventilation of this building is well-nigh perfect, the sides and rear being practically thrown open in warm weather and provided with close-fitting shutters for stormy weather. The policy of the Casino is to give good, clean vaudeville or light opera, and nothing that borders on the vulgar is permitted. The popularity of this house has been phenomenal. Although a show is given every week night and two matinees a week, the house has sold out every clear night, and that with a 25-cent admission.

Perhaps the wisest move made by our general manager was when he leased the Ocean View concessions—for everything is leased—the policy being outlined by him, but the property being directly operated by the lessees, Jake and Otto Wells, the leading theatrical managers in the South. Jake Wells, in addition to having some twelve summer parks and possibly that many

winter theaters in his own circuit, has recently come into the management of the "Leath" circuit of theaters, composed of eight of the largest theaters in our largest Southern cities. Otto Wells is the local manager for the Casino and the city theaters in Norfolk. The wisdom of turning over to them all the concessions has been demonstrated by the fact that they can give much stronger shows, getting their return from the increased patronage of attractions other than the theater, than they could possibly do depending on the Casino alone to reimburse them. This naturally increases the travel on the road, and the policy of this company has been to make the resort self-supporting, paying its own maintenance and bond interest, leaving the increased business on the road as "velvet."

"TRAIN SERVICE"

The old method of handling the public to and from this resort was to run trains with one motor car and four or five trailers, trains running one to two hours apart. These passengers were unloaded at the Henry Street station, which is about a mile from the center of Norfolk, and then transferred to the city lines. The present method, since the double track has been installed, is to run motor cars as frequently as the business demands, and when trailers are used only one is carried behind each car. During the entire summer of 1904 a fifteen-minute headway was maintained, and in the evening a 7½-minute headway. On heavy Sundays and exceptionally heavy week days, cars have been run as frequently as five minutes apart. On the Fourth of July there were 157 trains each way between Norfolk and the resort, not mentioning the hour service maintained between Ocean View and Old Point and the half-hour service between Ocean View and Willoughby Pier. The improvements in this car service, making it possible for persons to get a car either way whenever they want it, has done more than any one thing to upbuild the resort. This naturally requires a great deal of attention on the part of the management, and especially as the travel here is spasmodic to some extent,

a great many excursions being run into Norfolk from all over the South by the steam roads, making travel extremely heavy on these excursion days. As many as 3500 people have been brought into Norfolk by one railway in one day. The Norfolk & Western Railway Company states that they handled 100,000 excursionists during last summer alone, and the bulk of these people during their stay in Norfolk visit Ocean View. This, coupled with the good opinion of the resort held by the Norfolk people and the attractions above enumerated, has made this resort experience its most successful year during the season just past, and at a time when most places were suffering on account of unseasonable weather and an off year on account of Presidential election. With anything like normal conditions, the coming season will break all records.

ADVERTISING

Perhaps the greatest factor in making a summer resort a success is persistent and systematic advertising. For Ocean View a considerable amount of space is arranged for in each and all the local newspapers, about the same amount of money being spent with each, for a street railway company cannot afford to "play favorites." This space is used every day during the entire season, and complimentary reading notices naturally follow for good newspaper patrons.

Before the season opens, the tributary territory is pretty well covered with three-sheet posters, calling attention to the fact that Ocean View is a "popular resort" on the seashore, where numerous attractions are located, and where the finest bathing on the coast can be had. These are followed up with numerous other methods of advertising. For instance, last season we dis-

tributed 10,000 good hand fans with pictures of attractions at Ocean View on one side and printed matter on the other, setting forth the advantages of the resort. The fans were distributed from several points in Norfolk on the first warm days of summer, and a large proportion were sent to excursion agents on the steam roads. During the hot weather these fans in thousands of homes were constantly presenting the advantages of Ocean View to the "suffering" people. Thanks to the good quality of the fans, this gentle reminder lasted about all of the season.

But the best method by far for presenting the claims of the resort was through the medium of "Street Railway Chat," our own publication, issued twice a week, containing pertinent suggestions and the programme for the next few days' entertainment, calling special attention to features and extra attractions—constantly exploiting the fact that it was foolish to stay at home or go anywhere else while Ocean View was open. The present policy as enumerated above is rapidly making this resort one of the leading ones on the Atlantic Coast.

◆◆◆
CORRESPONDENCE

SNOW FIGHTING IN BUFFALO AND VICINITY

INTERNATIONAL RAILWAY COMPANY
Buffalo, Feb. 15, 1905.

EDITORS STREET RAILWAY JOURNAL:

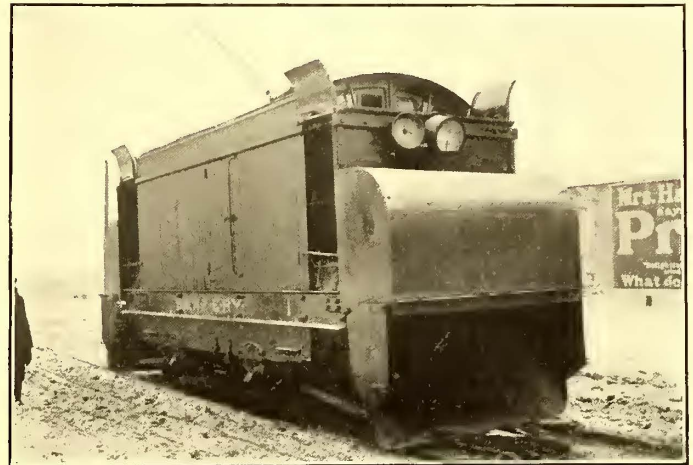
In reply to your request for information relative to our methods of handling the snow problem, the following may be of interest:

Our system is divided into three divisions, as follows: Buffalo Division, with 260 miles of track, all of which is city mileage, except one 14-mile suburban line; the Lockport Division, consisting of 45 miles of track, practically all of which is interurban, and the Niagara Falls Division, consisting of 45 miles of track, all of which is also interurban mileage.

Our snow-fighting equipment consists of fifty-two sweepers and plows, made up of several different types. The Inter-

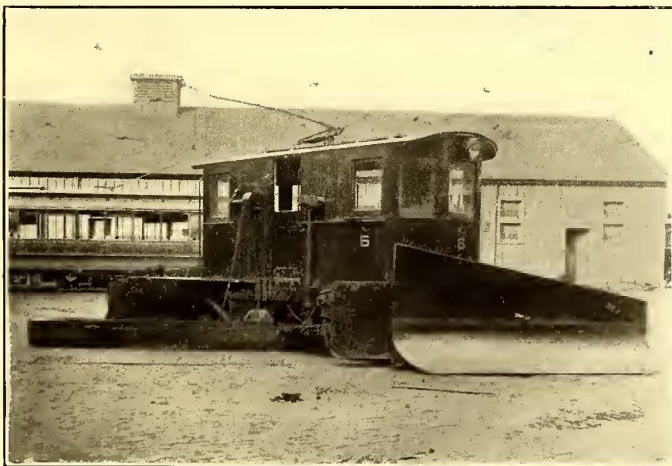
has a short but heavy body mounted on a single-truck equipped with two GE 57 motors. It has a heavy nose or shear, as shown in the illustration, and it also has a movable wing at the side for clearing a space 6 ft. or 8 ft. outside the track. Both the nose and the wing are operated by chains wound on drums by hand power.

The "Green" plow is a type which we believe is peculiar to Buffalo, and which we have found to be exceedingly effective. It consists of a short body mounted on a single truck with two GE 1000 motors; it has no nose or shear, but its work is done by means of a mold board hanging underneath the body at an angle of approximately 45 degs. with the line of the track. The mold board is made of 14-in. heavy planking, reinforced with steel sheathing. The board runs in vertical grooves, and



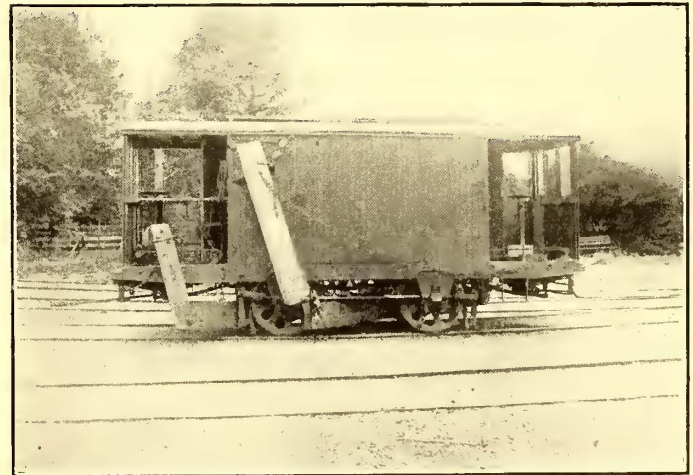
SINGLE-TRUCK ROTARY

is raised and lowered by a chain and hand power from the vestibule. There are two of these boards under each plow, one for each direction of travel. This type of plow also has movable wings for pushing back the snow from the side of the track. Of course, this machine is effective only before the



THE "RED" PLOW

national Railway Company is strongly committed to small single-truck plows, as it is believed more effective work in fighting snow can be done with these small units, provided there are enough of them, than can be done with a smaller number of larger and heavier plows. For our city mileage, and even on our interurban lines, we rely chiefly upon the small single-truck plow for keeping our lines open. These are sent into service at the first sign of a serious snow storm, and are kept going until the snow is thoroughly packed and the danger of tie-up is past. We have two types of single-truck plows, known locally as the "Red" plow and the "Green" plow. The first type



THE "GREEN" PLOW

snow is piled up seriously, and it is of little use for bucking drifts. However, if it is brought into service early in the fight it will keep its lines open under extremely difficult conditions. We find it particularly useful in keeping switches, crossings and cross-overs free from snow and ice, as the mold board can be kept close to the track when running over special work.

We also have a number of single-truck rotary plows which are used on the city lines as well as on the suburban and interurban lines whenever a particularly long and severe storm shows signs of getting the best of our single-truck plows. We also have two heavy double-truck nose plows, which have been

dubbed locally "Nancy Hanks." These find their particular application in bucking drifts.

The distribution of the snow-fighting equipment over the three divisions is as follows:

The Buffalo Division has twenty-two of the single-truck plows known as the "Red" type and eleven of the "Green" type. There are also on this division two single-truck sweepers, four single-truck rotaries and three single-truck plows of the Taunton type.

The Niagara Falls Division has two of the "Red" plows, one "Green" plow, two rotaries and two of the "Nancy Hanks" type, the latter being equipped with four motors to each plow.

The Lockport Division has one "Red" plow, one "Green" plow and one rotary.

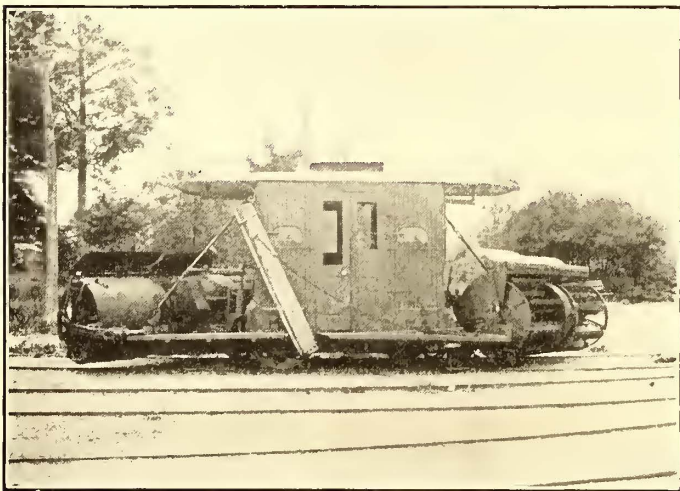
On the Buffalo division of the International Railway system the entire problem of fighting and removing snow is in direct charge of the transportation department, and the superintendent of transportation is alone responsible to the general manager for the maintaining of service during snow storms. Contrary to the more usual practice, this supervision is even extended to the matter of keeping crossings, switches, curves and special work free from ice and snow. This latter detail was formerly under the track

On the suburban lines the plows are put out in greater number, in order to make sure of keeping the lines open.

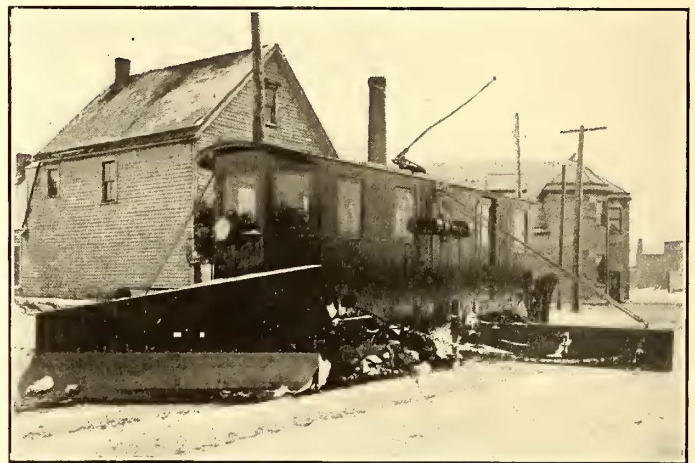
For snow duty we take men from the regular lists, and usually try to pick out the older and more reliable men. The men are assigned to plow work in the fall and are instructed to report at their car houses at the first indication of snow. If the storm starts in the night the men are called from their homes, and if the storm starts in the daytime they are called in from their regular work. The instructions read that in case of snow all men laying off must report to their stations immediately. Each plow is placed in complete charge of a designated man, who is responsible for getting it into service and covering the allotted territory.

Trainmen on plows between the hours of 5 a. m. and 10 p. m. are paid at a flat rate of 30 cents an hour; from 10 p. m. to 5 a. m. they receive 40 cents per hour. The regular pay of trainmen on passenger cars is 20 cents, 21 cents and 22 cents an hour. Usually three or four men are placed on each plow.

When necessary to operate the plows continuously for several hours, the plow crews are fed at the expense of the company, the division superintendents having instructions to take the men to the most convenient restaurant and give them a good meal. The men as a general rule do not object to the



SINGLE-TRUCK SWEEPER



THE "NANCY HANKS"

department, but this winter the experiment has been tried of doing away with extra men from the track department at special work, and the responsibility for keeping special work open has been placed with the snow-plow crews. This experiment has proven very satisfactory, and we have done away entirely with extra men for taking care of crossings, curves and special work. The mold boards on the "Green" plows, as before mentioned, remove most of the snow from these places. The plows carry a barrel of sand and a barrel of salt, and if the plow crews see that a switch or crossing needs cleaning out they do what work is necessary and throw a little salt into the special work to keep it from freezing up. This does away entirely with the necessity for keeping men at switches. Of course, it takes up a little of the time of the plow crews, but not enough to make a serious objection to this practice.

All passenger cars are equipped with track scrapers, and these are relied upon to take care of light snows. At the first sign of snow, the plow crews report at their respective car houses, but we usually wait until an inch or so of snow has fallen before starting out the plows. If, however, a storm gives evidence of more than an inch of snow, orders are immediately issued to the plow crews, through the division superintendents. The "Green" plows are usually ordered out first, and we put out one plow to each line—that is, a plow to each 5 miles to 15 miles of track. If the storm keeps up and indications are that it will continue, the plows are added as required.

plow service, and by picking the older men we get employees who will stand right by us until the fight is won, and the plow crews take as much interest in keeping the lines open as do the officials of the company.

We have about twenty-five sand cars on the system, and when the conditions give rise to slippery rails the sand cars are sent out over all lines. We make it a practice to sand only the inside rail of each track, as this prevents wasting the sand, and it is found that one sanded rail is as effective as when sand is poured on both rails.

In the city of Buffalo the city authorities remove all snow from the principal streets after our plows have piled it at the side of the tracks, the railway company paying an agreed proportion of the cost.

We have about 40 miles of snow fences along our suburban and interurban lines, and have adopted the New York Central type of fence.

C. A. COONS,

Superintendent of Transportation.

The street railway companies of Chicago have notified Corporation Counsel Tolman that they will comply with the ordinance recently passed by the City Council which requires that the temperature of cars be kept at 50 degs. F. Thermometers are to be installed in the cars and a supply of cards is to be kept at hand upon which patrons may send to the city complaints concerning the temperature of the cars.

THE QUESTION BOX

This Question Box is open for a free discussion and exchange of ideas and suggestion on all topics relating to electric railway construction and operation. Replies are requested from readers of this paper who can shed light or offer suggestions on any topic concerning which inquiries are made. Oftentimes the answers themselves as printed will suggest replies, and these additional answers are invited and will be printed in succeeding issues. There is but one restriction. Statements of an advertising nature cannot be published; otherwise these columns are open to the readers of this paper, whether they be representatives of operating companies, independent engineers or supply men.

A—GENERAL.

A 1.—What various methods do you employ for advertising your road and its attractions?

We have at one time or another used to some extent, at least, nearly all forms of legitimate advertising, but I believe the best results have been obtained from a descriptive pictorial folder containing a map, time card, and general information relative to the road, with a description of the parks and features of interest along the line. We make it a point to keep all alien advertising out of our printing. Although this means a loss of a small revenue I believe the results secured are more satisfactory without alien advertising. It is a hard matter to say from just what sort of advertising one obtains best returns. Last season we posted in Columbus, Ohio, along 200 eight sheet stands (this means a billboard 9 ft. high by 7 ft. wide) 1500 full sheets of attractive paper, a regular circus billing, posted on all the main streets of that city, notifying the public that we operated every hour between Columbus, Newark and Zanesville, high-speed 65-ft. cradle riding cars, containing baggage, smoking and toilet compartments. Our trains are crowded to more than capacity during the summer season, while our regular winter traffic is very satisfactory. We do not, however, offer reduced rates as an incentive.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

We publish time tables and advertise in newspapers. In August, 1904, we published a 50-page pamphlet, 4 in. x 8 in., containing descriptions and illustrations of our various properties, and time tables of all the lines. It also contains a two-page map in colors, showing our lines and connections. The book contains about 24 pages of alien advertising, which helped defray the cost of publishing.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

We use the newspapers extensively. W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

We get up an attractive description booklet of our road, illustrated with cuts showing the roadbed, and attractive points along the line. We advertise the road as covering a very fine scenic route. We also advertise the attractions at our summer park in the local and county newspapers.

