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Temporizing in Chicago

The city of Chicago has again temporized with the surface transportation problem by granting a franchise extension until Jan. 1, 1905, to the Chicago City Railway Company operating the lines on the South Side, thereby putting off nine months the settlement of a twenty-year franchise grant. At any time during the past year a settlement of the franchise question, as regards the Chicago City Railway Company, could easily have been made had the city authorities ceased to discuss non-essentials in the framing of a franchise extension ordinance, and proceeded at once to settle the important points and frame an ordinance to be submitted to the Council. After hours upon hours of consideration of an ordinance, the local transportation committee is no nearer a settlement of the question than it was a year ago. It is remarkable that as honest and capable a set of business men as constitute this committee should be so misled as to what constitutes their duty to the public as to have accomplished nothing definite in the months and years this matter has been considered. The committee for some time has had information before it which should enable it to come promptly to a definite conclusion upon the real question at issue, which is, what is the proper compensation to be paid for the franchise? The difficulty seems to be that the committee knows that the absurd compensation which has been demanded by some of the anti-corporation element of the city is out of the question for a twenty-year franchise, while at the same time it fears to recommend what it knows to be the proper compensation, because of the fear that it will be charged that the committee has not looked after the city's interests properly in not demanding more. As a result, the local transportation committee has most studiously remained on the fence, with the result that nothing has been or is likely to be accomplished soon. The public suffers more than anyone else, because of this delay in transportation improvements, but it is only now that the Chicago press seems to be waking up to that fact.

The Electric Railway Tests at St. Louis

We have already referred to the plan adopted by the managers of the Louisiana Exposition in St. Louis to conduct a series of practical tests on electric railway apparatus at the fair this summer, and it is with great pleasure that we are enabled to present in this issue a fairly complete programme of the trials which have been decided upon. From these it will be seen that the work laid out by the commission is a very important one, and the results which may be anticipated from the tests at St. Louis will not only have a high commercial value to all persons interested in electric railroading but will have great scientific interest and import as well.

These tests will be divided into three classes, those carried on within the building itself, those on the test tracks in the Exposition grounds, and finally some more elaborate trials which may be conducted on an outside line to elucidate certain problems in high-speed railroading, in case it should seem desirable to do so. These tests can also be divided into and will completely cover equipments for city and suburban railroading, for interurban electric roads, heavy traction conditions and new electrical railway systems. Those carried on within the buildings will be in a sense similar to shop tests, except that all apparatus will be subject to one set of inspectors, and will be governed by one set of rules. By this means the results can be co-ordinated and compared in a way not possible otherwise. The outside tests will represent actual operating conditions, and by them it will be possible to determine the ratio between the temperature rise and the watt loss in different parts of the motors, that is, the capacity curves, as found in the shop tests and as obtained in actual practice with different train cycles and conditions. If this relation is determined for a large number of motors and for different conditions of operations, the data secured will be of the greatest value to railway engineers.

We look forward with especial interest to the tests on train resistance as full of promise of information for which there is now even less data available than in the directions which have been previously mentioned. This is an instance, although one only, in which the commission will be able to supply the engineer with data which are essential, if high-speed electric rail-

ways are to be successfully built, and we refer to it simply because it is a glaring example of the way in which railway development has outstripped scientific investigation. One reason for this has been, of course, that no private corporation would care to go to the expense of conducting elaborate tests of this kind, but under the auspices of the commission valuable, as well as authoritative, results ought to be secured.

The Opening of the Season

The season is now here when extensions are in order and the manager is planning his campaign for the summer. June and July will ere long bring their harvest of traffic, but from now until settled weather in our Northern climate is a time of stress in the street railway business. The most serious question is that of adequate car accommodation to suit not all people at all times, for that is a task for omniscience, but a fair proportion of the people most of the time. It will not be long before the first warm days will tempt the open car out of its den, and for a couple of months the railway manager will be kept guessing as to whether he shall let it frisk about or chain it up.

Beloved of the stalwart fresh air fiend, and denounced of testy old gentlemen as a purveyor of pneumonia, the open car is a standing problem. In spite of the undoubted success which the semi-convertible car has had in both city service and on interurban roads, it is not a complete substitute for the open car. The latter may be productive of more accidents than any other design, but there is a freedom of access to it and a pleasure in riding in it at moderate speeds which can never be attained by any car which is partially closed. Of course, the plutocratic corporation that can afford several suits of rolling stock gets along well enough by strenuous exertion, but the mere well-to-do-company that has to look very sharply after the nickels is in no such comfortable case. With it the question of a duplication of rolling stock, one for use during nine months of the year and for a few cold days in summer, and the other for the three months or less remaining, is a very serious one.

Time only will tell whether there is any complete solution to this problem. The semi-convertible car has so far been the most popular mean between the open and the closed types, although there are also several full convertible cars in the market. Some managers will have nothing to do with either attempt to reconcile the two types of car in one structure, and denounce the plan as impossible of application, like "perpetual motion" or "squaring the circle." We are not disposed to take such a gloomy view of the situation. The semi-convertible car has been found to suit many conditions where it was formerly thought the open car was the only substitute for the full closed car, and it is by no means impossible that further improvements may evolve a car which still more closely resembles the open car for summer service. Again, although the view may seem heterodox, we still persist in believing that there are conditions in which an open trailer can be used to advantage to care for peak loads on the road which cannot afford two complete equipments of car bodies. Such a trailer, if used behind a semi-convertible car, would afford those passengers who insist upon an open car a liberty of choice, while giving accommodation to those who prefer to ride in the partially closed semi-convertible. The open trailer could, if considered desirable, be fitted with a center aisle, although if passengers descend from a running board on one side of the car only we hardly consider that this is necessary; and if a center aisle is used it might even have a single exit, either from the front or rear platform, as a further precaution against accidents. The plan is at least worthy of consideration in view of the early approach of the summer season and the difficulties which may be presented in finding accommodation for all passengers who wish to ride.

Electricity on Long Lines

A paper recently read before the Institution of Electrical Engineers, by F. F. Bennett, gives some interesting, even if rather daring, estimates on the possible saving to be made by operating the entire railway system of England and Wales electrically. The proposition strikes one on its face as rash, but upon further examination improves in appearance. The fundamental proposition laid down by Mr. Bennett is, however, one that is well worth thinking about in connection with the interurban networks that are extending so rapidly.