H. C. PAGE, Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

The Boston & Northern and Old Colony Street Railways which operate over 800 miles of suburban and interurban roads in Eastern Massachusetts, have one of the greatest opportunities for creating pleasure riding of any company in the country, by reason of the fact that they not only reach practically all the historical cities and towns, the seashore resorts, lake regions and river valleys through this historical section, but their lines also run through a section of diversified scenery, all of which is calculated to attract travel. The companies have just established a passenger and advertising department, the first of its kind in this section of the country. Various plans for advertising their lines and attractions are under consideration, but have not been fully matured. However, the department is compiling six folders for editions of from fifty to seventy-five thousand each. One folder is devoted exclusively to seashore resorts, parks, summer resorts and picnic grounds that are especially adapted for public school picnics, as well as for other societies and organizations. As to the other five folders the two systems are divided into five divisions, and each folder gives the mileage, rates of fare, running time, general time-tables and a brief description of the routes in one division. These folders will be distributed from all the various important places along the two systems, from folder cases and racks, similar to those used by steam railroads. At the present time it is impossible, as this office is in its infancy, to give any estimate of what the companies will spend annually for advertising, neither is this office in a position

to state how much money can be spent profitably by an electric railway company for advertising. The amount that could be spent profitably depends entirely upon what the different lines offer as an inducement to create pleasure riding. The lines in order to pay for expenses incurred by advertising, should have attractions for tourists; otherwise it would be useless to try and induce travel. It is hoped that some suggestions that will be of value to us in this direction will be obtained from your columns.

ROBERT H. DERRAH, Pass. and Adv. Agt.,
Old Colony St. Ry. and Boston & Northern St. Ry.

A 2.—How much money do you spend annually for advertising?

In the neighborhood of \$1,000.00.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

About \$1,000.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

About \$2,000.

H. C. PAGE, Gen. Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

A 3.—How much money can be spent profitably by an electric railway company for advertising?

It depends on where the road is located, the number of miles operated, competition, what lines you connect and interline with, etc. If you go after foreign business and your line is so situated for such traffic I would say set aside about 1 per cent of the net annual earnings for advertising your road.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

A 4.—What are some of the ways by which an electric railway company can kindle and foster a more kindly feeling and a fairer treatment on the part of the public press of its community?

On the first of January of each year enter into an advertising contract with each paper within your jurisdiction, under which you agree to give transportation of a stated value at stated rates in exchange for advertising space in the paper of an equivalent value and stated rates. News items of general reading interest not to be classified as advertising matter. Contract considerations should be proportionate to size of circulation and influence. In that connection request the newspaper men not to write up your accidents and disturbances until they have both sides of the story. Also request them not to call attention to jury verdicts against you in any larger head lines than are used in announcing verdicts given in your favor.

A. H. ROGERS, Pres.,
Southwest Missouri Elec. Ry. Co., Webb City, Mo.

Try and keep in close touch with all the papers. Have found it profitable to give once a year, the representatives of the local press an outing, consisting of a trolley ride and banquet.

H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

It has been claimed by a number of railroad men that the best policy to pursue with newspapers is to pay for what you get and vice versa. With the steam roads this policy is perhaps best pursued, their advertising being so much more extensive. With electric roads, however, I believe that passes placed judiciously among the newspapers will not only create a kindly feeling, but will bring better returns than twice the amount of money that the transportation will cost, expended in advertising. I think that the policy of friendly, dignified association between the newspaper men and the operator of the electric roads, and understanding that at all times and in all cases a true statement of any so-called news features, in connection with the company, can be obtained at the company's office, will in nine cases out of ten keep out scare-head lines and a garbled story.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

Strict attention to business.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

The question of how an electric railway can kindle and foster a more kindly feeling and a fairer treatment on the part of the public press, is fully answered in an article in the STREET RAILWAY JOURNAL for Dec. 24, 1904, page 1096, entitled "Newspapers and the Interurban Road." I have for fifteen years been brought into close contact with the newspaper men of New England, and I am more satisfied to-day than ever, that any confidence placed in them is not misused. I believe that if any subject of importance comes up concerning the street railway, in which the public are directly interested, that the newspapers should feel there is one office or department where they can always rely upon getting accurate in-

formation. If this policy were pursued by the street railway officials, it would be found that newspaper articles would be more reliable than in some cases to-day, where the newspaper representative is obliged to get information from outside sources. Personal acquaintance with newspaper representatives is a valuable asset to a passenger agent, and it takes years to cultivate it. The newspaper man must be made to feel that he is a personal friend of the management and he will accept their statements with confidence. To do this, he must be cultivated and always treated fairly.

ROBERT H. DERRAH, Pass. and Adv. Agt.,
Old Colony St. Ry. and Boston & Northern St. Ry.

Give them small orders for printing from time to time and send an annual pass to the business manager.

H. A. TIEMANN, New York City.

Treat the representatives of the press in a candid, honorable, liberal and courteous business spirit. With regard to the local newspapers, the policy of the writer has always been to bring the relations between them and his companies to that of strict business so far as business relations were concerned, and to treat them with candor, courtesy and strict impartiality so far as news was concerned. Primarily, the writer has tried, and in nearly every case has succeeded, in abolishing all passes and free transportation to everyone not in the employ of the company and not legally or contractually entitled to them, and no exception to this rule has ever been made in favor of newspapers or their representatives. This has always cleared the way, possibly with a little temporary thunder and lightning, for an adjustment of business relations on a strictly business basis, the representatives and owners of the papers paying for their transportation at regular rates, and the railway paying for its newspaper advertising also at regular rates. Any proposition that "free transportation equals free publication" will sooner or later produce dissatisfaction and friction. The railway company will expect too much from the papers, and the papers will want the free transportation favors extended to the sisters and cousins and aunts. Let the company pay for its advertising, and the representatives of the press for their street railway transportation.

H. S. COOPER, Gen. Mgr., Galveston City Ry. Co.

A 5.—What are some of the ways by which an electric railway company can kindle and foster a more kindly feeling toward it on the part of the public?

A public serving corporation cannot afford to hold a public off at arm's length. We try to cater to the needs of the people in the different towns and cities, and keep the public as good-natured as possible. We find that the public, as a rule, appreciates being catered to, and it pays to create a local pride in the road.

H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

In my opinion a too "kindly feeling" is not conducive of good results in the end, as it will mean too much individual personal expectancy sooner or later. But a "square-business-deal feeling" to all alike is the best in the end. Give the people of the community to understand by fair, firm business-like treatment that you have rights, and intend to maintain them at all times; that you will always respect their rights; but that you know what their rights are in connection with your company as a common carrier, tax payer, and promoter of the city's and country's interests, and that you will also look to it that they do not abuse their rights. Have them bear in mind at all times that while you are a caterer to their patronage, you give value received, and you meet their wants. Good service, equipment, roadbed, gentlemanly employees, the guarding of property and precautions against accidents are the things that bring not only patronage and results, but business esteem and confidence as well.

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

Good service and civility.
W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

There are several ways by which an electric railway company can kindle and foster a more kindly feeling toward it by the public. First, by familiarizing people with all the advantages which the lines of the companies afford for pleasure riding. Our companies will do this not only by means of booklets, magazines and newspaper advertising, but our general passenger office is established in the heart of Boston and we have there a display of hundreds of photographs showing practically all the historic houses, parks, and resorts along our lines. It is both free and instructive to the public. Second, by having within easy reach time-tables and other literature which gives the mileage, rates of fare, running time and time-tables. Third, by having competent motormen who so guard the front end of the car that the safety of the passengers is assured, and courteous conductors who will not only watch for the safety of the passengers, but who can enlighten them regarding

the historical places, points of interest and picturesque scenery along the lines. A class of motormen and conductors similar to those indicated, will do more to create a friendly feeling between the public and the corporation than can be done in any other way. I also believe that the method of going before clubs, churches, and other societies, giving illustrated talks on the development of street railways and the beauty spots and historical places, has a good effect in creating a desire on the part of the public to travel by electric lines.

ROBERT H. DERRAH, Pass. and Adv. Agt.,
Old Colony St. Ry., and Boston & Northern St. Ry.
Good treatment by employees and reliable service.

H. A. TIEMANN, New York City.

A 8.—A company wishes to carry its own fire insurance, by setting aside a certain percentage of its gross receipts each year to cover fire losses. What would be a safe percentage to allow?

Our present premiums are under 2 per cent of the receipts.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

I am not in position to state what this percentage should be. Our rate of insurance runs from 1.25 to 1.40. We get this rate by putting our buildings in exact accordance with recommendations made by the Board of Fire Underwriters, and we feel that this is the cheapest manner of handling our insurance.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

A 9.—Under what conditions can an electric railway company venture to carry its own fire insurance on its various properties?

Our group of companies might perhaps carry their own insurance owing to many scattered risks, but we have not done so, and I do not think the ordinary company could.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

It is my judgment that a street railway company cannot carry its own insurance judiciously unless the rates in the locality are exorbitant.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Trac. Co.

In my opinion, a company having a number of car houses and power stations located at different places on its system, can very wisely assume its own fire insurance, in view of the exorbitant rates demanded on street railway property. Take the case of a company having four car houses and three power stations, located at as many different points. The seven plants have a total valuation of about \$2,500,000 and are covered by a blanket fire insurance policy, which also includes rolling stock, the premium being at a flat rate of about 1 per cent per annum. The premium will be \$25,000 per year. I would suggest as a better method of handling this matter, the following: Let the company place \$250,000 of its own bonds in escrow with a trust company as a fire insurance fund, and charge the 5 per cent interest on these bonds or \$12,500 per annum to fire protection. Under the blanket insurance policy first mentioned, the \$25,000 premium per year is absolutely gone, unless the company happens to have a serious fire. Under the bond method, the \$12,500 interest accumulates as a fire insurance sinking fund. The chances of a conflagration wiping out more than one of the car houses or power stations and involving a loss greater than \$250,000, are so remote that the company is justified in taking the risk. As a matter of fact, in the case cited, a conflagration so widespread as to destroy any two of the company's plants, would leave conditions in which an electric railway would no longer be required.

EDGAR S. FASSETT, Supt.,
United Traction Company, Albany, N. Y.

A 10.—What percentage of your gross receipts are you paying out through the claim department?

About 4½ per cent.

E. G. CONNETTE, Vice-Pres. and Gen. Mgr.,
Syracuse Rapid Transit Ry. Co.

During the past six years our legal and claim department absorbed the following percentages of our gross receipts:

Year ending August 31, 1899, 2½ per cent.
Year ending August 31, 1900, 6½ per cent.
Year ending August 31, 1901, 6½ per cent.
Year ending August 31, 1902, 4 per cent.
Year ending August 31, 1903, 4 per cent.
Year ending August 31, 1904, 5½ per cent.

A. H. ROGERS, Pres., Southwest Missouri Elec. Ry. Co.

One and one-tenth per cent.

H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

About 2 per cent. J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

For the past year we paid out in damages \$45,000; in other legal expenses connected with the claim department, \$11,000; or a total of \$56,000 as the cost of the claim department. Our gross receipts were, approximately, \$1,700,000. Percentage of cost of claim department to gross receipts, about 3 1/4 per cent.

United Traction Company, Albany, N. Y.

Two per cent. to 3 per cent.

H. A. TIEMANN, New York City.

A 11.—A company wishes to set aside a certain fund each year to cover all accident claims. Should this fund be based on a definite sum per car-mile, or on a percentage of the total gross receipts? What would be a proper allowance?

The setting aside of 6 per cent of the gross receipts of an inter-urban road should be a proper reservation.

A. H. ROGERS, Pres.,
Southwest Missouri Elec. Ry., Webb City, Mo.

Gross receipts. Proper allowance is a question.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass

A company should set aside a certain fund each year to cover accident claims. It should be based on a percentage of the gross receipts.

E. G. CONNETTE, Vice-Pres. and Gen. Mgr.,
Syracuse Rapid Transit Ry. Co.

Set aside a certain percentage of the gross receipts. The rate will vary on different roads. A road operating wholly inter-urban lines would be a different proposition from a city road.

H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

My judgment is that this should be on the gross receipts. We are at present laying aside 4 per cent to take care of accidents.

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

A 12.—What is a proper basis on which to compute accident liability insurance?

Three per cent on the gross receipts ought to cover an inter-urban road, provided it is properly managed.

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

A 13.—In the electric railway business, is an accident liability insurance company—mutual or otherwise—feasible? Why?

I doubt the feasibility or practicability of accident liability insurance, either mutual or otherwise, because the conditions of operation are so different, making the liability and expense much greater in one locality as compared with another.

E. G. CONNETTE, Vice-Pres. and Gen. Mgr.,
Syracuse Rapid Transit Ry. Co.

Accident liability insurance (public) is not feasible. Each company must attend to its own affairs of this kind. They cannot be delegated to strangers, even through specialists.

A. H. ROGERS, Pres.,
Southwest Missouri Elec. Ry., Webb City, Mo.

Do not think it is feasible to have a mutual accident liability company, as it would be impossible to get a group of roads with the same conditions. If each road could have a standard equipment of the same style, running at the same speed, and have rules and regulations the same as insurance companies do, this would be practical.

H. C. PAGE, Gen. Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

I have never believed that it was, but there is a mutual company being organized in Cleveland at present, and with the exception that the power that is invested in the board of trustees is more than I think it should be, I think it a good idea.

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

A 13 C.—What can be done to prevent newsboys and others from riding on the bumper?

The International Railway Company, of Buffalo, had considerable trouble from this source and the number of accidents caused by boys stealing rides on the bumper became a serious matter. To prevent persons from securing a foothold on the bumpers, all the cars of this company are now fitted with a piece of No. 14

sheet steel fastened to buffer and dasher at an angle of 45 degs., with 1/4-in. stoll bolts about 3 1/2 ins. apart, as shown in the engravings. This incline effectually prevents anyone from standing or sitting on the buffer. A hardwood block, 2 ins. long, is placed



BUFFER ARRANGED WITH INCLINED TOP

underneath this incline at the center line of the car in front, to strengthen it at this point. No other filling is used.

EDITORS.

A 14.—Do you carry United States mail over your road? If so, please describe how you do it.

Yes; in front vestibule.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

United States mail in pouches is carried by our company over our road between Columbus and Newark and intermediate points. Our contract requires that we carry the mail pouch twice a day from Columbus to all stations along our road, the pouches being delivered to our car and taken from it by the government's agent. The pouch is carried in the motorman's cab of regular cars.

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

A 16.—What would be a proper basis on which to formulate contract with the Government for carrying United States mail on electric railways?

Ten cents a mail bag for any distance.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

We get 3 cents a mile for carrying the mail.

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

E.—MASTER MECHANIC'S DEPARTMENT

E 50.—Are you in favor of split or solid gears? Please give your experience with either. What are the relative advantages and disadvantages of each?

The first gears used were made of cast iron, but it was demonstrated in a short time that cast-iron gears would not stand the wear and knocks they had to bear on a motor car. Open hearth cast steel was then tried and is now commonly used for gear rims. The split gear of to-day causes troubles which are numerous and of a varied effect. Gears become loose on axle, due to poor fit, causing knock or jar on starting car. Nuts run off and bolts break and get caught between gear and pinion. The keyseat in axle required by split gear is quite deep, and it has been the practice on most roads to have seat cut to edge of gear hub and without taper at ends of seat, thus reducing the strength of the axle. The effect of loose gear on an axle is a wearing away of the key, spreading of the keyseat in axle and gear, and wearing away of axle seat—thus ruining the gear, key and axle in many instances. If axle seat is not worn enough to interfere with clamping effect of gear, a compromise key can be made and save the axle. If seat is worn too much for a fit, then axle must be used for an idle wheel or as is sometimes done, turned down and used on smaller equipment where it is possible,—otherwise it must be scraped. Before putting a split gear on axle, the gear seat on axle should be calipered and bore of gear gaged to see that the gear seat is not worn

away too much, and that gear is bored sufficiently under diameter of axle seat as to allow a good clamping fit. It is the practice on some roads where the gear seats on their axles are worn, to use a thin metal shim on axle opposite the key seat, but this is a poor practice and one that should be abandoned. The damage done due to the loose gear, would, in most cases, pay for the cost of a new axle to replace the one with the worn gear-seat. To overcome some of the drawbacks of the split gear, several roads have adopted the solid gear and claim to be very well satisfied with it. While the solid gear eliminates a number of bad features of the split gear, it has some drawbacks that must be considered. Unless the gear is made with a solid web with holes for bars to pass through for pushing off track wheels, these gears are liable to break the same as the split gear. The solid gear has the disadvantage that, when gears wear out, the axle must be taken from under car and wheel next to gear pressed off, a new gear pressed on, and then it becomes a matter of controversy whether it would be safe to press the same wheel back on that was pressed off to remove the gear. The condition then presents itself where the track wheels are worn out and must be pressed off, and where the solid gear we will say has been about three-fourths worn out. Would it be policy to press new wheels on axle with a gear in this condition? The first cost of a gear is of such amount that the master mechanic does not want it scrapped until it is worn out. The chance of gear and track wheels being worn out at the same time is about one in a hundred. While the first cost of a solid gear is less than of a split gear, the increased mileage from split gear will overcome the difference of first cost. We read accounts of steel-tired and rolled-steel wheels making mileage as high as 190,000 car miles which is about three times the average life of a gear, and if solid gears are used under equipment of this type, the expense and trouble of renewing gears would discourage the management from using them. While the solid gear does away with trouble of loose gears, broken bolts and nuts getting jammed in gearing, yet the disadvantage due to renewing same when worn out is a great drawback to their adoption. The ideal gear would be one whose hub is pressed on axle under high pressure and not requiring key-seat in the axle, and having the rim of gear so constructed that it could be detached from hub and replaced by a new rim without having to press off the truck wheels, the rim being fastened to hub in such a manner as to be absolutely sure of not coming loose on hub, and no possibility of parts used in fastening rim to hub getting detached and jamming between gear and pinion. Gears have been pressed on axles under 30 tons pressure without using key in axle and have worked satisfactorily. There is a detachable rim gear which has been recently developed and is being tried out by quite a number of roads, which gives promise of coming near to the ideal. The hub of this gear is pressed on the axle and rims bolted on with four 1½-in. wedge bolts. The outer edge of hub section is turned V-shaped, and a V-slot cut in under edge of rim fitting over V of hub; the rim is made of T section, open-hearth cast steel. The four wedge bolts clamp the V of hub into V slot of rim forming a very powerful clutch. The heavy shank of wedge bolts act as the key for rim on the hub, and is a positive preventive of rim turning about hub. The only tensional strain on these bolts is the strain that is applied in tightening up on nuts, and whatever strain that comes on the bolts afterwards is a cross-strain, tending to shear off the heavy shank of the wedge bolt. Here we have a gear which is the most unlikely to come loose on axle, whose rim is removable without disturbing track wheels, and the bolts used in fastening rim to hub of sufficient size as not to break under the severest strain. While this gear hardly comes up to the ideal on account of the fact that bolts are used in fastening the rim to hub, it has features that are commendable and will no doubt be adopted by many of the different trolley companies of the country.

A MASTER MECHANIC ON AN EASTERN ROAD.

E 51.—If split gears are used, what do you do to prevent bolts and nuts from becoming loose?

The running off of nuts and breaking of bolts which get jammed between gear and pinions, is the worst source of trouble to be found with the split gear. Owing to the severe and constant jar and strain coming on bolt and nuts, it becomes a difficult problem to secure them. On different roads different methods are used for locking nuts. Some prefer stud bolts with lock nuts with cotter; others steel bolt and split lock washer with standard nuts and cotter; others stud bolts, split lock washers and crown nuts with cotter, etc. But with all the systems of securing the nuts, trouble continues from their getting loose and dropping off into gear case. The trouble from broken bolts is due to the use of too small a bolt. The majority of bolts used in gears of the motors for city service are ¾-in. steel bolts. The car house man is drilled to pull up all he can when tightening bolts, and with a long socket on a

¾-in. bolt he can always get a little more—the consequence is he snaps the bolt. If he does not pull until nut comes hard up, then he does not know whether the bolt is pulled up sufficiently, or whether it is strained. If it is not pulled up sufficiently the gear will work loose; if he has pulled too far the bolt will be liable to break under a severe strain. With 1-in. steel bolts the trouble from broken bolts is practically eliminated. ANONYMOUS.

E 76.—Many of the steam roads dry-wipe their cars without the use of any water. Do you think this method is applicable to electric cars?

An oxygenized coat of varnish that will resist the effects of the elements a reasonable length of time must necessarily be of a semi-elastic nature, and, therefore, its superficial gloss cannot be expected to stand the effects of attrition as though it were a vitreous glaze; yet the methods sometimes employed in car cleaning leads one to suppose that the two surfaces were regarded as being identical. The employment of some of these methods of car cleaning is more or less open to criticism, and one in particular, is the so-called "dry-wipe" practice. The dust that is attracted and adheres to car surfaces is composed of a very fine grit, and in the process of dry wiping a car the waste that is usually used for this purpose being filled with an ever increasing amount of grit has the effect on varnish that is equivalent to that of a slight rub with flour pumice. By following this practice the grit in the waste is not removed at short intervals as it is from a sponge where water is used, and therefore, the waste becomes more and more injurious to the varnish as the work of cleaning proceeds. This, of course, means that every time a car is cleaned by dry-wiping a small percentage of varnish is thereby removed, and the duration of time that this thin film will exist under these conditions can only be estimated by the number of times that the varnish is subjected to this treatment.

The above view of the matter of dry-wiping a car is taken in its most favorable light when the fine grit from dust was alluded to, but if there be any doubt existing about the injurious friction of dry-wiping a car, let one imagine the results of dry-wiping car panels covered with the cement-like lumps of dried mud which condition is no uncommon sight, and the matter should be settled.

H. ARNOLD FRENCH, Master Painter,
The Rhode Island Company, Providence, R. I.

E 79.—Should the matter of cleaning and washing cars come under the transportation department or the master mechanic's department? What are the advantages or disadvantages of either system?

The washing of cars properly comes under the master mechanic's department and under the immediate supervision of the foreman car painter, for the reason that he can tell at once what condition the car is in, and what materials or methods should be used in cleaning it. Also, he is in position to know whether the car has been painted previously under conditions that would make a special way of washing necessary. For instance, the car may have been repaired and a section of a side or end repaired hurriedly in order to get the car back into service, and it may not have received the usual method of painting. In this case the particular section should be washed without the use of the stronger cleaning materials, which might, perhaps, be used on cars that had received the regulation painting process. As a matter of fact, a thoroughly competent foreman painter is the only man on the road who knows how the car should be washed. Again, if the washing is done under the supervision of the foreman painter, he is at all times familiar with the condition of his work and may observe the result of using different processes and various kinds of materials. In short, he should have opportunities for watching the condition of his work from the time the car leaves the paint shop until it returns.

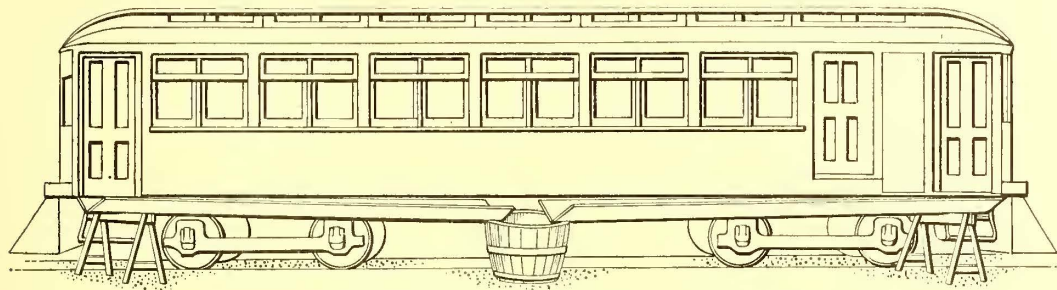
E. W. SELKIRK, Chicago, Ill.

E 80.—Please describe a good arrangement of stand and room for washing cars.

A cement stand for washing cars is best if arrangement of shops permits cars to be transferred readily from one portion of the shop to another. If cars cannot be brought to a central point for washing, or if there is no cement or other sloping floor to give drainage, cars can be washed where they stand. However, if it is the practice to wash cars in different parts of the shop, some precaution must be taken to avoid water soaking the floor and pits. A good scheme is to have wooden troughs, each one

about half the length of the car and wide enough at top to catch the drips. These troughs can be placed just under the side-sills in the manner shown, with the outer ends supported on saw horses and the inner ends resting on a half barrel, to catch the

before the car painting begins has a great influence on the methods to be followed in the painting and varnishing operations. If the time limit is an item, the experienced foreman painter must know, and will know, where, in the particular system he is using, the time can best be saved without injuring durability. Practical experience and no rigid set of rules will apply in car painting. The question suggests comparisons between different ways of arriving at a surface. The use of linseed oil in proper proportions with other liquids and materials, in priming and white lead for pasting or knifing, in other than "ready-to-use" surfaces, is customary. The writer is of the opinion that neither pure linseed oil nor pure

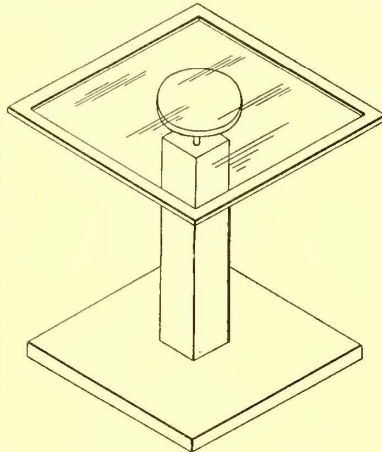


TROUGHS USED WHEN WASHING CARS

white lead need have any place in the proper painting of a steam, elevated or street car. The belief that the more linseed oil used in priming, according to the time available for the work, the better, is an error, and pure white lead can be dispensed with entirely in any car paint, with excellent results. The truth of this statement can be determined by a simple experiment. Coat two pieces of white-wood siding on the face only, one with pure white lead and oil priming, and the other with priming made of slop varnish of known good quality, thinned with turpentine to oil consistency and mixed with any dry paint material such as ochre or brown mineral. It will be evident that the lead and oil priming will take much the longer to dry. Then coat both pieces of the wood with any flat color, varnish, and, when dry, hang the pieces out-doors where they will be exposed to the weather, and note the result. This experiment will prove conclusively that the theory of the use of linseed oil in car priming is wrong. In hurried work it never has time to dry properly, and plastered over with several coats of surfacer, body color and varnish coats, it has every chance to decompose by its own heat. Badly checked and cracked cars primed with pure linseed oil and pure white lead priming, after being in commission several years, on examination other than by burning or removing the outer coats with patent paint and varnish removers, will often reveal the fact that the priming is still soft and warm. If further proof of how the oil acts under the surfacer and varnish coats is required, saturate a small piece of cotton waste with pure linseed oil and hold tightly in the hand for a few minutes. The experimenter will need a pail of water handy to prevent seriously burning his hand.

E. W. SELKIRK, Chicago, Ill.

E 83.—Do you know of an improved form of table or rest for expediting the work of varnishing window sash? If so, please give description with photograph or drawing. (A rough sketch of the device will do.)



STAND FOR HOLDING SASH

A good sash varnishing table can be made as shown in the illustration. The wooden disc on which the glass rests revolves on a spindle placed in a hole in the upright standard. With this revolving stand, a man can varnish all around a window sash on both sides without changing his position, and without danger of marring the freshly varnished surfaces. The support can be placed on a table, or the upright piece can be made long enough so that the base can rest on the floor.

E. W. SELKIRK, Chicago, Ill.

E 85.—What are good ways of heating the paint room?

In a room for car painting it is only necessary to maintain a normal temperature, say 70 to 75 degs. F. Higher temperatures are not in any respect necessary or desirable.

E. W. SELKIRK, Chicago, Ill.

E 86.—What can be done to prevent dust in the paint room?

For cleanliness, the ceiling or roof timbers in a paint shop, and also the side walls should be sprayed with good white cold water paint that will not flake nor peel off. In order that cobwebs and dust accumulations can be noticed easily and removed at other than varnishing times, a 5-ft. dado should be placed all around the side walls and painted with a good dull gray paint. Keep the paint room floor clean by frequent sweeping after slightly sprinkling. The floor should never be flooded with water.

E. W. SELKIRK, Chicago, Ill.

E 89.—What are the relative advantages and disadvantages as regards cost, durability, etc., of the two general systems of painting cars, i. e., that known as the "knifing" process, using a foundation coat of pure lead and linseed oil, rubbed in with a putty-knife; and that known as the "rough-stuff" method?

It is possible to outline plainly various methods of car painting, any one of which has particular merits for certain conditions, but no matter how good the system or how plain and explicit the method or formula may be laid down, the results depend entirely upon the application, and the application must be under the direction of a practical car painter. The best method for a system of car painting ever devised will prove a failure if the application is faulty. Any system or method will have to be altered or modified to meet the particular conditions and requirements of each individual case. The condition of the preparatory work that is done

before the car painting begins has a great influence on the methods to be followed in the painting and varnishing operations. If the time limit is an item, the experienced foreman painter must know, and will know, where, in the particular system he is using, the time can best be saved without injuring durability. Practical experience and no rigid set of rules will apply in car painting. The question suggests comparisons between different ways of arriving at a surface. The use of linseed oil in proper proportions with other liquids and materials, in priming and white lead for pasting or knifing, in other than "ready-to-use" surfaces, is customary. The writer is of the opinion that neither pure linseed oil nor pure white lead need have any place in the proper painting of a steam, elevated or street car. The belief that the more linseed oil used in priming, according to the time available for the work, the better, is an error, and pure white lead can be dispensed with entirely in any car paint, with excellent results. The truth of this statement can be determined by a simple experiment. Coat two pieces of white-wood siding on the face only, one with pure white lead and oil priming, and the other with priming made of slop varnish of known good quality, thinned with turpentine to oil consistency and mixed with any dry paint material such as ochre or brown mineral. It will be evident that the lead and oil priming will take much the longer to dry. Then coat both pieces of the wood with any flat color, varnish, and, when dry, hang the pieces out-doors where they will be exposed to the weather, and note the result. This experiment will prove conclusively that the theory of the use of linseed oil in car priming is wrong. In hurried work it never has time to dry properly, and plastered over with several coats of surfacer, body color and varnish coats, it has every chance to decompose by its own heat. Badly checked and cracked cars primed with pure linseed oil and pure white lead priming, after being in commission several years, on examination other than by burning or removing the outer coats with patent paint and varnish removers, will often reveal the fact that the priming is still soft and warm. If further proof of how the oil acts under the surfacer and varnish coats is required, saturate a small piece of cotton waste with pure linseed oil and hold tightly in the hand for a few minutes. The experimenter will need a pail of water handy to prevent seriously burning his hand.

E. W. SELKIRK, Chicago, Ill.

E 90.—What can be done to reduce the cost of painting and varnishing cars without sacrificing durability?

Secure the services of a first-class foreman car painter. He should be a man who has learned the trade of car painting and can do any part of the work personally from wood to finish; he should have worked on new work, both in contract and companies' shops by day work and piece work; he should be a man who is willing to try out, and, if found available, to adopt and put in practice up-to-date methods of doing work; and he should have the ability to induce others to do work as he knows it should be done.

E. W. SELKIRK, Chicago, Ill.

E 92.—Do you favor the use of rubbing varnish on the exterior of cars? Why?

The use of rubbing varnish is advisable when necessary to hasten the work, whether it is the intention to rub down or not. It is better to use rubbing varnish than to attenuate the finishing varnish in any way, either by the addition of japan or by thinning with turpentine to hasten the drying. If time is not an item in the question, two coats of finishing varnish are preferable.

E. W. SELKIRK, Chicago, Ill.

E 93.—Have you ever tried mixing varnish in body colors in order to make the body coats more elastic? What were the results secured?

Every car painter knows that the addition of some varnish to body color is advisable, as its addition assures him that there will be sufficient binder to allow the body color to be properly cleaned after striping, ornamenting, etc. Also the body color will hold out the varnish coats better.

E. W. SELKIRK, Chicago, Ill.

E 100.—The suggestion is made that the regular daily in-

spection of cars should be made at the terminals of the lines, between regular trips. Is this feasible, and what are the advantages to be gained?

Not possible in many cases, but where it can be done there is much to be said in its favor. Trip inspection admits of regular and frequent daylight inspection and gives good opportunity for competent and trained men to take the "stitch in time that saves nine." Thus, the equipment can be kept in first-class shape, efficient, neat, and attractive to the passengers at low cost. Also, when necessary to take a car off the road and put another one in its place, the substitution can be made without inconvenience to the traveling public. Better results can be secured by having an extra car on each division for a layover car at each terminal at the outer ends, and having the crews change cars there.

D. F. CARVER.

E 146.—Do you know of any cheap and convenient form of small gas or electric furnace for heating soldering irons, etc.? If so, please give description, with photograph or drawings. (Rough sketches will do.)

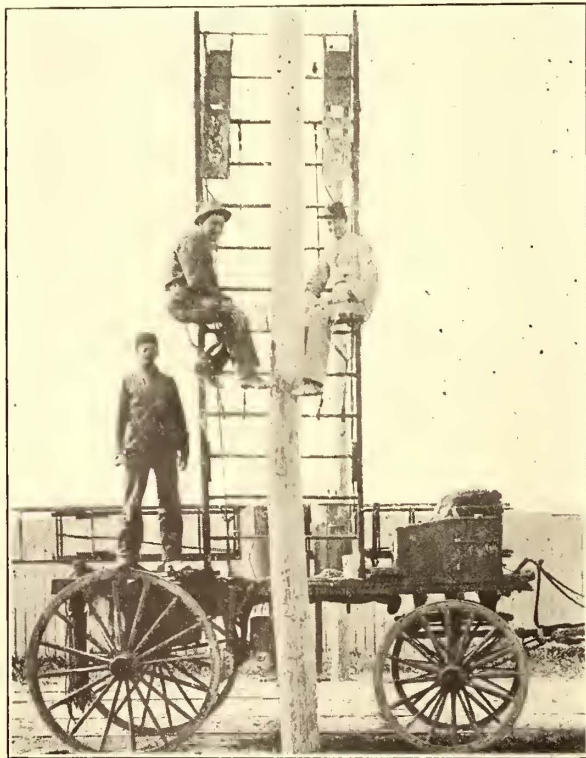
There is on the market an efficient and economical gas heater for soldering irons. Any of the first-class dealers in gas stoves and appliances can furnish them. When the irons are in the furnace the weight of one of them will keep the flame on. When the furnace is empty the flame is automatically cut down as low as possible, and kept burning. Sometimes the insurance companies make it advantageous to use these in place of gasoline torches.

D. F. CARVER.

H.—LINE DEPARTMENT

H 8.—What is the best way to paint trolley poles? Give sketch or photograph and description of apparatus used; also detailed cost of doing the work.

We use a ladder wagon for painting poles. The apparatus consists of a light platform mounted on wheels, and designed to be drawn by a horse. To one side of this platform is fastened a ladder, the ladder being attached to the platform by brackets and renewable pins at the lower end. The ladder is in two sections; the lower half being fixed to the platform as stated, while the other section, known as the "fly," may be raised or lowered according to



LADDER WAGON

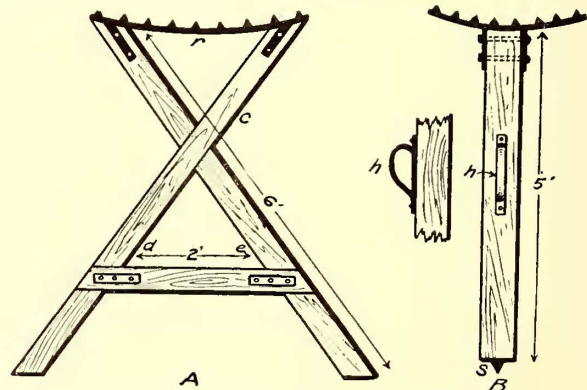
the height of the pole to be painted. This extension section is arranged after the fashion of a painter's ordinary extension ladder. The ladder is re-enforced with a support or rib running the length of the ladder between the two outside pieces. This serves to strengthen the rounds and gives greater stability. The fixed section of the ladder is braced with two rods which run from the upper ends of the sides of the ladder diagonally to the opposite

side of the platform, where they are held between brackets with renewable pins. Several holes are provided near the lower ends of these bars or braces so that the ladder may be adjusted to different angles. The painters work from small seats or platforms, which are hung at one end from the rounds of the ladder by hooks, and are supported at their outer ends by Y-shaped braces, the upper ends of the Y being hinged to the outer ends of the seats, and the lower end being formed like a fork to allow it to rest on a lower round of the ladder. It will be understood that with this arrangement the lower ends of the Y braces can be lifted from the rounds, thus permitting the seats to fall flat against the ladder when passing poles or trees, or when the ladder is being drawn through the street. There are also two movable supports arranged on the wagon platform which can be drawn out so that the course between the ground and the lower platform can be painted when the fly is raised for painting high poles. A tank having a 40-gallon capacity is attached to the rear of the apparatus for carrying paint, and the driver's box at the front is utilized for carrying tools and brushes. This box also serves as a wardrobe for the mens' clothes. With the use of this apparatus the cost of painting poles has been reduced nearly one-half as compared with the use of such implements as the common ladders, the lineman's spurs, the boatswain's chair, etc. Also the obstructing of highways with paint pots, etc., is entirely unnecessary, as the paint pails and tools are always confined to the apparatus. The apparatus has been used by this company for seven years. It was designed by the writer, who holds letters patent covering the chief features.