Broadly the proposition is, that while it might be difficult or impossible to show a saving on electrically operating the consecutive sections of a single line, the inclusion of all the lines in a given territory would generally lead to a good economic result. A series of sections, each fed by a single power station, is an arrangement inevitably leading to a bad load factor, unless in the case of very exceptionally heavy traffic. If, however, lines in contiguous territory are taken in so that each station feeds an area instead of a line, the load factors may reasonably be expected greatly to improve. For example, Mr. Bennett figures, there were in England and Wales in 1901, 15,308 miles of railway in service, and if each company undertook to electrify merely its own line in 50-mile sections, there would be needed some 306 power stations to do the work. If, on the other hand, all the roads came into the deal, so that the territory could be cut up into blocks, each of 900 square miles, each block supplied by a central station, the total number of stations required would be only sixty-five. The total output of the stations being the same in either case, the block stations would show four to five times the output requirement of the previous case.

Of course, some gain in economy is obvious, even supposing the load factor to remain unchanged, and taking the change in load factor into account, the case is very much bettered. The argument is certainly specious on first sight, and it evidently has a sound basis of fact, but the attempt to chase it over into the field of numerical computation is somewhat hazardous. To figure out the load curve for even a single block station is little short of appalling in its complication, and until this is done one cannot be at all sure of the gain in the load factor. Mr. Bennett computes an average block station of about 5500-kw output, but the actual load factor attainable and the maximum output required at the peak of the load are matters on which one can scarcely do more than guess. Clearly, cases might occur in which the load factor would be hardly better than that pertaining to any single line, while sometimes the load would be fairly uniform. With one station for every 50 linear miles of track, the theoretical average station would be not much in excess of 1000 kw, and if it were much larger for any reason would still be likely to have increased size, only because of an associated bad load factor. Standing these off against each other it is fair to suppose the 5500-kw station could furnish power, perhaps, 25 per cent cheaper than the smaller station. Further than this we do not care to follow Mr. Bennett's figures, for the simple reason that his data are only roughly approximate, and some of his figures open to severe criticism. In point of fact the sections fed from a single station, in view of the economy of alternating-railway motors, would, for a single line, be considerably more than 50 miles in length, and the

areas per station much greater than 900 square miles. Each increase in practicable radius of distribution means an added advantage in going to a station feeding the corresponding area.

The moral of Mr. Bennett's paper, so far as street railway organization goes, is obvious. It appears if one but takes the trouble to glance at a street railway map of any well-served section. It shows at once that while each individual interurban road may have a well planned system of power transmission and distribution, the power stations, considering the network as a whole, will almost always be badly arranged. If it were possible for a group of roads to pool their interests in the generation of power and to install a proper system for the group as a whole, there is no doubt at all of a very substantial saving in the power bill. Organic consolidation is not at all necessary to this end, since a group of roads could put up its power systems in charge of trustees, and take power by meter, each road paying its share of the running expense and fixed charges. The proposition would generally work out rather simply, and with the present rate of growth of interurban systems would very quickly become a source of very considerable saving. If the speed on electric lines keeps on its present rate of increase, the power bill will grow steadily heavier year by year, and the fuel bills may be counted on for regular increase anyway. The large interests of electric roads, even in contiguous territory, are common interests, and no small spirit of jealousy should be permitted to interfere with harmonious action. There are many ways in which neighboring roads can help each other, but a common supply of power, and distributed for the common account, strikes one as perhaps the most important item in the line of co-operation. Sooner or later there will be much consolidation among electric lines, but, however that may be, co-operation of a very effective kind can be introduced most profitably without any close, formal union in other things. We should certainly like to see the plan tried on a large scale, and feel reasonably sure that the result would turn out to be a happy one.

The Duties of the Repair Inspector

Several articles have appeared in recent issues of this paper on the design of car houses and repair shops, but without proper superintendence and inspection the best arranged and most completely equipped building for the maintenance of the rolling stock of any railway company is of little use. The foreman, or chief inspector, has usually secured his position by promotion from among the car inspectors, and the latter by selection from among the mechanical force. The efficiency of the organization, therefore, depends upon whether these appointments have been made because of the knowledge and ability of the men who hold these positions. The importance of both offices is too often overlooked. The chief inspector and his assistants should not only be able to detect and remedy troubles, but should also have the acumen to foresee and take the necessary steps to prevent it, either by strengthening the equipment or by directing the attention of the management or men to ways in which it is being abused.

On many roads the inspection department is the one through which the motormen are taught as to their manipulation and care of the apparatus under their charge, and where this practice is followed the chief inspector should have the executive ability to instruct the men as to the proper use of the equipment. In this connection there are two points in the operation of electric cars that have often been neglected, as those who have had opportunity to inspect systems in all parts of the country will realize, although both are important features in railway work. One is how to locate defective motors and the method of cutting them out, the other is the method of using the reverse. Very often there are no indications on the controller as to where the motors are connected. There should be a diagram on the inside of the cover of the controller or in the motorman's instruction book, showing the position of each motor on the car, and also indicating what switches should be thrown in order to cut out each motor. It is a lack of knowledge and training in these particulars that often causes blockades in city service and serious accidents in interurban operation.

Familiarity with these matters, especially the perfect use of the reverses, inspires a motorman with confidence, and in cases of emergency where this knowledge is valuable he is not liable to lose his head. It is a matter of record that many damage cases have been won by proving that the reverse was used in attempting to avoid collision. In other cases where only the hand brakes were used the court has held that the motorman did not do all within his power to stop the car, and that consequently the company whose agent he was was responsible for the damages caused. The degree of proficiency that is required of a motorman in remedying defects of minor importance while on the road naturally varies with the different systems, and is governed somewhat by the number of equipments allotted to each inspector. On interurban lines, because of the long runs involved, the motorman should be much more proficient in making repairs and have a much better knowledge of the equipment than is absolutely required on city lines.