H. ARNOLD FRENCH, Master Painter,
The Rhode Island Company, Providence, R. I.

H 9.—What is the best way to raise and set trolley poles? Give sketch or photographs and description of method; also detailed cost of doing the work.

P. A. Price, writing in the "American Telephone Journal," gives the following description of modern methods of setting telephone poles; the remarks contain suggestions for electric railway work:— In raising poles a skilled lineman should be in charge of the gang. Three skilled men can do the work of six green hands, for there is a knack in handling the heavy, awkward dead weight of a large



SUPPORTS FOR RAISING POLES

pole that only comes of practice. Solid pike-poles of assorted lengths are essential, and they should be tipped with metal points. A man should be stationed at the butt of the pole with a cant hook to keep the pole from turning as the men raise it. A "dead man" is indispensable, and any blacksmith can readily make the metal parts. In the illustration two styles of "dead men" are shown. "A" is somewhat heavy, and to a green hand is awkward, but it is a very safe affair. "B" is easily handled in rough ground, but requires that the pikers understand their business, as it has no side supports of its own. These are usually about 5 ft. in height. The pole can be lifted by the men so its top rests on the "dead man," and it can be shifted up the body of the pole as the men raise on it. When the top of the pole is raised high enough to admit of pikes being used, have a man on either side of the pole with short pikes to hold the pole to its direction. This "side-piking" is essential when the "B" type of "dead man" is used. Do not allow the men to hold the pikes against their bodies under their tool belts. No matter how carefully the work be done, the pole may get away from the men, and woe to the man who has his pike under his belt. On the shoulder or free in the hands is the place for a pike, so it can be dropped in case the men should lose control of the pole. When high poles are to be set it will facilitate matters if the hole be trenched; that is, dug away on the side the pole is raised from. This provides a natural path for the butt to the bottom of the hole. Above all, have a cool-headed person to direct operators.

EDITORS.

ELECTRIC RAILWAY OPERATION IN A GREAT CITY*

BY H. H. VREELAND

You are dealing with the most interesting problem that now engages the practical ingenuity of men. The azure of speculation seems nowhere so illimitable as in the region which your science seeks to explore. What the knowledge-seeker in politics or medicine or mechanics or other departments of human activity may yet accomplish for the betterment of life is bounded by a horizon that seems short indeed, in comparison with that which measures the broad area within which a new force can operate. What limit is there to the practical advantages that can be extended to mankind if the energy which is capable of sending an impulse around the earth within the space of a few seconds can be caged and stored and trained? When I consider what you have enabled it to do for human comfort and convenience in the single industry that I represent, the attempt to measure your possible achievement seems as futile as a guess at human destiny.

It is not my duty to tell you what electrical energy is, or how you can catch it and put it in harness; but I can tell you something of one of the existing conditions to which it must be applied. And you have poorly learned the very first lesson of life until you have convinced yourselves that the business of adaptation pays better than the business of revolution. Your invention, however interesting and wonderful, and whatever may come of it in the end, is going to be of small use to you if its employment calls for the upsetting and overturning of established conditions with all the waste that that implies. It is for this reason that the first study of an electrical engineer who finds himself in the possession of an idea as to a profitable use that may be made of electrical power, must be the existing conditions of the business to which he believes his idea applicable.

Although it is true that all great industries are organized in this country to-day upon substantially the same lines, and while the peculiarities of each are apparently slight, it is in the comprehension of such differences as do exist that a specialist must excel. The distance between the claim agent and the electrical engineer seems remote, until it appears that the engineer's device, by its too great intricacy or delicacy of construction in the hands of a low-salaried motorman, has involved the company into disastrous accidents. The distance between the electrical engineer and the auditor seems remote until when the engineer's device has been tested and compared, and its economic results have been written down in the auditor's cold figures and submitted to the general manager, the engineer is informed that it costs too much for installment, and saves too little in operation. It must not be supposed, therefore, that the utility of an idea or of the machine that embodies it has been fully passed upon, even when the operating manager and the master mechanic are satisfied.

It is fortunate for you that in these days of combination the president of a great corporation is no longer its owner with his thoughts fixed solely upon the immediate recovery of his investment. Combinations, call them trusts, if you prefer, by the very fact that they represent so great an investment that no one man, indeed, no small group of men, is ever in secure and absolute control, afford the best assurance that any business method has ever provided in the history of trade of the largest opportunity for men of force and brains. The ownership of a property capitalized for twenty-five or fifty millions, bonded for fifty or one hundred millions, is distributed all over the country and lodged in the hands of thousands, and often tens of thousands of investors. However identified it may be in the public mind with the genius of a single individual who

may have created or brought it together, the fact invariably is that his personal financial interest in the concern bears only a trifling proportion to the total investment, and well he knows that his control is no control at all, but merely that measure of authority which he can justify by an annual dividend. He knows, moreover, that its continuance depends not so much upon what he can accomplish to-day as upon the steady, constant and permanent value that he can give to his corporation's securities. He and his associates, for of himself he amounts to little, perfectly realize that they must keep their eyes constantly trained on the future and their minds are always receptive, therefore, to a man with an idea.

You are all familiar with the claim that the consolidation of great properties is against the interests of the individual, of labor as a class, of inventors as a class, of youth and ambition however employed, unless it is backed with money. It is constantly alleged with most elaborate sophistries that the ultimate result of consolidations is a reduction of working forces, and that the effect of elaborate organization is to thwart ability and stifle hope. I suppose that, in a modified way, the experience of my corporation is that of every other. If it is, this is the fact—computing on a mileage basis, since the street railroads of New York City were consolidated into the Metropolitan System, and since the electrical engineer drove the electrical force against the wheels of our cars, we employ three times the number of men that formerly were employed upon the same mileage. We have one president, it is true, instead of twenty odd, and we have reduced the number of secretaries, managers, treasurers and superintendents and the like, but as to the working force, from which the loudest protest is heard against combination, it is three times as great and its wages per individual have increased fifteen per cent.

Not only so, but in our organization we are absolutely dependent upon ability. What should an electrical engineer, who is a director's son but a man of no particular capacity, weigh with me against an electrical engineer through whose device I can start my cars more easily, stop them more swiftly, govern them more accurately, when my relation to my company depends solely upon the value of securities owned by ten thousand individuals scattered throughout the land? Influence may secure to youth an opportunity, it may set his foot in the right direction, but there never was a time when the length and the swiftness of his stride depended so entirely upon the man himself as they do to-day.

But combination has had this result and you must never omit it from your calculations. There is no one of the departments into which a great industry is now classified that is not going to be affected in its operation by each and every idea as to management that is attempted to be put into execution. The general manager, the secretary, the treasurer, the attorney, the chief engineers, the purchasing officer, expert, and separate as each may be as to his particular functions, work so completely through the executive head of the industry that at that central point the effect of the slightest change at any spot in the whole working plane of operation is registered for the information of them all with the accuracy of the sensitive plate in the photographer's camera as it records the moving picture. Just when the change occurred and what its effect has been upon the entire prospect are witnessed for the judgment of all.

Important, therefore, as an electrical engineer or other expert is in the system of a street railway, his value depends upon his realization of the unity of the system and the effect which his idea, incorporated into an apparatus, is bound to have upon each department of a complicated organization. Of course he must bear in mind at all times that his machine must go into the hands of a class of men who, however expert they may become in its manipulation, must be recruited in large numbers from those whose physical strength is their chief

* Abstract of an address delivered before the New York Electrical Society, Feb. 15, 1905.

capacity, there to be subject to continual use under the most disadvantageous conditions that can possibly arise. It must be stowed away where it is out of sight and reach, under the car body and close to the roadway. It must stand not only use, but the hardest sort of abuse not only from the incompetency of a great army composed of unskilled labor, in which there will always exist a large percentage of gross dullness, and into which there must always be drawn another large percentage of inexperience, but from adverse weather conditions and from adverse conditions of traffic, and that the machine operating under these circumstances, however it may break down, must never be permitted to stand in the way of the car that is coming on.

These conditions, of course, are fairly obvious, but it is beyond belief how often some one or more of them has been overlooked by the electrical engineer. He learns his business generally in some great establishment largely devoted to experiment where the gross earnings of an ordinary street railroad are written off the books in a single month of fruitless investigation, where he is provided not only amply, but even superfluously, with the tools of his trade, and it is difficult for him to understand when he comes to street railroad work that, in the running of a car there is no time for repairs, and that no device, however generally useful, can be employed on a street car which, if it falls out of gear, requires the car to be stabled before it can be repaired. He easily forgets that the motorman, however well instructed, is not a machinist; that he must keep his car going without the facility of a machine shop, and that often the most important repairs must be made at dead of night in a dark and narrow pit, with cheap labor and under whatever circumstances the fates may provide.

Later in the evening I have provided for an exhibition, both for your information and your criticism, of the provision we have made for the instruction of our men. You are well informed, no doubt, of the remarkable improvement that has come about in the course of twenty-five years in the handling and instruction of every class of railroad employee. When I first threw gravel from a flat car, I was just as likely as any other man to be employed the next day in running an engine, for the business of railroading in those days required no other equipment than strength and adaptability. The same hand that built the fire held the throttle, and if a man applying for work claimed to be experienced, it meant that he was a brakeman, a fireman, an engineer and a conductor, all in one, and his word was generally taken for it all. To-day the employees of a great railroad are highly classified and I am proud to say that among street railroads, at least, my corporation has lead the way in all that pertains to the care, instruction and development of its men. Nobody gets a job in our business nowadays simply because he has provided himself with influence. The action and reaction of corporate employer upon corporate employee has taught both of them many useful lessons. It is no longer possible for a large employer of labor to pay or promote his men entirely as he pleases. The rule of seniority will be invoked, and in response to its operation it is necessary for him to exact of them the attainment of a certain standard of efficiency, and their retirement from the service when their capacities fall below the necessary point of skill. They will not endure the competition of the superannuated, and the employer will not endure the service of the incompetent. Consequently, for the betterment of all, the men must adjust themselves to periods of service, to promotions only after careful examination, and that the consequences of these rigid general rules may not fall too heavily upon age and infirmity, we have provided in our organization a pension system that secures to old age and long and faithful service a safe lodge against the winter of its disability.

At the base of this organization is the school of instruction. As its methods are disclosed to you by practical examples you

will see the extent to which our experience justifies us in going in the attempt to turn that class of ability which is sufficient for a motorman and a conductor into the ability of an artisan and mechanic. We aim to do as well for him in this respect as his work on the car requires, and the point that you must bear in mind is that you must adapt your devices, appliances and machines to that class of ability and that degree of training. Nothing the use of which requires of him greater ability or higher training can be useful in a street car. The motor that he runs must not be complicated to an extent beyond which his mind and his hand can go in its management. The repairs that it requires must be limited to his capacity and to the few minutes of time that he can be allowed for making them. The machine not only must be accessible to you for the renewal of its parts, but accessible to him, and this fact should be present in your minds at all stages of your work,—that any single element the use and control of which are beyond the ability of this class of labor with the amount of preliminary training that practical conditions enable us to give and the men to take, is an element that detracts from its value.

It is the characteristic weakness of an expert to exaggerate the importance of his line of work to the industry with which he is connected. No established industry can afford to spend more than a certain fixed proportion of its earnings upon improvements and betterments. It must pay its fixed charges, maintain its dividends and store up something in its surplus, and whatever it spends for betterments, whether by the use of what remains after all this has been done or by an issue of new securities, must be done with an eye carefully fixed upon its earning capacity. The expert, whether an electrical engineer or other specialist, is rarely willing to concede this condition of things, and the more absorbed he is in his own line of investigation the more unwilling he becomes to admit that anything else counts. When, therefore, he ascertains that of the all too insufficient sum that can be applied to improved methods, some must go in one direction and some in another, and that the amount that is left for him to work on is but a fraction of the insufficient whole, his dismay not infrequently takes the form of a fit. He has been trained, moreover, in institutions where experiment is a part of the business, and when he goes into the service of an established industry, or undertakes work for the advantage of such an industry, he is slow to adjust himself to the fact that it has no funds for experiment. No small part of the discouragement which awaits the specialist as soon as he leaves that occupation in which his specialty is the sole aim and business, to employ his talents and training for the benefit of an industry in which his specialty is merely a feature, arises out of this circumstance, and he must quickly learn the great art of making bricks without straw. He will find his consolation in the fact that that is the only way good bricks are ever made; that the man who can only produce when the conditions of production are perfect rarely produces anything worth while; and that the valuable things of life almost invariably come by easy and natural stages from one good and successful thing to another that is better and more successful, from one valuable improvement to another that is better still, and that the perfect has never been reached, but is always further on. His opportunity is limited, therefore, not by what has been accomplished, but only by the inevitably insufficient means with which he must work. He has accomplished his greatest triumph when he has adjusted himself to this fact.

So swift has been the advancement in your science that there always exists the great practical danger of your getting too far ahead, commercially speaking, of the operator. If I were to go to a manufacturer of a locomotive and say that I wanted ten of his machines and wanted them to attain a certain standard and be able to perform a certain work, and when I had them a couple of months in operation, and, having ascertained that they were not perfectly adapted to my other stock, upon

complaint to the manufacturer were to be told, "That locomotive is two months old; what you want is our new locomotive; you must throw all those two-month's old locomotives away and buy our new and perfect machine," I should feel that I was being pretty badly imposed upon. This, however, is a common experience in dealing with electrical engineers and manufacturers of electrical apparatus.

It is no unusual experience for us to buy and install a very expensive electrical device, to discover that it does not work in perfect synchronism with other parts of the machine, or with other machinery necessary to be operated with it and to have it said to us, "Nothing ails this new motor; it is a good motor. What you want is a new governor; since we made that motor we have made some other new thing to go along with it; you must get that." And then before this other new thing has been in operation a week, still another and still a better thing has been devised or is claimed to be devised. There is great danger of your getting too far ahead of us. This may be all very well for the development of the science, but in a practical sense it is not well for you or for us. If you are going to make money at your profession, you must help us make money in our business. You must not forever be postponing the day when income begins to pay for investment. You must not be forever requiring one great investment on top of another until we have paid half a dozen times over for substantially the same service. You must keep the practical phase of every subject closely harmonious with experimental conditions.

The word "mysterious" is in frequent use whenever electricity is talked of; but when we consider how little we know about any great causation, it does not appear that we are much more deficient in our knowledge of the electric than of any other force. Perhaps, indeed, the use of such adjectives as "mysterious" refers to the state of mind which the amazing power of electricity produces coupled with the fact that only its effects are subject to visual examination. It is this circumstance probably that has so long delayed to science the knowledge of its characteristics. The way to exact knowledge was thereby rendered more difficult. But so well have you succeeded in overcoming these embarrassments that it is hardly an exaggeration to say that the habits, peculiarities, preferences and methods of the electric force are as well known to you to-day as those of any other. If this is so, the facility with which the practical application to commerce of its possibilities will now be ascertained is limited by nothing impossible to human apprehension that relates to the force itself. In other words, the difficulties you are now to encounter, in the present advanced stage of your science, in the practical use of the electric force, are similar in character to those that hinder your ingenuity in the effort to utilize each of the other forms in which power is manifested. I congratulate you upon the existence for the genius and ambition of the electrical engineer of so magnificent a field of possible achievement. Only its infinitude can give you dismay, and that has not long perplexed nor greatly thwarted the hand and mind of intelligent men.

I envy you these noble possibilities. I envy the inspiration with which they must exalt your courage and ambition. The release of mankind from war lords and superstitions and its engagement so general as to be fairly called universal in the grand business of making life comfortable, assures to you an appreciation in your work vastly greater than the student of applied science has ever enjoyed in the history of the world. You are doing things in the nick of time,—when opportunity and appreciation are both at their best.

To analyze the general organization of a large property involves a great amount of detail and statistics, and more time and patience than either you or I have to devote to such a task. As each one of the many departments has its own de-

tails of a more or less technical nature, it would require a special paper to be written on each department to give the specific value of each department and its relation to the general organization.

The points to which I have referred as bearing on the electrical engineer and his branch of the business, are just as applicable to the other departments of the general organization, whether it be executive, legal, financial, accounting or transportation.

The systematic working of the various department and preserving the proper relation to the executive department is in recognizing the necessity of strictly adhering to established policy for conducting the business. Satisfactory results can no more be obtained from the railroad organization with each or any of the departments conducting its business on the views that best suit the head of the department any more than a battle could be successfully waged with each captain fighting on his own "hook" without reference to the plans of the commanding general. Of course, there are times when emergencies demand quick action on the part of departmental heads, but there is no reason whatever when the emergency has passed why affairs should not at once be brought in line with managerial policy and method.

With well conducted policy and maintaining of standard methods, and with an authority equal to the responsibilities placed upon departmental chiefs, successful operation must follow. There are many avenues for expenditures and but one principal source of revenue. Efficiently organized, well conducted departments, each doing their share in furnishing thoroughly satisfactory and up-to-date service to meet the requirements of the traveling public, is the true measure of departmental success. Equipped with the best facilities that can be purchased, and safe and efficient mechanical and electrical appliances, all is then dependent upon the character of individual service rendered by each and every employee of a railroad company. No matter what the technical ability, experience and education is of a department head, unless he understands human nature and is capable of discrimination and good judgment in the selection and handling of employees he cannot successfully bear his share of the burden imposed.

If I can do you any service, it will be by leaving with you the idea with which I began. The world does not want to be pushed or jarred or thrown out of gear; it wants to be facilitated in the daily routine to which it has grown accustomed. It resents a shock; it is pleased with an accommodation. It pays for what it wants. It leaves the giver of what it does not want, though his benefaction be never so great, to the unsatisfying reward of private reflection.

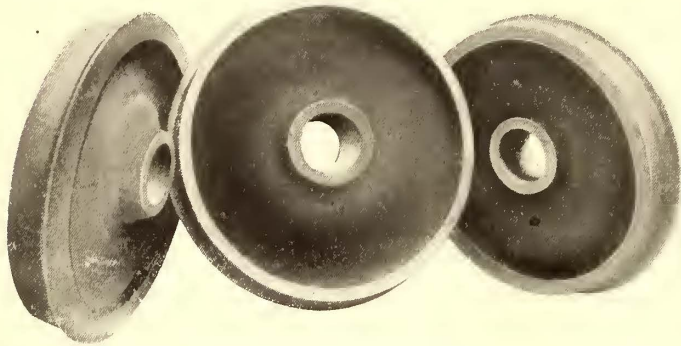
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IMPROVED SCHEDULE ON THE DETROIT, MONROE & TOLEDO SHORT LINE

The Detroit, Monroe & Toledo Short Line has announced a new schedule by which the time between Detroit to Toledo is reduced from three hours to two and a half hours. Later the company expects to put on limited cars, making the run in two hours. The Lake Shore Electric Railway, which connects with the Detroit, Monroe & Toledo Short Line at Toledo, has arranged to have its limited cars meet the Detroit cars on the loop in Toledo on the even hour. Through passengers and baggage are transferred without being taken to the Toledo station, as the limited cars are not due to arrive there until a quarter after the hour. This saves a layover of forty-five minutes in Toledo and makes the run of 178 miles from Cleveland to Detroit six and a half hours, instead of about eight hours, as heretofore. The new schedule is drawing a great deal of through trade, as the time is nearly as good as the steam road. The Detroit, Monroe & Toledo Company is planning to double-track the portion of its line from Monroe to Detroit.