Probably one of the most important reforms that has been instituted in the methods of inspection and repair of car equipments is the abolition of the practice of inspecting the equipments in the car house at night. This system is radically wrong, and wherever it has been employed the maintenance of equipment has not reached a high standard on account of the poor light that the men must necessarily work by and other unfavorable conditions, such as dirty and confined quarters. It has been found, moreover, that the best class of labor for this purpose is not attracted by night work. This is now pretty generally recognized, and most roads are gradually coming to day inspection for most of their equipment and confining night inspection of such work as is only absolutely necessary, such as greasing the journals, blowing out the controllers with compressed air and looking after the brushes, or else changing the brushes every night on each equipment as is done on some roads.

Spare Trucks vs. Spare Cars

In connection with the general subject of car inspection, the growing practice of providing spare trucks instead of spare cars is worthy of consideration. The procedure followed in Boston on the elevated railway system, on which this method is in use, is described in this issue, and is simply an elaboration of the growing practice of inspecting motors from above instead of from the pit. The elevated railway systems were naturally among the first to adopt this method, owing to the larger size of their electrical equipments, but many of the surface companies are following the practice, and, as described in recent issues, a number of the largest and most recent car houses are equipped so that all new equipment will be inspected in this way. It is a comparatively simple matter with a double-truck car to take out one truck and substitute another. If this is done, the repairs and inspection of the electrical equipment can be made without the detention of the car body in the repair shop beyond the few minutes required for making the change.

STEEL-TIRED WHEELS ON THE BOSTON ELEVATED RAILWAY SYSTEM

Perhaps no elevated railway company has studied the wheel question so carefully as that in Boston. One reason for this is that the conditions of grades and curves on the Boston Elevated Railway system, owing to the narrow and crooked streets through which the line runs, are undoubtedly more severe than those in any other city, so that the wear caused to both wheels and rails has been serious. In addition, the company has given special attention to the wheel question in an effort to reduce the noise from the cars on its elevated structure. As is well known, the company has made a careful study of the different factors which produce noise in the operation of trains on elevated structures, and as a result has been successful in greatly ameliorating the original conditions. The exact extent to which the attention paid to the wheel question is responsible for this improvement is difficult to determine. Other suggestions have been tried, such as the use of wooden blocks and other cushioning material under the track rails, ballasting the track, etc., but more has undoubtedly been accomplished by strict attention to keeping the wheels absolutely round, and by careful attention to having the other parts of the car equipment, such as brake chains and shoes, kept tight, so they do not clatter, than in any other way.

To keep the wheels absolutely round they are ground down regularly every two weeks and are also turned down every three months. Steel-tired wheels, as shown in Fig. 1, are used. An enlarged section of the tire itself is given in Fig. 2. The tires are open hearth and crucible steel from various manufacturers, among them the Midvale and Latrobe Steel Companies, and Krupp, of Essen, Germany.

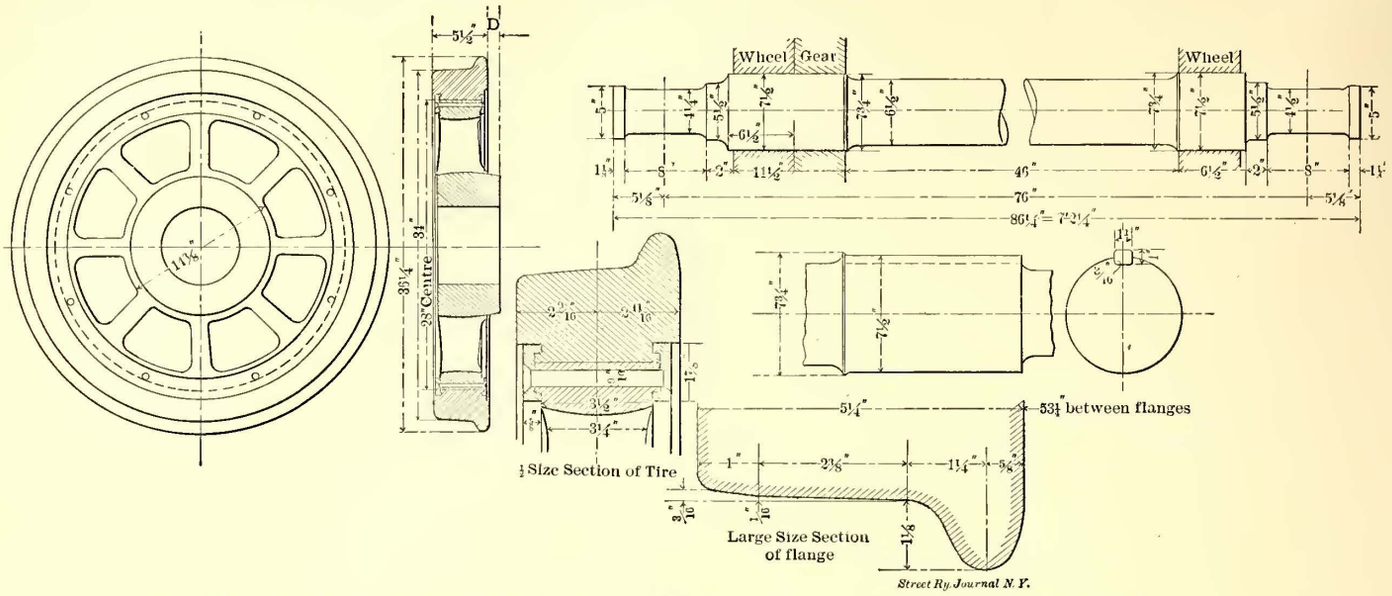

FIG. 1.—DETAIL OF STEEL-TIRED MOTOR WHEEL, BOSTON ELEVATED RAILWAY CARS

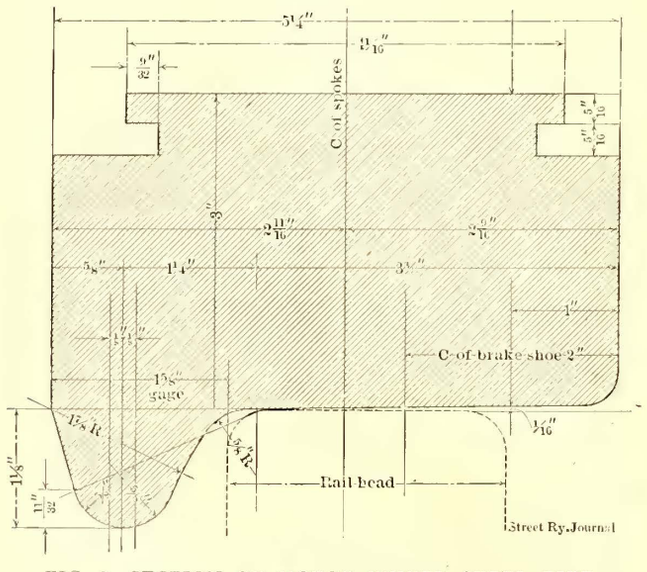

FIG. 2.—SECTION OF MOTOR WHEEL STEEL TIRE

The work of changing wheels is carried out at the Sullivan Square car house, and the wheels on about twelve cars are changed each day. In doing this the company has adopted the policy of keeping spare trucks and not spare cars, and the pro-

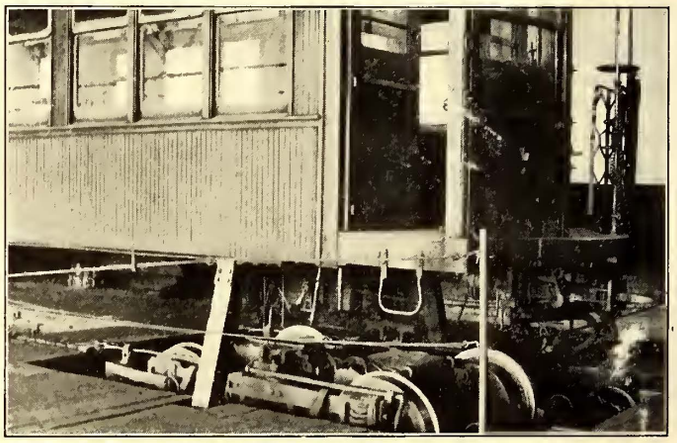

FIG. 3.—ELEVATOR BEING LOWERED WITH TRUCK ON IT, CAR SUPPORTED OVER OPENING

FIG. 4.—CAR SUPPORTED OVER ELEVATOR OPENING, WAITING FOR NEW TRUCK

cess of changing the trucks on a car has been carefully worked out and requires a minimum of time.

The Sullivan Square car house is in two floors. All the storage and repair tracks for the elevated cars are on the upper floor, which is on a level with the elevated structure. The repair shop proper is directly below, on the ground floor. In changing trucks the car is first run in over an elevator in the floor, which is raised slightly after the truck is run upon it, as shown in Fig. 5. Braces are then slipped under the truss plates at the end of the car to support the end of the car in position. The elevator is then lowered to the ground floor, carrying the truck with it, while the car body remains supported over the opening. Views showing the appearance of the car on the car house floor are given in Figs. 3 and 4, while Fig. 6 shows the descending truck as it appears from the ground or repair shop floor.

Upon reaching the repair shop floor the truck is pushed on to the turn-table shown, and taken to any part of the floor desired. A finished truck stands ready on the track at the other side of the elevator, and is moved to position on the latter. The elevator then returns to the car storage floor, the truck is slipped into position, the car body braces are removed and the car, as far as that truck is concerned, is ready for service. The entire change takes less than 5 minutes.