THE SOLID FORGED AND ROLLED STEEL WHEEL FOR STREET RAILWAY SERVICE

Probably no one feature of the question of electric railway operation is of more interest and importance to operating men than that of the type of wheels to be used for the best results. With the rapidly increasing stress of service in all features of railway work, in the form of heavier rolling stock, faster schedules, etc., the demand has come for similar increases in strength in the wheels to properly carry the loads. It has long been evident that something stronger than the chilled cast-iron wheel should be used under electric cars, especially those oper-



THE NEW SOLID FORGED AND ROLLED STEEL WHEEL FOR STREET RAILWAY SERVICE

ated under high-speed conditions and upon tracks that are none too smooth or straight. The conditions under which electric car wheels are operated have too often been wrongly compared with those met by wheels under passenger cars in steam road service, which is manifestly incorrect; in the latter service, wheels are called upon to carry heavy weights in the car body carried through the truck springs, but in motor cars the wheels have to carry not only the heavy car body weights but also the uncushioned loads of the heavy motors themselves.

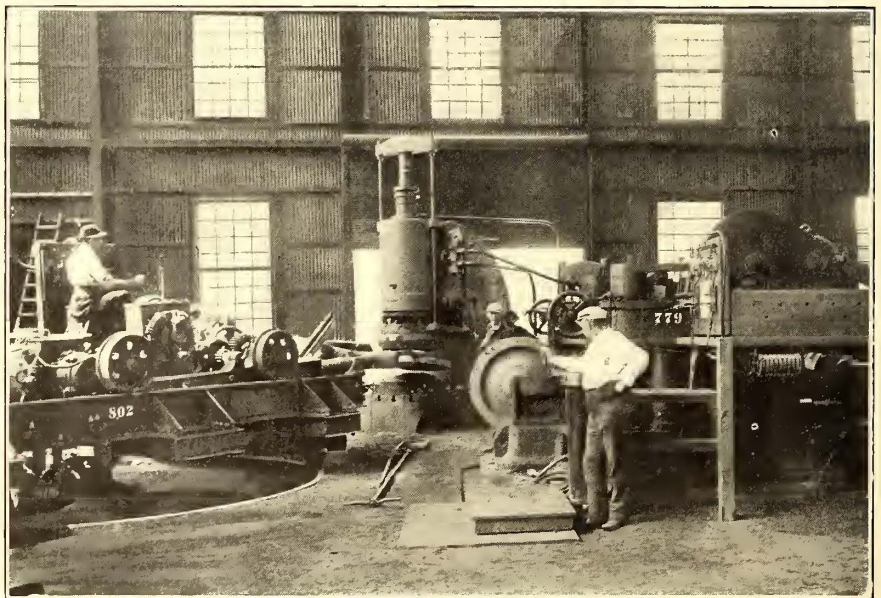
For satisfactory operation, wheels should, to meet the severe requirements of present conditions of electric railway operation, be absolutely unbreakable in any part and free from defects incident to manufacture; they should also have wearing surfaces of great density and solidity, and also be of the proper hardness to resist rapid wear. The various types of built-up wheels, having tires secured to separate centers made of cast iron, wrought iron or cast steel, have been very largely used in both steam and electric road service, and are giving very satisfactory results, filling in every respect the most rigorous specifications. Yet the development of street railways, the demand for a wheel of similar strength, but of a cost not so greatly exceeding that of the chilled cast-iron wheel, has arisen; the cost of the steel-tired wheel, while not absolutely prohibitive where safety requires its use, is still such as to cause a reluctance in applying it more generally to this so-called "light service."

Much interest has been centered in the recent perfection of the solid forged and rolled-steel wheel, which seems to embody every requisite demanded by the new condition. The following illustrations present interesting details of the manufacture of the new solid forged steel wheel which the Standard Steel Works, Philadelphia, Pa., have recently placed upon the market. This company has long been well known as one of the successful builders of steel-tired wheels, its wheel of that type having been used in all classes of railroad service with

the most satisfactory results. In the aim, however, to still further extend the use of higher quality wheels, it has made experiments along the line of the solid formed wheel, and has succeeded in producing one the cost of which will compare so favorably with that of the chilled-iron wheel as to make its more general use practically a certainty.

In the manufacture of this new type of wheel, the whole wheel is treated with as much care and forged as thoroughly as a tire bloom, and is subsequently rolled to the required form and size, which so increases the strength of the hub and web that a much lighter design is permissible, reducing largely the weight in comparison with steel-tired wheels. The steel used in the manufacture of these wheels is made from the acid open hearth, of composition similar to that used for steel tires of medium grade of hardness—that is, from .60 to .65 carbon. The method of manufacture has, however, appeared to increase the density of structure of the steel so as to give better wearing qualities than would the steel tires of the same chemical composition. In the process of manufacture great precautions are taken in the selection of the billets, which will enable wheels of a maximum soundness to be produced. The billets from which the wheels are rolled are cut from long vertically-poured ingots, the bottom sections only being used; the top of the ingot which contains the piping and segregation is discarded, nothing being used except billets cut from the solid part, so as to insure perfectly solid and homogeneous construction. This is one of the strong features of this steel wheel, in that it obviates the possibility of defects and hidden weaknesses which exist in wheels made in any other way.

The billets are first forged under a 5000-ton hydraulic press into wheel blanks of suitable size for the final rolling. They are then rolled to shape in a specially designed rolling mill, by which they are subjected to great pressure simultaneously with



MACHINERY USED IN THE MANUFACTURE OF THE SOLID FORGED AND ROLLED STEEL WHEELS, INCLUDING ROLLING MACHINE, SHAPING PRESS AND MANIPULATOR

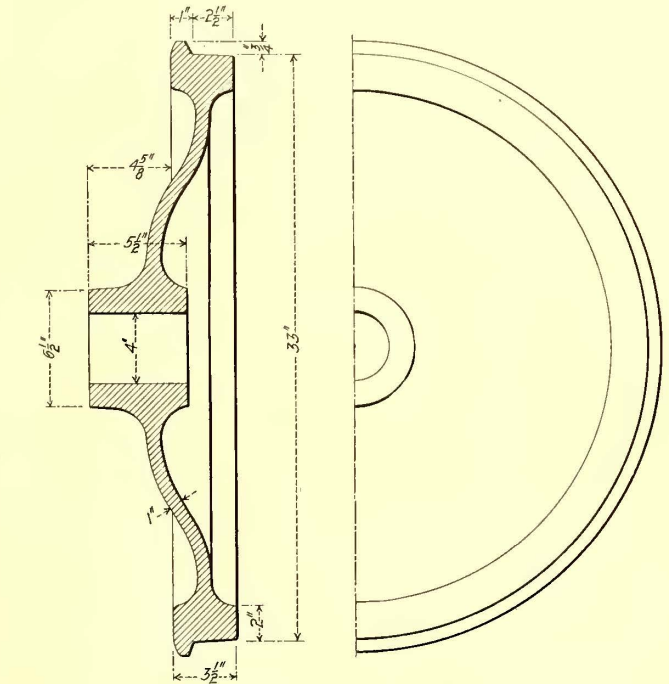
the rolling, so as to produce the finest possible structure in the steel; this rolling machine is shown to the right in the shop view presented herewith. Next the curve in the web of the wheel is shaped in the 500-ton hydraulic press shown at the left of the accompanying shop view. The electric manipulating machine, by which the hot ingots are handled, is also shown to the left of the press in the same view; a heated wheel blank is shown just being lifted by it off of the shaping die. After carefully cooling, the wheels are finished by boring and machining, the latter process consisting of facing the hubs and rims and truing the treads to exact diameter.

Many chemical and physical examinations have been made of the wheel as manufactured in this manner, in order to determine the degree of homogeneity of the steel in all parts; the results have been very gratifying, indicating that the work done on the billets by the 5000-ton press, and subsequently in the rolling mill, produces material of remarkable density and solidity. The accompanying table is of interest in indicating the results of both chemical analyses and physical tests upon specimens taken from various parts of a representative sample wheel.

In another view are shown radial sections from the solid rolled wheel, upon which the above noted tests were made, which have been subjected to bending and distortion tests. These tests were made cold, the sections receiving no treatment of any kind after being cut from the wheel; the wheel itself, of course, in no case received any heat treatment after the rolling process. The results indicated are excellent proof of the character of the material put in the wheels and the efficiency of this process of forging and rolling in improving the structure of the steel. It seems to result in providing exactly the character of wheel material that wheels should have to best withstand the very severe service met under modern operating conditions.

The result is a wheel embodying lightness, strength and durability—three very important requisites. It is believed that these wheels are especially adapted for all classes of electric railway service, not only interurban but also for city lines, particularly under the heavier double-truck cars. It is being tried by many companies and is proving satisfactory in all cases. The accompanying illustration shows the details of the solid rolled wheel which has been manufactured by the Standard Steel Works for the Hartford Street Railway Company, Hart-

ford, Conn., as was referred to in detail upon pages 107-8 of the Jan. 21 issue of this journal; a number of these new solid rolled wheels have been placed in service at Hartford, under both city and interurban operating conditions, and the results will be watched with much interest.



DETAILS OF THE SOLID FORGED AND ROLLED STEEL WHEEL AS USED BY THE HARTFORD STREET RAILWAY COMPANY

CHEMICAL ANALYSES.

Specimen Tested.	Carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.
From Flange of Wheel.	.610	.268	.043	.87	.050
“ Tread “	.614	.268	.042	.90	.048
“ Face “	.620	.267	.041	.86	.052
“ Rim “	.614	.270	.042	.91	.052
“ Plate “	.602	.265	.043	.89	.051
“ Hub “	.608	.265	.042	.86	.048

PHYSICAL TESTS.

Specimen Tested.	Size of Specimen.	Elastic Limit.	Ultimate Strength.	Elongation.	Reduction of Area.
From Flange of Wheel.	2" x .619"	50300	126600	12.0%	19.0%
“ Tread “	2" x .619"	50600	124600	10.0%	12.0%
“ Face “	2" x .619"	52600	121000	10.0%	13.0%
“ Rim “	2" x .619"	52000	121300	12.0%	16.3%



THIN RADIAL SECTIONS OF THE SOLID-STEEL WHEELS, SHOWING HOMOGENEITY AND REMARKABLE STRENGTH UNDER PHYSICAL TEST

ford, Conn., as was referred to in detail upon pages 107-8 of the Jan. 21 issue of this journal; a number of these new solid rolled wheels have been placed in service at Hartford, under both city and interurban operating conditions, and the results will be watched with much interest.

Inasmuch as the solid forged type of steel wheel should outlast four or five chilled-iron wheels in actual service, its econ-

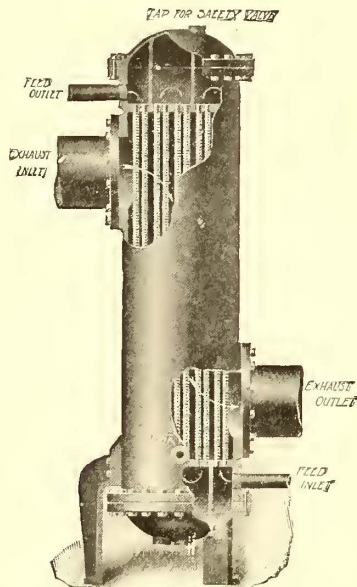
omy over the use of the iron wheel will be evident; also an additional economy should be taken note of in the form of the greater security of the steel wheel over that of the chilled-iron wheel while in service, which feature is one of inestimable value. Furthermore, this type of wheel, which, as used at Hartford, weighs about 425 lbs., while considerably more expensive than the chilled-iron wheel, costs very much less than the complete steel-tired wheel. The steel wheel involves, by virtue of its construction, the certainty of maximum soundness and ability to withstand all classes of service with absolutely definite results. Its use offers many inducements to electric railway operating men, particularly in view of the present heavy equipment and fast running in suburban service, which demands a better quality of wheel than those of the chilled cast-iron type.

At a recent meeting of the stockholders of the Guatemala Street Railway Company it was decided to change the system of traction from mules to electricity. Water-power up to 600 hp will be developed and transmitted some 8 miles. The company is now operating 10 miles of track. An additional 5 miles will be added. L. E. Allen, of San Jose, Costa Rica, has been appointed engineer of the company, and will have charge of the work.

The Lake Shore (steam) has completed a spur between Elyria and Lorain, and is going after the local business heretofore held by the electric lines, by operating passenger trains between the towns morning and evening at a 5-cent fare.

A NEW FORM OF EVEN-FLOW FEED-WATER HEATER

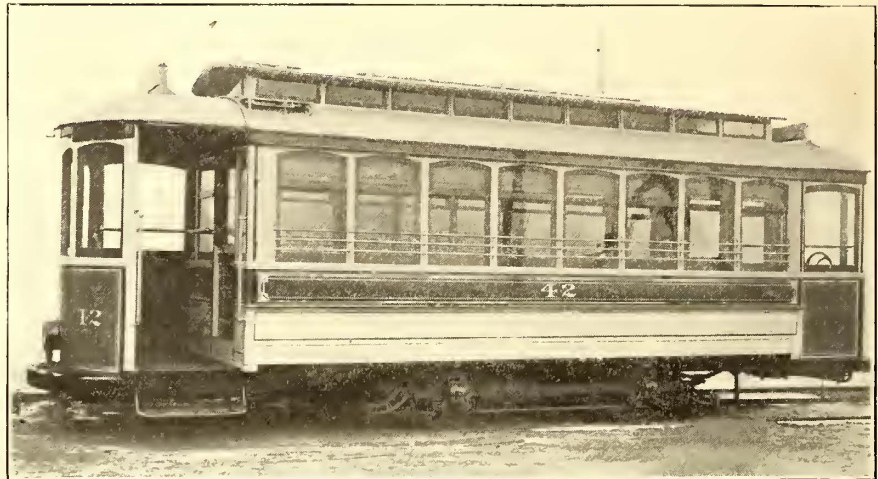
The Taunton Locomotive Manufacturing Company, of Taunton, Mass., has recently brought out its "K" schedule Wainwright even-flow water-tube heater. This later type preserves all of the valuable features possessed by the company's well-known "B" schedule heater, and, in addition, contains new and equally valuable features of its own. No reduction has been



PART SECTIONAL VIEW OF EVEN-FLOW FEED-WATER HEATER

NEW CARS FOR DECATUR

Two closed cars like the one illustrated have lately been delivered to the Decatur Railway & Light Company by the American Car Company. As the cars are to be run in one direction, entrances are provided at only one side of the vestibules, and semi-accelerator doors of the Brownell type are used. The cars are transversely seated with a capacity of thirty-two. At the forward right-hand corner and the rear left-hand corner the transverse seats are arranged to hold three passengers, while in the opposite corners the seats are for one passenger. Thus the seating arrangement does not interfere in the slightest



DOUBLE-VESTIBULE SINGLE-TRUCK CAR FOR THE DECATUR RAILWAY & LIGHT COMPANY

made in the amount of heating surface per horse-power in the "K" schedule, but 1-in. tubes are used instead of 1½-in. tubes.

The tubes are divided into groups and the water sent back and forth several times through the heater, but in dividing the tubes an odd number of divisions has been made, making it possible to put the feed inlet at the bottom of the heater and the outlet at the top. This arrangement has also made it possible to arrange the exhaust openings so that the cold entering water meets the partially cold outgoing steam, while the heated water just as it leaves the heater receives the full benefit of the entering exhaust. Not only are the tubes separated into groups and the water caused to flow back and forth seven times through the heater, but when conditions justify this arrangement partitions are put in the steam chamber and the steam made to travel back and forth through the shell, securing in this way a double counter-current and multi-flow effect.

The change in size of tubes from 1½ ins. in the "B" schedule to 1 in. in the "K" schedule has increased the efficiency of the heater by breaking the water up into smaller columns, and has increased the value of the heater for use with bad water by increasing the scouring and cleaning effect in the tubes.

Although the velocity of flow is much larger than in ordinary heaters, it does not even approach a velocity which produces friction enough to offer any objectionable feature. This point has received very careful consideration, and has resulted in securing a velocity high enough to produce enormous heat transmission and at the same time have no more friction than is encountered in the feed-pipe itself. The use of smaller tubes allows more heating surface in a shell of small diameter. The heaters therefore, though apparently small in size per horse-power, are large in power and heating capacity. They are made in both the vertical and horizontal types.

The Columbus, Delaware & Marion Railway is planning to place limited cars between Columbus and Marion, making practically the same time as the parallel steam trains.

with the semi-accelerator doors, and, as will be seen from the illustration, these doors, situated right at the step where the way in and out is clear, greatly facilitate the movement of passengers. The platform passengers are also as comfortable as men can stand together without being continually disturbed by passengers getting on and off.

The lower sashes are arranged to drop into pockets in the



SEATING ARRANGEMENT OF DECATUR CARS, WITH SEMI-ACCELERATOR DOOR

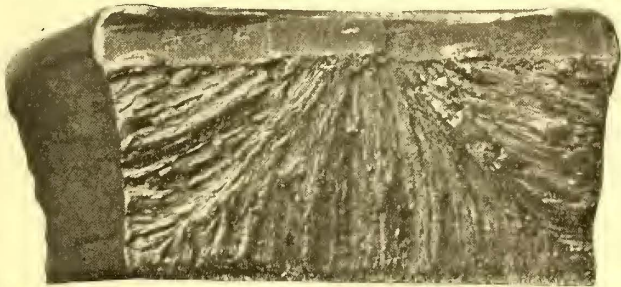
side walls, the openings being closed with hinged covers and the upper sashes are stationary. Three-bar bronze rails extend from corner post to corner post. The grab handles attached to the seats are found to be a decided improvement over the old method of strap hanging. The interiors of the cars are finished in cherry, with bronze trimmings, and the ceilings are green, with gold decorations. The furnishings include Brill sand boxes, "Dedenda" gongs, angle-iron bumpers, steps and tilting seats.