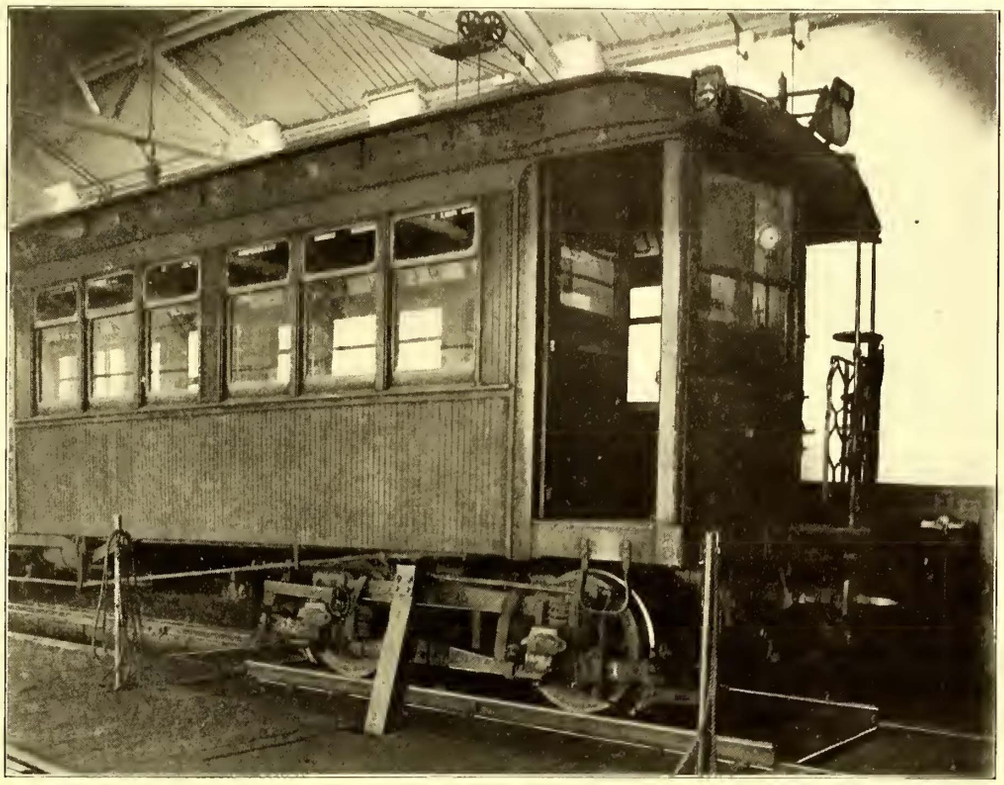

FIG. 5.—CAR, WITH TRUCK ON ELEVATOR, FIRST OPERATION, ELEVATOR RAISED SLIGHTLY TO INSERT BRACES FOR HOLDING BODY

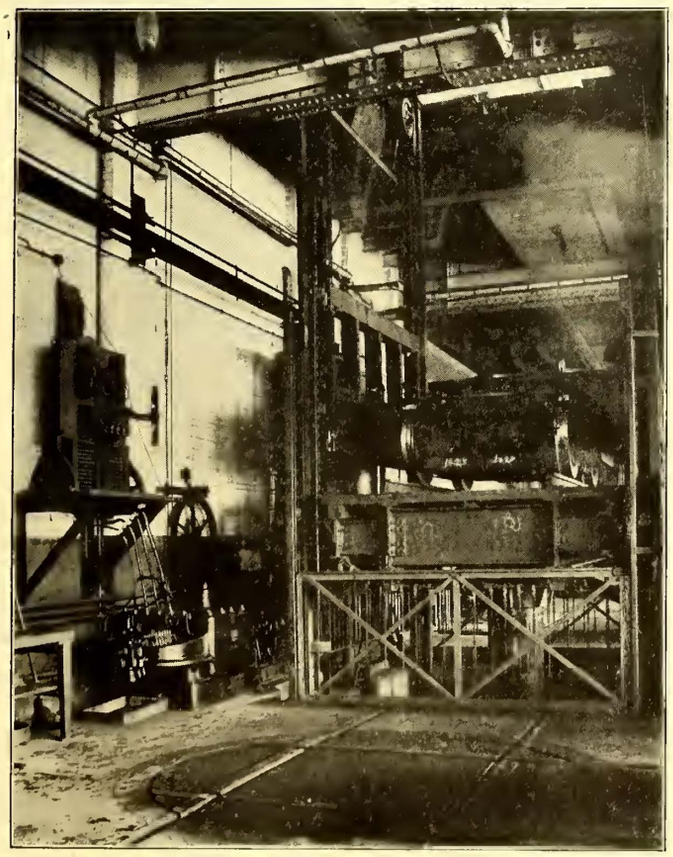

FIG. 6.—TRUCK ELEVATOR FROM REPAIR ROOM FLOOR, WITH TRUCK PART WAY DOWN

The cars in the car house and the trucks on the repair shop floor are moved by means of their electric motors. As it was not considered wise to employ the third-rail system in the car house, an ingenious form of flexible overhead contact has been arranged. It consists of a loose, flexible contact attached to an over-running trolley carried on an overhead conductor. The end of this connection is bare and in the form of a hook, so that it can be placed against the bare shoe support. To protect the workmen from accidental contact with the bare end, or the live end, of the wire, a wooden cylindrical shield, as shown in Fig. 7, is used, which drops down over the bare wire at the

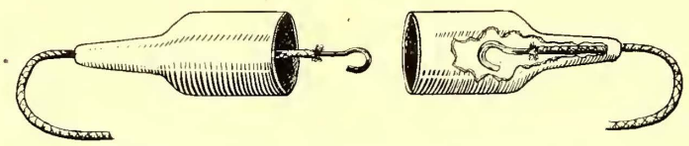

FIG. 7.—SHIELD FOR PROTECTING LIVE WIRE CONTACT USED FOR MOVING CARS IN CAR HOUSE

end of the contact when not in use, and can be shoved back when desired so as to make the contact accessible. The overhead trolley wire is protected by a 300-amp. fuse, so that any possible short circuit in the car house would not be disastrous. In moving the trucks on the lower floor wall rheostats are used with flexible couplings to be attached to the No. 2 motor leads, so that the speed can be graded to any amount.

It will now be in order to describe the repairs to the wheels as they are made in the repair shop, which is on the ground floor of the Sullivan Square car house. When the trucks reach the shop floor, as described above, they are run off the elevator platform to one side or to the other, depending upon whether they are motor or trail trucks. If the former, the truck and motors are raised by a pneumatic hoist and the axle and wheels are run out and replaced with another pair. If the wheels are to be reground, they are taken to a gang of four Springfield grinders, where they are ground down about one-sixteenth of an inch in circumference. The wear on the elevated road is particularly on the tread of the wheel, and for this reason, as

stated, the wheels have to be turned down about once in three months to reduce the flange to the proper section. The lathe used for this purpose is shown in Fig. 8, and is arranged for turning down two tires at once, with two tools on each side. The wheels are brought to the lathe on the special truck shown in the foreground, and as the lathe is driven by gearing the gear is made with a section which can be lifted out and replaced in order to insert the axle and wheels in the lathe. As shown in the engraving the gear case is raised to show the sectional gear and the removable section is shown in the foreground.

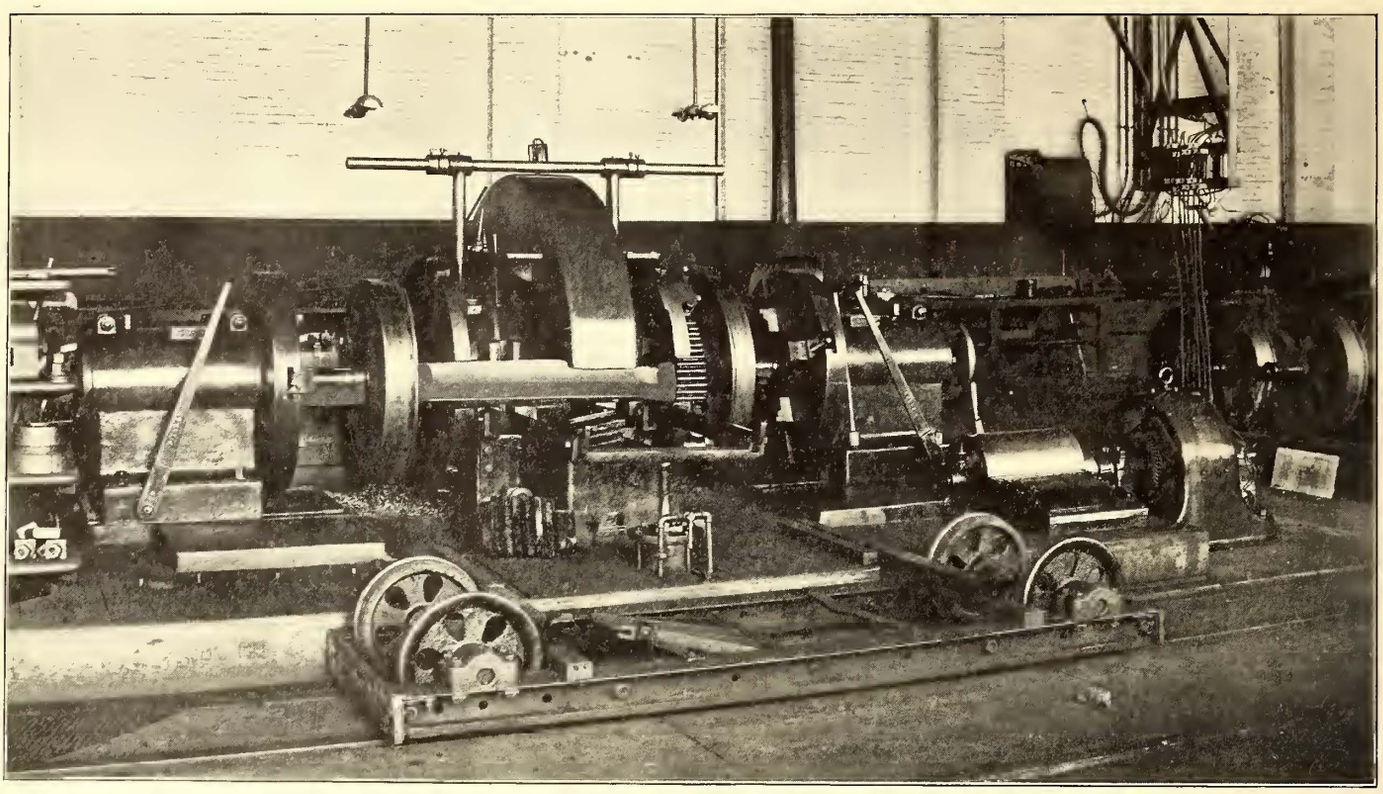

FIG 8.—WHEEL LATHE WITH SECTIONAL GEAR, SHOWN WITH GEAR CASE RAISED

Two sizes of wheels are used, a 33-in. and a 31-in. wheel. The former is allowed to wear down to 30½ ins. in diameter, and the other to 28 ins. in diameter before being re-tired. From two to three years are usually required to wear out a wheel in the tread. Owing to the difference in diameters of partially worn wheels, it is, of course, essential for good electric motor operation to exercise great care in mating the wheels on the same axles, and to a certain extent those on the same motor truck. The maximum difference permitted under ordinary conditions for wheels on the same axle in a motor truck is ⅛ in. in circumference, while the difference between the wheels on two axles may be ½ in. in circumference.

When a wheel is re-tired the usual way of loosening the tire by heating it is employed. After knocking out the rivets which hold the retaining rings together, see Fig. 1, the wheel is swung over the gas burner, shown at the side of the elevator in Fig. 6 and also in Fig. 9. The tire is then knocked off. A new tire, which has been carefully bored out on the tire lathe, shown in Fig. 9, is then heated and slipped on to the old center. The tire is bored to .001 in., and is .031 in. smaller in diameter than the center. A pneumatic hammer is used to knock out the tire rivets.

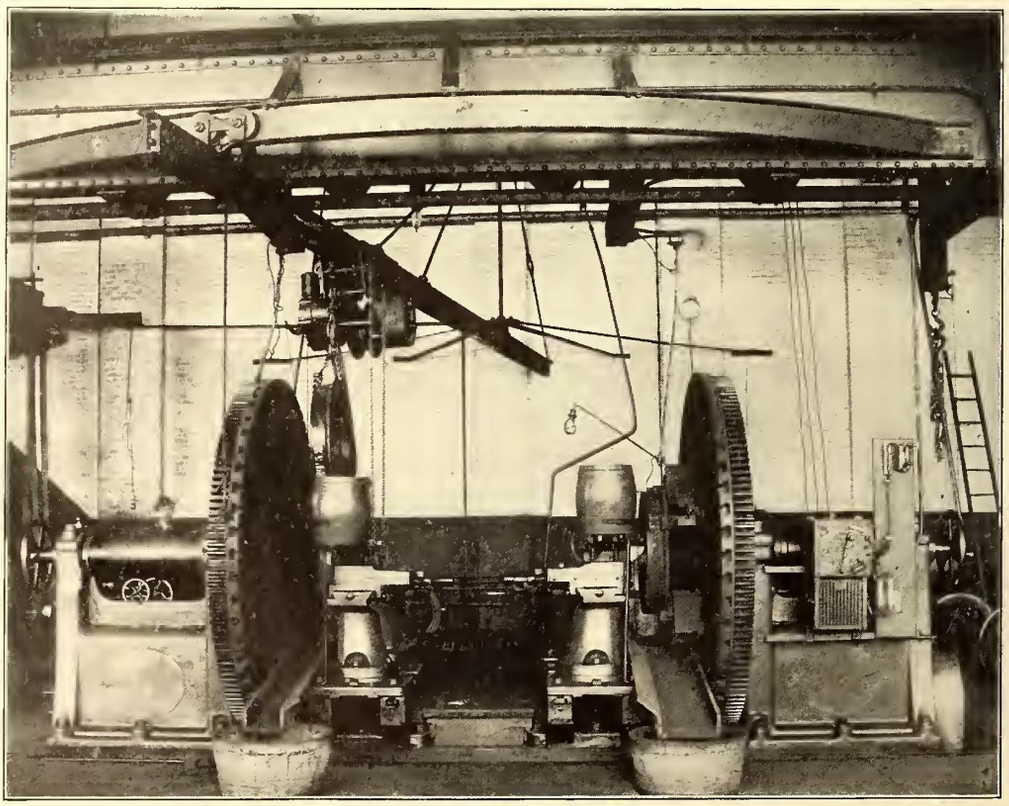

FIG. 9.—RADIAL CRANE TIRE LATHE FOR BORING TIRES, AND GAS HEATER FOR PLACING THEM ON HUBS

Open-hearth cold-rolled steel axles with solid gears pressed

on and keyed to the shaft are used, as shown in Fig. 1. All axles before being used are tested in the machine shown in Fig. 10. The axle is first laid in the straps which extend over each end, and a pressure of 25 tons is applied from below in the center of the axle, and the deflection is recorded by means of the gage illustrated. This pressure should spring the axle about ¼ in. If the axle does not come back to the zero point a permanent deflection is shown, and the axle is rejected. The company not only tests new axles in this way but tests all axles by this process once every two months.