The general dimensions are: Length over the end panels, 20 ft. 8 ins., and over the outside vestibule sheathing, 30 ft. 1 in.; from the panel over the vestibule sheathing, 4 ft. 8½ ins.; width over the sills, including the panels, 8 ft. 1 in.; width over the posts at the belt, 8 ft. 3½ ins.; sweep of the posts, 1¾ ins.; distance between the centers of the posts, 2 ft. 5 ins.; side sill size, 4 ins. x 7 ins.; end sill size, 4 ins. x 7 ins.; sill plates, ½ in. x 7 ins.; thickness of corner posts, 3¾ ins.; thickness of the side posts, 2¾ ins.; length of the seats, 35 ins.; width of aisle, 20 ins.; height of the steps, 15⅞ ins.; height of risers, 14 ins.

A NOVEL ANTI-FRICTION METAL

An interesting feature in the line of anti-friction metals, and something which is said to be entirely new, is shown in the accompanying illustration. The particular point of interest lies in the peculiarity of crystallization, and forms the chief basis of the claims of superiority which are made by its producers. The cut represents a piece of metal which has been nicked on one side and after being placed in a vise has been broken off by a sharp blow from a heavy hammer. This operation reveals a fibrous, stringy mass; the crystals, it will be seen, extend perpendicular to the chilling surfaces. The alloy is of tin and aluminum base, and a remarkable characteristic is that these fibres always radiate from the chilling surfaces, regardless of the number of times reheated, thereby presenting the ends and not the sides of the fibre to the sliding friction surface.

It is well known that in the case of wood and of wrought iron, the surface exposing the ends of the fibre will stand a greater amount of crushing weight and wear than the sides of



PIECE OF ANTI-FRICTION METAL, BROKEN BY HAMMER

the material. The metallurgist who produced this combination worked for this principle in an alloy.

To prove the soundness of the theory of resistance to wear the composition was given many severe tests which were, in all instances, gratifying. Its great toughness and malleability combined permits it to withstand the most severe shocks without becoming brittle or "crystallized." A close examination of the fractured metal shows it to be of so fine and smooth a texture, with no granular matter intervening, that it may be said to be a true chemical compound.

Users of anti-friction metals always experience difficulty in remelting and using them over, owing to the grosser metals—those which melt at the lowest point—volatilizing and escaping, which leaves the composition harder with each pouring. The producers of this metal say they have entirely overcome this, and that by a perfect combination of metals they have secured an alloy which, it might be said, has produced not a new composition, but an entirely new metal in itself that will admit of remelting an indefinite number of times without becoming hard or harsh or losing any of its original properties. The characteristics of this metal should make it particularly desirable for use in linings of driving box and engine truck brasses, eccentric straps, cross-head gibs, steam and gas engine bearings, ships' bearings and other high-speed machinery.

The Buda Foundry & Manufacturing Company, of Chicago, will place this metal on the market, together with some new

bronzes and a copper-steel composition. This departure on the part of the Buda Foundry & Manufacturing Company, whose former output has been largely confined to track supplies, will in the future be made an important branch of its increasing business, though it will not in any way interfere with its railroad specialties. The company was attracted to these metals by the exceptional merits which they possess, and after thorough tests became convinced that it had something which would be an agreeable surprise to users of anti-friction alloys.

ADJUSTABLE WEDGE GATE-VALVE AND CUSHIONED NON-RETURN VALVES

In designing a steam plant too much care cannot be given to the arrangement and quality of the steam piping. This branch of power station work has become in fact a specialty in itself, which development has naturally resulted in bringing about many improvements. As the Best Manufacturing Company is

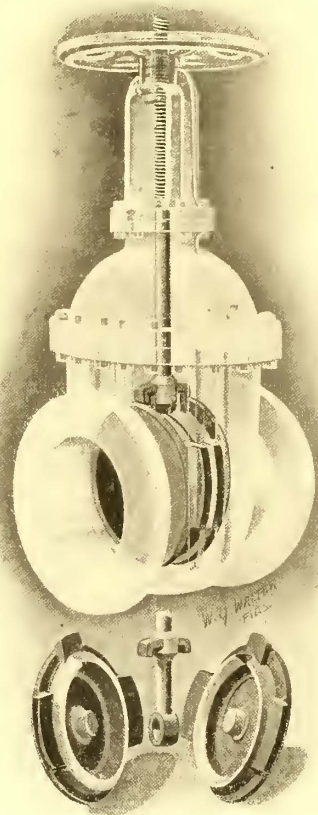


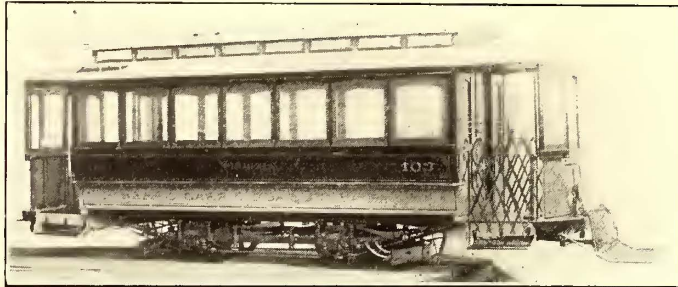
FIG. 1.—ADJUSTABLE WEDGE GATE VALVE

a firm which has accomplished a great deal in this line, having furnished its products to a number of the most important installations in the world, a description of some of its steam plant apparatus should offer interesting points for consideration.

The accompanying transparent view, Fig. 1, of the adjustable wedge gate valve shows the wedge in the same form as the solid taper wedge, except that it is in two parts, there being a ball joint on the inner surfaces the entire circumference of the wedges. This arrangement permits a positive and absolutely adjustable seating, which also insures the taking up of the wear. The renewable feature makes the valve very durable. Rails or guides are cast in the body on either side, and wings are cast on either side of the wedges, which fit inside of the guards or rails in the body, to forbid any possibility of the valve becoming disarranged. Wings are also cast on the top edge of the wedges and a collar with guides cast on the spindle as a factor of safety. Adjustable wedge gate valves of this type are so constructed that they have no more parts than a solid taper

wedge gate. The wedges have bronze facings. Even the bronze seats are screwed up in such a manner as to leave no pockets in the rear for the water and steam to attack the threads. The correct mechanical construction of these valves makes them especially fitted for all classes of service.

Fig. 2 shows the Anderson cushioned non-return valve, which fills a vital point in the general piping system of steam power plants. When valves of this type are placed between the boilers and header they equalize the pressure between the different units of a battery of boilers because they remain closed as long



AN INTERESTING CAR FOR A SOUTH AMERICAN RAILWAY

as the boiler pressure is lower than that of the header. When the boiler and header pressures are equal, the valves open and remain in that position without chattering or hammering, on account of the dash-pot arrangement for cushioning these valves. They will cut off a boiler automatically in case of an

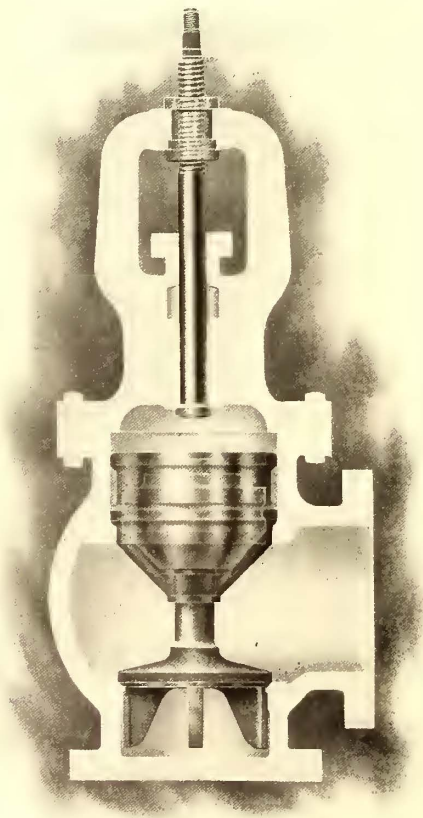


FIG. 2.—CUSHIONED NON-RETURN VALVE

accident to the latter, such as the bursting of a tube, and they will also act as a safety stop to prevent the turning on of steam into a cold boiler. Fig. 3 shows the Anderson cushioned combination non-return valve, which has the same vital points as the one shown in Fig. 2, except with the additional feature that the valve can be opened and held in that position if desired simply by operating the auxiliary hand wheel.

AMERICAN CARS FOR LA PAZ, BOLIVIA

The J. G. Brill Company has recently shipped to the Ferrocarril Guaqui a La Paz, Bolivia, a number of single-truck closed cars. These cars are for use at La Paz, a city in the central western part of Bolivia, having 80,000 inhabitants, and situated in a deep valley, and yet 12,000 ft. above sea level. It is worthy of note that the cars are transferred seven times before reaching their destination, their route being from Philadelphia to New York, from New York to Colon, from Colon to Panama, from Panama to Mollendo, from Mollendo to Puno, at Puno put on board steamer on Lake Titicaca, which is the largest lake in South America—155 miles long—and whose surface is 12,200 ft. above sea level, making it the highest lake in the world upon which there is steam navigation, and at Chililaya the cars are again put aboard steam cars, and from there go direct to La Paz. The cars are shipped in sections, but so simple is their construction that they can easily be put together at Bolivia without the builder's assistance.

No. 21-E trucks are used, the company already having in use trucks of this type which are giving excellent satisfaction. The seats are of spring cane, and are longitudinally placed. Wall pockets are provided, into which the sashes may be dropped. The cars are 20 ft. long over the end panels, and over the crown pieces, 28 ft.; panel over the crown piece, 4 ft.; width over the sills, 6 ft. 2 ins., and over the posts at the belt, 7 ft. 6 ins.; sweep of the posts, 8 ins.; side sill size, $3\frac{3}{4}$ ins. x $5\frac{3}{4}$ ins.; end sill size, $4\frac{1}{2}$ ins. x $5\frac{1}{2}$ ins.; thickness of the cor-

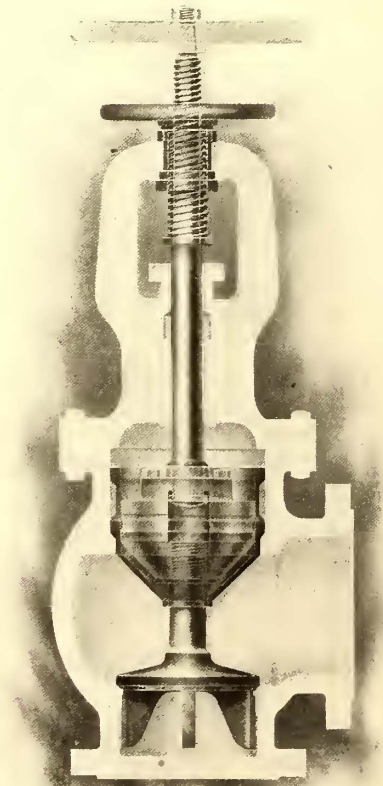


FIG. 3.—CUSHIONED NON-RETURN VALVE WITH AUXILIARY HAND WHEEL

ner post, $3\frac{3}{4}$ ins.; thickness of side post, $1\frac{3}{4}$ ins. The 21-E trucks have 4-in. axles and 33-in. wheels. The cars are finished in cherry, with bronze trimmings, and the ceilings are alternately poplar and linwood, stained. Among the builder's specialties with which the cars are equipped are angle-iron bumpers, radial draw-bars, "Dedenda" gongs and folding gates.

FINANCIAL INTELLIGENCE

WALL STREET, February 21, 1905.

The Money Market

There were no important changes in the local money market this week. The tone was somewhat harder, but there was an ample supply of funds for all maturities at near the recently quoted rates. The inquiry for funds was confined largely to the call loan department, which was fairly active throughout at rates ranging from $1\frac{3}{4}$ to $2\frac{1}{2}$ per cent, borrowers generally being disposed to take advantage of the continued ease in this department rather than to pay the higher rates asked by the banks and individual lenders for time accommodations. Consequently, the volume of business in time contracts was extremely light. The demand was principally for small amounts, but at the same time there was no disposition on the part of lenders to press their funds upon the market. The belief prevails in local banking circles that better returns will obtain for money in the near future, this belief being evidently based upon the fact that within the next fortnight the receipts of currency from the interior will show a material falling off as a result of the opening up of the spring trade. That preparations are already making at the interior to take care of this demand is shown by the fact that in the week ending February 17 the receipts of currency by the local institutions decreased \$1,750,000, as compared with the preceding week, while the shipments by the same institutions were about \$500,000 larger. The weakness in sterling exchange noted at the close of last week has continued during the present week, prime demand bills declining 65 points in the local market, while the price of sterling at Paris has advanced fractionally. This eliminates, at least for the present, all possibility of a resumption of gold exports to Paris. The shipments of gold to Cuba are also likely to cease, the payment of the final instalment on account of the Cuban bonds having been practically completed. The bank statement was better than was generally expected. The loss in cash of \$4,436,000 was indicated by the reported movement of currency. Loans decreased \$6,094,000, due partly to liquidation, and deposits decreased \$10,416,400. The surplus reserve decreased \$1,832,500 to \$9,204,425, and compares with \$27,506,600 in the corresponding week last year, \$9,041,675 in 1903, \$12,456,650 in 1902, \$14,546,675 in 1901 and \$12,678,550 in 1900. At the close indications pointed to a firmer market in the near future. Besides the usual spring outflow of currency, the national banks will be required to pay into the national treasury about \$15,000,000 by March 15, most of which will probably be paid by the New York banks. Various railroad and municipal bond issues now pending will also have to be provided for. There was no material change in the discount rates at the leading European centers, except at Berlin, where the open market rate advanced from $1\frac{1}{2}$ per cent a week ago to $2\frac{1}{8}$ per cent.

The Stock Market

Greater activity and breadth developed in the local securities market this week, and although prices showed more or less irregularity, the general tone was decidedly strong. The opening was substantially higher, but toward the close of last week the market became unsettled. The news from Washington was to the effect that the prospects were more favorable to the proposed railroad rate legislation, which, together with the developments at St. Petersburg, caused considerable selling both for local and foreign account, and which carried prices down sharply. On Saturday, however, the upward movement was renewed, and prices for many issues more than recovered the earlier losses. There was no unfavorable news developments over Sunday, and at the beginning of the present week prices were lifted to a much higher level. It was evident that stronger interests had taken hold of the market, and despite of a hardening in local money market, prices moved up with comparative ease. Interest centered largely in Union Pacific and Northern Securities on the "curb," both of which established new high records. Other stocks to make new high records were Ontario & Western, which rose several points on reports that the New York & New Haven's holdings in the company were to be acquired by the New York Central. Southern Pacific was also conspicuously strong. Other noteworthy strong features were Reading and the other coal stocks; the Southern iron and steel issues, which advanced sharply on rumor of a consolidation of the various companies; National Lead, American Smelter and a number of the prominent stocks. The bond market

was active and strong, the overshadowing feature being the Union Pacific convertibles, which made a new high record, and the Japanese 6s, and United States Steel Corporation sinking fund 5s.

The local traction issues were practically neglected, but prices held fairly steady.

Philadelphia

Increased activity developed in the local traction issues this week, and, although prices displayed more or less irregularity, the general tendency or values was toward a higher level. Interest shifted to the stocks of the Philadelphia Company, both of which made new high records for the present movement on unusually heavy transactions. The common opened around $42\frac{3}{4}$ and rose to $44\frac{3}{4}$, while the preferred stock moved from $46\frac{3}{4}$ to $48\frac{1}{8}$. The advance in both issues was attributed to buying for the account of a local pool. In the final dealings there were fractional reactions. About 30,000 shares of the common and about 4000 shares of the preferred were dealt in. Persistent rumors of a "deal" of some sort were largely responsible for the activity and strength displayed by Philadelphia Rapid Transit. In the early dealings realizing developed which carried the price from $28\frac{7}{8}$ to $27\frac{1}{2}$, but toward the close there was a sharp advance to $29\frac{7}{8}$ on extremely heavy buying. Total transactions in the stock aggregated about 29,000 shares. United Gas & Improvement was considerably less active than a week ago, and the price displayed a drooping tendency throughout. On sales of about 12,000 shares, there was a gradual decline from $114\frac{7}{8}$ to $113\frac{3}{8}$, a net loss for the week of about $\frac{1}{2}$ point. In the other issues the dealings were comparatively small, and prices showed no material change from those ruling at the close of a week ago. Philadelphia Traction moved between $100\frac{1}{2}$ and 101, while Union Traction sold in small amounts at 59 to $58\frac{7}{8}$. Consolidated Traction of New Jersey brought 82, and United of New Jersey brought $27\frac{1}{2}$ for 99 shares. Other sales included American Railways at 51 to $51\frac{1}{4}$, and Railways General at from $4\frac{3}{8}$ to $4\frac{7}{8}$ and back to $4\frac{1}{2}$.

Chicago

Little interest was manifest in the local traction stocks this week. Trading in them was extremely quiet, but prices generally held firm. Chicago Union Traction opened at $12\frac{3}{8}$ and declined to $11\frac{7}{8}$, but later, on very light purchases, there was a full recovery to the opening figure. North Chicago fluctuated between 97 and 99, closing at the latter figure, while small amounts of West Chicago brought 68. The elevated railroad stocks were also quiet. Metropolitan sold at 21 to $21\frac{1}{2}$, and \$10,000 of the extension 4 per cent bonds brought $90\frac{1}{4}$. Chicago & Oak Park common changed hands at $6\frac{7}{8}$. South Side brought 94 and 95.

Other Traction Securities

There was a very active market for street railway securities at Baltimore. Trading included a much larger number of issues, and prices generally were inclined to a higher level. Interest centered largely in the United Railway issues, especially the income bonds, which advanced nearly 3 per cent to $59\frac{3}{8}$, and closed at the highest. About \$1,000,000 of them were traded in. The buying was said to be for account of a local pool. The first 4s were also strong, upward of \$50,000 of them selling at prices ranging from $95\frac{3}{4}$ to $96\frac{1}{4}$. The stock advanced to $14\frac{1}{2}$ on rather light purchases. Other transactions included Macon Street Railway 5s at 99 to $99\frac{1}{2}$, City Passenger Railway 5s at $117\frac{1}{2}$, Washington City & Suburban 5s at $106\frac{1}{2}$ to 107, Norfolk Railway & Light 5s at $94\frac{1}{4}$, and Toledo Traction 5s at 102. The feature of the Boston market was the sharp advance in Boston & Worcester common and preferred on unusually heavy dealings. From $22\frac{1}{2}$ the common advanced to 27, a gain of 5 points, while the preferred moved up from 71 to 77. Massachusetts Electric common was unchanged at $13\frac{3}{2}$, but the preferred scored a substantial advance to $57\frac{1}{2}$, and closed at 57. West End stocks were both stronger, the common selling at from 96 to $96\frac{3}{4}$, and the preferred at 115. In the New York curb market Interborough Rapid Transit has continued the downward movement. The opening was unchanged at 215, but shortly afterwards the price dropped to 207. In the subsequent dealings there was an advance to 216, but at the close there was another drive against the stock, which carried the price off to $204\frac{1}{4}$, where it closed, a net loss for the week of $10\frac{3}{4}$ points. Other transactions included 3000 New Orleans Railway common at 3 to $3\frac{3}{8}$, 500 preferred at $12\frac{3}{4}$, United Railway of St. Louis preferred at 76, and \$20,000 Washington Railway & Electric at $87\frac{7}{8}$ to 88.