JOURNAL WEAR

On account of the large number of curves on the Boston Elevated lines it is found that the ends of the journal brasses as well as the journals themselves wear very fast, but the company has adopted a plan of renewing the end of the axle.

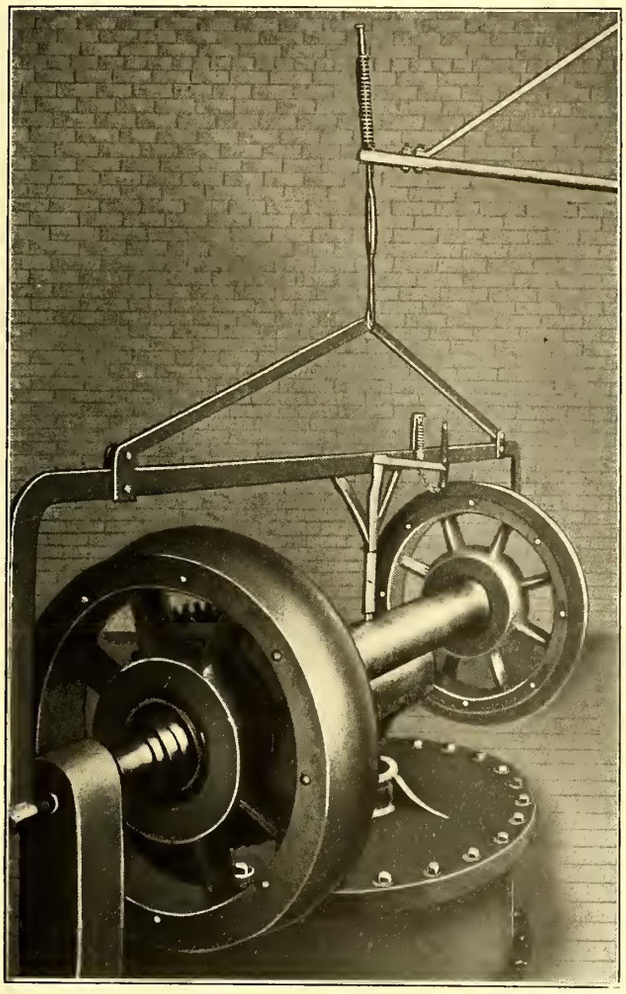

FIG. 10.—AXLE TESTING MACHINE

When the button is sufficiently worn as to require replacing, it is turned off and the journal is turned down. A new button fitted with a thread is then screwed on, being first heated to ensure a perfect fit. A hole is then drilled at the line of division between the new end and the old axle, and a No. 38 screw, 1¼ ins. long, is put into the drilled hole. The top of the screw is then riveted over. This will hold on the new journal button until it is worn out. The wear on the journal, outside of the end wear, is trifling.

A peculiar suit against the Northern Ohio Traction & Light Company for $10,000 damages for alleged electrocution is now pending in the Common Pleas Court at Akron. The suit is brought by the estate of the late O. P. Wheeler. The claim is that Mr. Wheeler, who was connected with the Citizens' Savings Bank, was shocked to death in the bank's vault while turning on an electric light, because of defective wire insulation.

RESULT OF THROUGH SERVICE BETWEEN CLEVELAND AND TOLEDO

In a recent issue of the STREET RAILWAY JOURNAL a table was presented, showing the extent of the through business between Cleveland and Toledo secured by the Lake Shore Electric Railway during the past year. The company has just compiled some additional figures showing the total number of passengers carried for each month of 1903, and the average fare paid by each passenger. It will be noticed that in January, 1903, the number of passengers was 166,467, and that the average fare paid was $0.189, while in August nearly twice as many passengers were carried, and they paid an average of $0.238. The average per passenger increased steadily, due largely to the increased through traffic. Here is the table:

1903	Passengers	Average Fare
January	166,467	$0.189
February	157,880	.186
March	203,843	.187
April	202,613	.190
May	238,622	.200
June	228,986	.214
July	275,007	.223
August	304,701	.238
September	254,027	.236
October	229,123	.230
November	194,105	.229
December	194,469	.228

Average per passenger for 1903, $0.217.

President Bicknell has also prepared a statement showing the earnings of the limited cars on the Lake Shore Electric. For October the westbound limited earned an average of $0.2893 per car mile, while the eastbound limited earned an average of $0.351 per car mile. The average for all limited cars for October was $0.3201 per car mile, while the general average of all cars on the Cleveland & Toledo division, including the limited cars, was $0.2349 per car mile, showing an increase of limited earnings over general average of $0.0852 per car mile, or an increase of 36 per cent.

The showing in November was even better than in October. The average earnings of all limited cars during November was $0.3495 per car mile, while the general average for all cars on the Cleveland & Toledo division was $0.2225, showing an increase of earnings for the limited cars over general average of $0.127, or an increase of 57 per cent.

December made a still better gain, and on some runs the earnings exceeded $1 per car mile. Mr. Bicknell expects the earnings of the limited cars to show still greater car mile earnings during the present year.

PACIFIC ELECTRIC RAILWAY COMPANY TENDERS RECEPTION TO ITS EMPLOYEES

Employees of the Pacific Electric Railway Company, of Los Angeles, were tendered a most enjoyable reception, Wednesday evening, March 9, by the management of the company. The employees took the occasion to present the retiring superintendent of the Northern division, W. H. Smith, a gift of a complete cabinet of sterling silver. An elaborate collation was served in the Dutch dining room.

When the Grand Rapids, Grand Haven & Muskegon Railway was built the prediction was made that a 40-mile third-rail line would be a failure in the severe weather to which Michigan is accustomed in winter. However, the road has been operated with less trouble than anticipated, and in several severe storms proved more efficient than some of the trolley lines operating under like conditions.