Security Quotations

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

	Feb. 15	Feb. 21
American Railways	50	50½
Aurora, Elgin & Chicago (preferred).....	—	—
Boston Elevated	*155	156
Brooklyn Rapid Transit.....	62¼	62¾
Buffalo Con. 5s.....	109½	109½
Buffalo Deb. 6s.....	104½	104½
Chicago City	198	198
Chicago Union Traction (common).....	11¾	11½
Chicago Union Traction (preferred).....	50	49
Cleveland Electric	83	83
Consolidated Traction of New Jersey.....	—	81½
Consolidated Traction of New Jersey 5s.....	110	110¼
Detroit United	78½	78½
Interborough Rapid Transit	217	209
Lake Street Elevated	—	—
Manhattan Railway	173¾	172¾
Massachusetts Electric Cos. (common).....	13½	13½
Massachusetts Electric Cos. (preferred).....	55	57
Metropolitan Elevated, Chicago (common).....	20½	20
Metropolitan Elevated, Chicago (preferred).....	60	63¾
Metropolitan Street	122½	120¾
Metropolitan Securities	81¾	80¾
New Orleans Railways (common).....	3	3¾
New Orleans Railways (preferred).....	12½	12½
New Orleans Railways, 4½s.....	a81	80½
North American	103¼	101
Northern Ohio Traction & Light.....	—	—
New Jersey Street Railway.....	22½	22½
Philadelphia Company (common).....	41¾	45¾
Philadelphia Rapid Transit	28½	30
Philadelphia Traction	100½	101
South Side Elevated (Chicago).....	94½	94
Third Avenue	132	131
Twin City, Minneapolis (common).....	105½	105½
Union Traction (Philadelphia).....	58¾	58¾
West End (common)	96	98
West End (preferred).....	115	a116

* Ex-div. a Asked.

Iron and Steel

The "Iron Age" says there has been a very heavy movement of pig iron in the Eastern markets. Steel makers in the Philadelphia district have bought fully 75,000 tons of basic pig at \$16 at furnace, deliveries in some cases to run well to the end of the year. Schuylkill Valley furnaces have also sold fully 25,000 tons of foundry iron in lots running up to 3000 tons. In the New York market a leading pump interest has purchased about 5000 tons, and other melters have bought. A large electrical company has taken some round blocks of foundry iron, Buffalo doing the bulk of the business. That producing center has also sold to a group of malleable foundries fully 25,000 tons of malleable Bessemer. In the Pittsburg district a large manufacturing concern has purchased 21,000 tons of foundry and forge iron, 8000 tons thereof from Southern makers on the basis of \$13.50, at Birmingham, and 13,000 tons at about \$15.75, at the Valley furnace. At other distributing centers the market is very firm. An interesting inquiry is for 21,000 tons of pig iron for the castings of another Hudson River tunnel. It is understood that the United States Steel Corporation is again testing the market for additional supplies, the tonnage needed being estimated at about 40,000 tons. Some large additional sales of steel rails have taken place. The Rock Island has contracted for 49,000 tons. Great Northern and Northern Pacific together 50,000 tons, and two Wisconsin lines 30,000 tons. Railroad Equipment Company has been booking quite heavily lately, and a good deal of additional business is in sight.

A DISCUSSION ON TECHNICAL JOURNALISM

At a meeting of the American Trade Press Association at the Hardware Club, New York City, on Feb. 17, Arthur Warren, manager of publicity for the Allis-Chalmers Company, delivered an interesting address entitled "A Plain Talk on Trade Journals." Mr. Warren is not only well versed in the subject discussed, but has established a high record himself as a successful newspaper editor, correspondent and contributor. He not only considered the technical and trade journal from many standpoints, but outlined the duties of a manager of publicity for a large company and the general principles of advertising. He did not hesitate to say that there were too many trade papers in the field, and too many special issues. It is constant, systematic advertising, not spasmodic, that brings results.

Mr. Warren pointed out the essential differences between ad-

vertising a soap or a breakfast food and that of pushing the sales, by advertising, of reciprocating engines, steam turbines, dynamos, motors, transformers, converters, controllers. The advertiser of the corset and the pill appeals to the world in the bulk, and to an unsophisticated audience. The industrial advertiser did not enjoy this advantage, but addressed his claims to an audience that is trained and experienced, and technically educated along the lines of the apparatus brought forward; and quite as likely to know as much about the wares advocated as the man advocating them. These facts made a remarkable differentiation, and constituted part of the problem of trade journal advertising. The technical press was none the less an educator, and Mr. Warren remarked that the editors of the technical and trade papers in America "yield as a body not an inch nor an ell in ability and influence and character to any body of professional men in any part of the world. They make your papers powerful and respected. Publishers, as well as other leaders of enterprise, civil, religious, military, are known by their lieutenants, by the company they keep. If it were not for your editors your advertisers would be fewer. The theory is that advertisers advertise in papers that men wish to read." As to elemental principles in the treatment of advertising, Mr. Warren contended that there should be absolutely no cutting of rates; that advertising business should not be handled through agencies, and that every advertiser should buy and handle his own advertising space, design his own advertisements and realize that a publicity department was as much a necessity as a drafting room or a foundry.

This brought Mr. Warren to the question of circulation. He said that circulation had been regarded as "one of the dim gods that men cherish in silence, but the time had come when the veil of the temple must be rent." He then described in detail the canvass that he had recently made of papers in which his concern advertised, requesting definite and specific information as to the figures of circulation. On the whole, the results were gratifying, although there had been instances of undue reticence. He was glad to note the fact that in the month of January three New York publishers of trade and technical journals—members of the association—were to be found publishing in seven of their journals statements of circulation. He thought that these figures might be carried one point further, namely, in making a distinction between copies printed and copies paid for. Their example at any rate was one which no publisher of good standing could afford to ignore, and the next step was one which he believed all members of that representative body could afford to make.

Mr. Warren brought a most admirable, interesting and suggestive address to a close by discussing the reading matter contained in technical papers, approving the development of the news features and pointing out ways in which even the ordinary descriptive article of a new appliance could be made instructive. It was impossible that the engineers of any great concern could write all the articles demanded of them, as they would then do little else, and he suggested, as an alternative, that the editors themselves or members of the editorial staff should be allowed to circulate more freely through the shops and factories, making observations at first hand and acquainting themselves for the benefit of their readers with what was going on. Some papers were conservative in this and other respects, but he did not believe that the technical press had yet developed the field of information. "There should be, and there can be a closer touch between the papers and the manufacturers. And that closer touch can be obtained without the loss of any independence on the part of the press. The papers that are not independent, the papers that are partisan and that curry favor, are the papers we don't want. The manufacturing concerns are sources of news. You want technical news, and perhaps other kinds of news. But very often, especially in regard to large undertakings, you do not get the information until it has lost its news value. There are reasons for that. Perhaps they will never be entirely overcome, because the manufacturer has not only to guard his own interests, but he has to guard the interest of his customer. When large investments are at stake the persons who are paying the money have the privilege of keeping their own counsel. You, as business men, can understand that clearly enough. And again, when the manufacturer is producing a new invention, he prefers silence until he has protected himself by patents, completed his tests and perhaps made a successful installation or two."

The street railway system of Para, Brazil, has been purchased by an English syndicate, and C. H. C. Moller, of the firm of Moller & Company, New Broad Street House, London E. C., who has been in Para as agent for the syndicate, left Jan. 30 for London with the documents perfecting the deal. According to the correspondent of the STREET RAILWAY JOURNAL in Para, it is too early yet to give the names of the contractors who will install a modern system of electric traction.

SUBWAY TERMINAL IN CINCINNATI

It has been announced that the company which for more than a year has been planning a subway in Cincinnati, presumably for telephone and lighting work, is in reality working on an extensive subway system and terminal station for the steam roads entering that city. The new company is known as the Union Terminal Railroad Company, and the plans under way call for an outlay of about \$10,000,000. It is the intention to build a subway from Broadway to a point east of Millcreek with a magnificent passenger station fronting on Court Street, and extending from Vine Street to Race Street, within a block of Fountain Square, the Court House and the City Hall. It is stated that all the roads entering Cincinnati have agreed to aid the proposition, and the announcement of the plans has just been precipitated by the election of W. H. Newman as president of the Big Four Railroad. This company is one of the important figures in the enterprise, and Mr. Newman has already given his assent to co-operate with the other roads.

For construction purposes the Passenger Terminal Construction Company will be formed. The president and general manager of this company will be George R. Scrugham, who is known in electric railway work as the promotor, builder, and, until recently, the president, of the Interurban Railway & Terminal Company, which operates one of the largest and most successful interurban systems in Ohio.

Mr. Scrugham informs the STREET RAILWAY JOURNAL that a large force of engineers is now at work on the proposition, and that it will be several months before the plans are completed. While this is a steam railway proposition, the question of using electricity in the subway is being seriously considered. This point will not, however, be decided for some time, and it is understood will depend to a large extent upon the success of electricity in the New York terminals of the New York Central.

WEST SHORE TO BE ELECTRIFIED BETWEEN FRANKFORT AND ILION

The Utica & Mohawk Valley Railway Company is planning to run its large interurban cars on the West Shore tracks between Frankfort and Iliion, because the trustees in these villages will not permit the company to build a double-track line through the main streets in order to make the complete distance from Rome to Little Falls, a distance of 37 miles, double instead of single track. The company has been trying for two years to get the franchise in Iliion. Two weeks ago a public meeting was held in the Iliion Opera House and the sentiment was against the movement; in fact, so strong was public opinion that at a subsequent meeting the trustees decided to vote down the proposition. The company is determined to have double tracks the entire length of its interurban line, and as it is merged with the New York Central interests, which control the West Shore, it has been decided to use the West Shore tracks between these two places, a distance of about five miles. The company will still continue to give local service in Iliion and Mohawk, but when the residents of either of these places want to reach other places in the interurban route, they will have to transfer.

The terminal of the company's double tracks in Frankfort is not far from the West Shore Railroad, and in order to reach the tracks of the latter company, a line will have to be built to connect the two. Permission will have to be obtained from the canal board to build an iron bridge across the Erie Canal, which lies between the two connections. The overhead trolley system will be used on the West Shore. When this work is completed, the running time between Utica and Little Falls will be one hour, instead of an hour and a half. The time to Rome from Utica will also be lessened.

General Manager Allen, of the Mohawk Valley Company, says that the electric schedule will be so arranged that the regular trains and the electric cars will not conflict.

**CHICAGO CITY RAILWAY STOCKHOLDERS' MEETING--
DIRECTORS ELECT OFFICERS**

The stockholders' meeting of the Chicago City Railway Company, which was held Feb. 16, 1905, was of much interest because of the recent purchase of that company by the new syndicate which proposes to consolidate all the street railways in Chicago. Resolutions were passed thanking the retiring president, D. G. Hamilton for his six years' service in the interest of the stockholders of the company. A new board of directors was elected representing the new owners. These directors, with their financial connection are as follows:

John A. Spoor, president of the Union Stock Yards & Transit Company and of the Chicago Junction Railway Company, and a director of the First National Bank; P. A. Valentine, of Armour & Company, director of the Chicago Junction Railway Company, the Union Stock Yards & Transit Company, the National City Bank, of New York, and the Continental National Bank, of Chicago; Robert M. Fair, of Marshall Field & Company; A. J. Earling, president of the Chicago, Milwaukee & St. Paul Railway, and a director of the Continental National Bank and Central Trust Company, of Chicago; Lawrence A. Young, vice-president of the Chicago City Railway Company; Edward Morris, of Nelson Morris & Company, packers; M. B. Starring, the president general manager of the Chicago Railway Company. It was announced after the meeting that at the directors' meeting Thomas E. Mitten, general manager of the International Traction Company, of Buffalo, would be elected first vice-president to take the active management of the road, a step of importance in the coming reconstruction of the system.

The stockholders further passed resolutions that immediate steps be taken without regard to future contingencies to re-establish the company in the confidence of the public, and that in order to attain this end, the directors of the company be instructed to begin at once a systematic and thorough investigation of the property and the affairs of the company, for the purpose of learning what steps must be taken to enable the company to provide ample and satisfactory accommodations for the public. The directors are further advised to put into effect such measures as will put the physical properties of the company into proper condition, without regard to expense, in order to furnish first class service.

If these resolutions are carried out it will mean that the company will not wait for a settlement of the franchise difficulties with the city before undertaking a thorough reconstruction. The following statistics were given as to income and traffic for the year 1904:

INCOME ACCOUNT		
	Dec. 31, 1904	Dec. 31, 1903
Earnings.		
From passengers	\$6,609,500	\$6,381,245
Other sources	59,478	54,319
Total	\$6,668,979	\$6,435,565
Operating expenses	4,802,120	4,648,341
Net earnings	\$1,866,859	\$1,787,224
Depreciation	120,000	100,000
Earnings on stock	\$1,746,859	\$1,687,224
Dividends	1,620,000	1,620,000
Surplus	126,859	67,224
Capital stock	\$18,000,000	\$18,000,000
	Dec. 31,	Dec. 31,
	1904,	1903,
Mileage—	miles.	miles.
Cable	34.75	34.75
Electric	184.20	183.96
Totals	218.95	218.71
Passengers carried—	Dec. 31, 1904	Dec. 31, 1903
Fare	132,852,717	128,304,445
Transfer	77,732,749	66,883,346
Totals	210,585,466	195,187,791
Car miles run—		
Cable	13,701,643	13,865,473
Horse	86,357	74,210
Electric	20,319,293	18,595,440
Totals	34,107,193	32,535,123

	Dec. 31,	Dec. 31,
	1904	1903
Per cent. expense to income.....	72.01	72.23
Per cent. increase traffic.....	7.88	16
Per cent. on stock.....	9.70	9.37
Per cent. transfer passengers to fare passen- gers	58.5	52.13

On Monday, Feb. 20, the directors organized by electing the following officers: Thomas E. Mitten, first vice-president; Lawrence A. Young, second vice-president; C. N. Duffy, secretary and auditor; T. C. Penington, treasurer; Mason B. Starring, general manager. No selection of a president was made, the syndicate not having decided who shall have the place.

AN EXTENSIVE RADIAL SYSTEM FOR TORONTO

Toronto railway interests, organized as the Toronto & York Radial Railway, are to build a series of radial lines extending from Toronto to aggregate 96 miles. These lines will extend from Toronto to Oakville, 20 miles; Toronto to Jackson's Point, 50 miles; Toronto to Whitby, 26 miles. The details for building are all being arranged so that construction can be begun as soon as the weather is favorable. W. H. Moore, the manager of the company, who also is assistant to the president of the Toronto Railway Company, informs the STREET RAILWAY JOURNAL that every effort will be made by the company to complete this vast system during the present year. The object in building the lines is to further the development of a most promising agricultural and industrial country. Especial attention will be given by the company to the development of freight, and the interests of shippers will be well conserved. Already freight terminal sights have been secured in several places through which the lines will operate. This plan will be followed until in each of the towns along the lines ample facilities are provided for expediting this particular service. In Montreal there will be several regular distributing stations, each of which will be supplemented by an elaborate wagon transfer system.

THE NEW YORK, WESTCHESTER & BOSTON COMPANY'S PLANS

The New York, Westchester & Boston Railway Company, which plans to build from New York City through Westchester County, has just announced that it has reached an understanding with August Belmont, president of the Interborough Rapid Transit Company, whereby a terminal station for the interchange of traffic between the subway and the Westchester lines will be erected at some point between One Hundred and Forty-Ninth Street and One Hundred and Seventieth Street, in New York. This arrangement will make the Westchester Railway practically an extension of the New York subway on the east side of the borough of the Bronx.

According to a statement made to the STREET RAILWAY JOURNAL by the company, ground will be broken as soon as the weather will permit, but the work of construction in New York City will be well under way before operations are begun in Westchester County. It is expected that the road will be in operation within two years.

In order to facilitate the interchange of traffic with the Interborough Company, the track and rolling stock of the Westchester Railway are to be electrically equipped similar to the elevated and the subway lines of the Interborough Company. The cars will be built of steel and fire-proof materials. Toilet rooms, lavatories and bundle racks are to be provided. Trains will include passenger, baggage and smoking cars, but the number of coaches to a train is yet to be decided.

The main line of the road as now projected will extend from One Hundred and Thirty-Eighth Street and Third Avenue, New York, to Portchester, a distance of about twenty-two miles. There will be a branch line from Pelham to White Plains, which will be 10.5 miles in length, and a branch to Clasons Point and Throgs Neck, 6 miles, four tracks to the city line and three tracks to the Connecticut State line, making a total of 117 miles. The line will be built over private right of way, fenced in for the entire distance. There will be no grade crossings on streets, highways, private roads or railroads. The rails used will weigh 90 lbs. to the yard. The bridges, culverts and crossings are to be of stone, concrete and steel construction; the stations along the line will be of similar build. Wherever possible, stations will be located between the tracks. An automatic electric block system similar to the one adopted in the Rapid Transit Subway will be used to protect the operation of cars.

As previously noted in the STREET RAILWAY JOURNAL, the general supervision of the construction of the road will be under the direction of Samuel Hunt, vice-president of the company, and one of the trustees for the city, of the Cincinnati Southern Railroad, who has had charge of construction work for the Missouri Pacific and other railroads. The engineering staff of the company, as previously noted in these columns, is composed of William A. Pratt, chief engineer; William Barclay Parsons and John Bogart, consulting engineers. Several engineering corps are now in the field perfecting the preliminary surveys that were made last year.

The ordinance giving the company the right to build in New York requires the company to carry passengers between all stations within the city limits for a uniform rate of five cents. The fares outside the city limits will be considerably lower than those charged by the steam railroads for the same distance.

A new board of directors of the company has been elected as follows: William Lanman Bull, of Edward Sweet & Company,

New York; Evans B. Dick, of Dick Brothers & Company, New York; Samuel Hunt, president of Detroit Southern Railway Company, Cincinnati, Ohio; Charles E. Lewis, New York City; John R. McAllister, president Franklin National Bank, Philadelphia; William Barclay Parsons, engineer, New York; Robert C. Pruyn, president National Commercial Bank, of Albany, and chairman of the United Traction Company, of Albany; Charles Pryer, New Rochelle; Robert E. Robinson, of Dick & Robinson, New York; Frederick E. Whitridge, New York, director Cincinnati & Northern Railway, Lake Erie & Western Railroad; William H. Buckley, attorney, New York City. Mr. Bull will continue as president of the company; Samuel Hunt, as vice-president, and H. Carroll Winchester, as secretary and treasurer. At the next meeting of the board of directors, which will be held on Thursday, Feb. 23, the representatives of certain traction interests will be elected to the board of directors of the Westchester Company. These will include Andrew Freedman, a director of the Interborough Rapid Transit Company.

THE APPEYARD SITUATION

Attorney-General Mayer, of New York, last week made public the report of Tracey C. Becker, of Buffalo, who, as special deputy attorney-general, investigated the insolvency of the German Bank of Buffalo.

The bank, according to the report of Mr. Becker, passed into the control of Arthur E. Appleyard, of Boston, on April 30, 1904. Mr. Appleyard then acquired \$51,000 of the capital stock of the institution, purchasing it in the name of Richard Emory, an employee, who immediately transferred it to Mr. Appleyard.

Almost immediately after buying the German bank stock Mr. Appleyard is said to have borrowed money in large amounts from the bank. It is alleged that he "kited" checks and drafts on it and through it with various other banks with which he was connected until, when the bank was closed on Dec. 5, 1904, Mr. Appleyard and the various street railways with which he was connected were indebted to the bank in the sum of more than \$662,000. The loans, discounts and drafts of Mr. Appleyard and his corporations purported to be secured in part by the bonds of several railway companies.

MORE WORLD'S FAIR MACHINERY SOLD

A sale has been made of one of the big units which was employed to generate current to operate the Intramural Railway at the Louisiana Purchase Exposition. The contract, which was closed through Westinghouse, Church, Kerr & Company, is for one of the seven 900 kw sets. The generator is a Crocker-Wheeler standard railway generator, 550-volt compound wound, running at 100 r. p. m. The engine was built by the Buckeye Engine Company, of Salem, Ohio, and is a cross-compound heavy duty type machine. The equipment is to be installed in the power house of the Consolidated Railway Company, of New Haven, Conn., the electric railway branch of the New York, New Haven & Hartford Railroad.

NEW DISTRICT OFFICERS OF THE NATIONAL ELECTRIC COMPANY

A. W. Wyckoff has been appointed district manager for the National Electric Company to operate in Pittsburg and the surrounding territory. Mr. Wyckoff is well known in that section, as he was previously district manager of the Bullock Electric Manufacturing Company, having been, prior to his taking the Pittsburg office, the general superintendent of the Bullock Works at Cincinnati. Mr. Wyckoff is a graduate of Cornell, and rounded out his engineering education in the Bethlehem Steel Works. He has already started the ball rolling for the National Electric Company by securing the order for the five 300-kw, 120 r. p. m., engine-type generators for the Carnegie Institute. This building when completed will cost \$5,000,000, and will be the finest of its kind in the world. Spranley & Reed have just accepted the district managership of the National Electric Company at New Orleans and the surrounding country. They will be remembered as having represented the Bullock interests prior to this time. W. T. Spranley is one of the oldest operators in the electrical market in that section of the country, and Lyman C. Reed, formerly with the Interstate Electric Company and the Safety Electric Company, is known as one of the most enterprising electrical engineers in the South.

The National Electric Company announces that Walter Fairchild has been placed in charge of its office at 135 Broadway, New York. Mr. Fairchild formerly represented the Bullock Electric Company in that city, and prior to that represented the Stanley Electric Company in New York. He is well known in electrical engineering and commercial circles in New York City and throughout the State. Robert S. Hopkins has been appointed city sales agent for this office. Mr. Hopkins obtained his engineering experience with the Bullock Electric Manufacturing Company, for whom he installed many alternating and direct current plants. J. Frank Perry has just been appointed sales engineer of the company. Mr. Perry's field operation has been largely through New England, but he has been connected with large power installations in all parts of the world. He is at the present time in California representing the interests of the National Electric Company.

LARGE REGISTER ORDER

The Detroit United Railway recently gave an order for 750 Sterling No. 8 registers. No. 8 is the Sterling-Meaker Company's printing register for city use, while its No. 9 is adapted to the zone system of interborough roads, any number of records being made with the latter between termini. Considering the fact that the Sterling-Meaker Company did not begin the manufacture of a printing machine until last June, the success achieved is especially noteworthy. The Detroit order is the largest so far, and the Sterling-management state that they have never before met with such ready appreciation of a new machine. The simplicity of the No. 8 is perhaps responsible in part for the welcome accorded to it. One movement of the resetting knob reverses the direction sign, returns the trip figures to zero and prints the totalizer figures in the day slip, together with the identifying number and the direction. Like other recent registers of Sterling make, the No. 8 is attractive in appearance, having the familiar blue and gold dial and the copper case oxidized.

LARGE CAR ORDER IN BROOKLYN

One of the largest contracts for cars ever let has just been placed by the Brooklyn Rapid Transit Company. It is for 200 surface cars of a new semi-convertible type and for 100 elevated cars. In addition to these, there will be 50 surface freight cars, the contracts for which will be let in a few days. Of the 200 surface cars, the J. G. Brill Company, of Philadelphia, will supply 175, while the Jewett Car Company will supply the remaining 25. The contract for the 100 elevated cars was divided among the Cincinnati, Jewett and Laconia Car Companies as follows: Cincinnati, 50; Jewett, 25; Laconia, 25. An article descriptive of the new type of semi-convertible surface car for which orders have been placed, will be published in an early issue of the STREET RAILWAY JOURNAL.

THE QUESTION OF VENTILATION OF CARS IN MASSACHUSETTS

The hearing on street car ventilation, continued from Tuesday, Feb. 7, before the legislative committee on Street Railways, was closed Thursday, Dec. 9. No additional evidence was put in by the petitioners for improved ventilation, but objection was offered by John P. Fox, who appeared as an independent railway engineer, who has made a special study of street railway conditions in this country and abroad, and by B. W. Warren of the Massachusetts Street Railway Association. Mr. Fox's argument was that the air in the Boston street cars is not foul enough to be injurious, or to warrant additional legislation such as is called for in the bill—that the Railroad Commission be authorized to investigate and to order the railway companies to equip the cars with ventilation devices. Investigations of his own have convinced him of this fact.

B. W. Warren took the ground that there is legislation enough to cover the subject, and the Railroad Commissioners investigated it thoroughly and reported upon it as recently as in 1897, and they have ample authority to take the initiative, should they find conditions changed since their last investigation to warrant them in making recommendations to the railway companies. He questioned the wisdom of creating for the commissioners special power on specific matters, as it tends to minimize their general power, supposed to be broad enough to cover all phases of transportation facilities; he also advanced the argument that it is unwise to give the commission power to "order" railway companies to do certain things, because the commission is not likely to be as comprehen-

sive in its requirements when it "directs" as when it "recommends," and only in two or three instances in the last thirty years are the railroads in Massachusetts known to have refused to carry out the recommendations of the Railroad Commissioners. The commissioners reported to the legislature, and were given power to enforce their recommendations in those particular instances. The authorities in Chelsea, whence come most of the complaints of foul air in the street cars, could go before the Railroad Commissioners to-morrow and be heard, and the commissioners have sufficient authority to investigate again and make recommendations. This closed the hearing on the ventilation bill.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED FEB. 14, 1905

782,312. Electric Traction Apparatus; Alfred Zehden, Charlottenburg, Germany. App. filed June 21, 1902. The rotary field idea is here carried out for traction purposes by arranging the poles as if they were opened out in a line of indefinite length.

782,405. Trolley; John Martland, Detroit, Mich. App. filed Jan. 2, 1903. The trolley consists of a bail-shaped frame adapted to stand vertically astride of the car, each arm of the frame being upwardly spring-pressed, and a tilting harp provided at the top of the frame having two trolley wheels and springs arranged each side of the harp permitting it to tilt to accommodate inaccuracies in the wire.

782,454. Car or Train Signal; William Lintern, West Park, Ohio. App. filed Aug. 4, 1904. Rear end signals showing whether the current is on or off are operated by contacts upon the controller.

782,455. Car Signal System; William Lintern, West Park, Ohio. App. filed Nov. 28, 1904. The system of circuits involving the idea disclosed in the preceding patent.

782,529. Trolley; Benjamin Williams, Columbus, Ohio. App. filed June 17, 1904. Consists of two trolley poles, one for operation in each direction, and means whereby when one pole is pulled down the other is raised to operative position.

782,598. Apparatus for Lifting Street Railway Cars; Charles Churilla, Allegheny, Pa. App. filed March 30, 1904. Details of a device for replacing a derailed car upon the track.

782,756. Trolley Guard; Edward R. North, Webster Groves, Mo. App. filed May 6, 1904. Details.

782,786. Trolley Pole Controller; Joseph P. Magney, Los Angeles, Cal. App. filed July 11, 1904. Relates to pneumatic control of the trolley pole.

782,796. Trolley Switch; Alexander Palmros, Columbus, Ohio. App. filed June 6, 1901. Details of a side-running trolley switch.

782,805. Car Fender; Raymond Andlauer, Kansas City, Kan. App. filed March 21, 1904. Details.

PERSONAL MENTION

MR. A. P. GODDARD, president and treasurer of the Freeport Railway, Light & Power Company, Freeport, Ill., died on Feb. 12, at the age of 72 years. Mr. Goddard had devoted many years to furthering the interests of the Light & Power Company, and the affairs of the company will be continued along the lines laid down by him.

MR. WILLIAM B. COMSTOCK, a prominent lumberman and banker of Alpena, Mich., died at Detroit a few days ago. Mr. Comstock was prominent in the construction and management of several electric railway properties, among them the Toledo, Fremont & Norwalk, now part of the Lake Shore Electric; the Rochester & Eastern Railway, and the Cincinnati, Georgetown & Portsmouth Railway.

MR. FRANK PATTERSON, general manager and vice-president of the Springfield, South Charleston, Washington C. H. & Chillicothe Electric Railway Company, of Springfield, Ohio, has resigned, and Mr. E. B. Gunn has been appointed general manager. Mr. Gunn has been superintendent of construction for the company, and before that was general superintendant of the Dayton, Springfield & Urbana Railway.

MR. H. ROOT PALMER, superintendent of the Norfolk Railway & Light Company's power house in Norfolk, Va., has been promoted to the position of general superintendent of the company's properties, to succeed Mr. Robert T. Gunn, who, as previously noted in the STREET RAILWAY JOURNAL, has become general manager of the Lexington Railway Company, of Lexington, Ky. Mr. Charles W. Bradley, superintendent of the Berkley division, will succeed Mr. Palmer as superintendent of the power house. Mr. Bradley's successor has not as yet been named.

MR. FREDERICK COOK, president of the Rochester Railway Company, of Rochester, N. Y., and connected with important commercial and manufacturing interests in that city, died early Friday morning, Feb. 17, aged 72 years. Mr. Cook was born in Wildbad, Wurtemberg, Germany, Dec. 3, 1833. When he was 12 years of age, his father died, leaving a family of eight children. In 1848 he landed in New York a poor emigrant, alone in a strange country, but for a sister and an uncle, each of whom was without means. His first position was as a shoemakers' apprentice. He migrated to Batavia from Buffalo and there began the career that finally saw industry and perseverance crowned with position and wealth. Mr. Cook is survived by a widow and two children.

MR. DICKINSON MACALLISTER, president of the Metropolitan West Side Elevated Railway, of Chicago, at a recent meeting of the board of directors, announced that he would not be a candidate for the presidency of the company at the annual meeting to be held April 4. The directors adopted a resolution expressing regret at Mr. MacAllister's action. Mr. MacAllister in a letter to the directors stated when he identified himself with the company that he intended remaining only until such a time as certain work then in hand was completed. That work being completed, he declined to remain president. Mr. MacAllister formerly was engineer for the Brooklyn Union Elevated and the Manhattan Elevated Railway. He came to Chicago as constructing engineer for the South Side Elevated Railway, but left this company to take charge of the construction of the Metropolitan railway. In 1899 he became president of the Metropolitan.

MR. WILLIAM A. GRAUTEN, of the National Electric Company, of New York, who died recently in Tucson, Ariz., was among the pioneers in electric traction. His first experience in railroading was in steam railway service in the West. This work he left to assist in installing the "Short Series System" in Denver. Mr. Grauten next went to Cleveland with Mr. Short, and was for some time employed at the works of the Brush Company in that city. About 1890 Mr. Grauten went to Rochester, in charge of erecting the line work in that city. He remained there until 1893 or 1894, when he accepted the position of line superintendent of the Hartford Street Railway Company, of Hartford, Conn. Later he became electrician of the Hartford system. In 1898 he resigned from the Hartford Company to enter the employ of the Christensen Engineering Company (now the National Electric Company), with which he was connected until his death. Mr. Grauten was a man who made friends rather than acquaintances. His generosity, good fellowship and unflinching wit endeared him to those with whom he came in contact.

MR. F. W. COEN, the newly elected secretary of the Ohio Interurban Railway Association, is secretary and general passenger agent of the Lake Shore Electric Railway, of Cleveland. He served his apprenticeship in a country bank at Vermillion, Ohio. In 1893 he became cashier of the Sandusky, Milan & Norwalk Railway, one of the earliest interurban lines in Ohio. In 1895 he went to Detroit as assistant secretary of the Detroit Railway, the 3-cent fare company, and a year later went to Cleveland as assistant secretary of the Lorain & Cleveland, now a part of the Lake Shore Electric Railway. During the formation period of the Lake Shore Company, he served as secretary of the Toledo, Fremont & Norwalk Railway, now the Western division of the Lake Shore. He was appointed secretary of the Lake Shore when that company was formed in the fall of 1901. Mr. Coen is particularly well equipped to further the active work of the Ohio Association. He was one of the first electric railway managers to appreciate the advantages of combining with other roads for interline traffic, and soon after the Lake Shore was formed the company commenced to exchange business with connecting steam, as well as electric lines.

MR. THOMAS FITZGERALD, JR., whose resignation as general manager of the Lexington Railway Company, of Lexington, Ky., to become assistant to Second Vice-President Dana Stevens, of the Cincinnati Traction Company, was noted in the STREET RAILWAY JOURNAL recently, is a native of Baltimore. In 1898 he was graduated from Johns Hopkins, where he subsequently pursued a post-graduate course. His first commercial position was with the Baltimore & Ohio Railroad, whose machine shops he entered as an apprentice. He resigned this place to become connected with the operating force of the Third Avenue Railroad Company, of New York, and subsequently entered the service of the Sprague Electric Company. Resigning from the Sprague Company, he accepted the position of superintendent of the Fairmount & Clarksburg Electric Railway & Light Company, of Fairmount, Va., and later became the general manager of the Norfolk, Portsmouth & Newport News Company, which includes in its operations the public service utilities of these places. At Lexington, Mr. Fitz-

gerald's experience was along lines similar to those at Norfolk, for at Lexington the street railway and lighting systems are under one management. Mr. Fitzgerald will thus take with him to his new position, a wealth of experience in the management of public service corporations.

MR. W. E. HARRINGTON, of Camden, N. J., has announced his resignation as general superintendent of the South Jersey Division of the Public Service Corporation, and the acceptance by him of the office of vice-president and general manager of the New York-Philadelphia Company, which is operating an electric line between New York and Philadelphia by way of Trenton. Mr. Harrington is one of the most progressive managers in this country, and the Camden property, which has been under his management since 1896, has developed rapidly both in extent of service and in physical and financial condition since it has been under his charge. From a system of 31 miles in length it has grown to one of 83 miles, while the annual receipts have increased from \$250,000 to \$551,000. During this time also he has introduced a number of improvements, including a unique system of discipline, which has been described in these columns, a mutual benefit association for the employees with monthly meetings, and a semi-monthly organization of the heads of departments for a discussion of technical topics and consideration of the best methods of improving the service. Mr. Harrington is a graduate of the University of Pennsylvania, class "87," and besides his experience in Camden was in charge of the Atlantic City Electric Railway, operated and controlled by the Pennsylvania Railroad Company, from 1889 until 1891 was general manager of the Consolidated Railway properties at Wheeling, W. Va., and is also an electrical engineer of considerable note.

MR. THOMAS E. MITTEN, on Feb. 20, was elected first vice-president and managing director of the Chicago City Railway Company, and on March 1 will assume full charge of the property.

Mr. Mitten, as most of our readers know, has been since 1901 general manager of the extensive electric railway properties controlled by the International Railway Company in Buffalo and vicinity. He took up his work in Buffalo just before the opening of the Pan American Exposition as general superintendent of these properties, and as a result of the success he achieved in handling the many intricate transportation and mechanical problems presented by the Pan American conditions, he was late in 1901 made general manager of the combined systems. Since that date the development of the properties and the financial results accomplished have placed the International Railway System conspicuously in the fore among the important electric railway enterprises of the country.

Mr. Mitten's early training was in the steam railroad field in the West, his first important position placing him in charge of the Denver, Lakewood & Golden Railroad, a combined steam and electric road. In 1895 he was called to Milwaukee, Wis., and was made superintendent of railway department of the Milwaukee Electric Railway & Light Company. Soon after entering upon this work he found it necessary to carry the company through a severe labor disturbance, and in his handling of men and conditions his success was striking, as is evidenced by the fact that when he left Milwaukee to assume his duties at Buffalo, he was tendered a testimonial signed by 1228 employees of the Milwaukee Electric Railway & Light Company, expressing to him their regret at the severance of the relation and their appreciation of him as a man and a manager.

The new position in Chicago to which Mr. Mitten has just been called is likely soon to be one of the most important in the street railway operating and constructing field in the United States, as the indications are that it will involve the reconstruction and consolidation of all the street railway lines in Chicago. As previously announced in these columns, the Chicago City Railway Company has been purchased by a syndicate, the avowed purpose of which is to bring all the street railway lines in Chicago under one management, and as the first official act of the representatives of this syndicate has been to virtually place Mr. Mitten at the head of its practical affairs in Chicago, it is evident that he is the man to whom the syndicate intends to intrust the arduous task of carrying out its plans. He will bring to the work a fresh and hearty vigor, an intimate knowledge of electric transportation affairs, and an executive ability of a rare order.



THOMAS E. MITTEN