ORGANIZATION AND OPERATING FEATURES OF THE PACIFIC ELECTRIC RAILWAY COMPANY'S SYSTEM

Many of the operating features of the Pacific Electric Railway Company, of Los Angeles, are of interest and will be treated in detail. For the operation of the city and interurban cars the system is divided into four divisions, each in charge of a superintendent, who reports directly to the general manager of the company. These divisions are respectively the Los Angeles division, handling the four city lines in Los Angeles; the Southern division, operating the Long Beach, Whittier and Ascot Park lines, and the local cars in Long Beach; the Northern division, operating the Pasadena, Monrovia and San Gabriel lines, as well as the local cars in Pasadena; and the Mt. Lowe division, which handles the Mt. Lowe cars to Rubio Canyon and the cable and electric cars above that point. The superintendent of the Mt. Lowe division is also manager of Ye Alpine Tavern on Mt. Lowe. The Northern and Southern are the largest divisions, and together they regularly operate 332 cars out of and 333 cars into Los Angeles daily.

HIRING AND INSTRUCTING MEN

As to operating and handling of the men, the methods of the different superintendents are in general similar, differing only in details. Each superintendent has full charge of the hiring and discharging of the men on his lines.

On the Los Angeles division the men are first sent to the chief surgeon for examination, and, in the case of a motorman, is put a week in the shop to learn about the motors, controllers, air brakes and other equipment of a car. Then he spends a week, or until such time as he is proficient in handling a car, on one of the city lines in charge of an old employee. When he has mastered that line he is given one run on each of the other lines, so as to become acquainted with the route, the location of circuit breakers, etc. He is then given a rigid oral examination by the superintendent, and, if successful, is put on the extra list.

On the Southern division the superintendent, after selecting his men, by their general appearance and his impression of them, puts them on a run in charge of a regular man for instruction. If a motorman, he stays about ten days, or until he becomes familiar with the controller and the method of handling the car, and learns the location of fuses, light switches, etc., as well as how to make repairs to the car on the road, that is, so far as a motorman can make repairs. Then he is sent to the foreman of the car repair shop, with instructions that he educate the applicant in the construction and operation of the motors, controllers, brakes, etc. This shop instruction usually takes two days, after which he is required to pass a severe oral examination, and is then put on the extra list. No printed form is used, as the man would be apt gradually to get acquainted with the questions.

Similar methods are used on the Northern division in hiring men. After a man passes the physical examination he is given a copy of "The Motorman and His Duties," which is quite generally used by all the superintendents, and is then required to spend three days in the car house tracing the wiring and familiarizing himself with the car equipment. He is then put on one of the lines, generally the Pasadena Short Line, for about eight days, and is reported to the trainmaster at the end of that time by the regular man, with a written statement as to his competency. Then he is put on the main Pasadena line for two or three days, and for about the same length of time on the Monrovia, San Gabriel and Pasadena local lines, so that he becomes thoroughly familiar with the entire division. It is usually necessary for the applicant to spend about thirty days in this manner on his own time. He is then thoroughly examined by the trainmaster on the usual points, and also on proper procedure in case of wreck or emergencies, and is put on the extra list.

Until recently all trainmen were required to deposit $25 with the company when they entered its employ as extra or regular men. That system has now been abolished, and in its place one adopted that has been in successful use by the Los Angeles Railway Company. By it all men are required to give a bond with a surety company. This bond is for $500, and costs $5, the employee and the railway company dividing the cost. The surety company, through its staff, looks up the record of the applicant, and, if satisfactory, he is hired. When a man first applies he is put to work, the bond company guaranteeing his record until they have completed their investigation. By this method the company is spared the bookkeeping expense that was necessary to keep account of the deposits, and is also freed from the trouble of investigating the records of the men.

OFFENSES AND PENALTIES

No merit or demerit systems are at present in use on the system, the record of each man being largely a matter of personal judgment on the part of the superintendents. The Brown system was used on one of the divisions for a time, but was abolished, as it was not regarded as satisfactory. For offenses the men are laid off, and this method proves very effective. If the offense is serious enough, or if it is a lesser one committed by a previous offender, the man is generally discharged. In case of small accidents, due to carelessness of the motorman, such as the smashing of the end of the car, one of the superintendents has found it advisable occasionally to give the man the choice of being discharged or of paying the cost of the damage. When such an occasion arises the man invariably pays, thus lessening the cost to the company as well as giving the man a severe lesson.

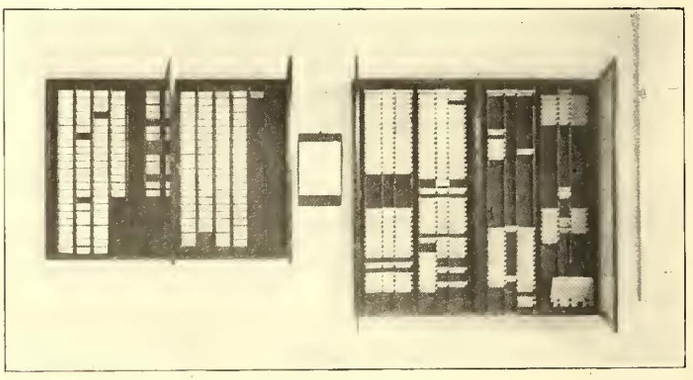

FIG. 1.—RACKS WITH CARDS SHOWING ORDER OF RUNS AND SENIORITY OF EMPLOYEES IN SUPERINTENDENT'S OFFICE

On one of the divisions, for violation of the rules a bulletin is posted giving the particulars without the name of the man. When a man is discharged his name is posted. On the other divisions it is thought that the fact of a man being given a lay off is sufficient notice to his fellow workers that he has committed an offense. The men all have printed books of rules, and they are required to be uniformly polite and courteous to passengers as well as proficient in the handling of the car. The men are closely watched by the superintendents and inspectors for infringements of the rules, and frequently regular trainmen in the employ of the company serve as "spotters" or secret inspectors, unknown to the other employees. Records are kept of all discharged men, and frequently the company is asked to give information to other companies to which the men apply for work. It may be said, to the credit of the Los Angeles railway companies, that their trainmen are generally courteous and above the average of intelligence.

SENIORITY RACKS AND RUNNING BOARDS

In the office of each superintendent are maintained two boards, or frames, one for indicating the seniority of the men, and the other the order of runs. The two boards in the Pasa-

dena car house are shown in Fig. 1, the seniority board being at the left. These racks are very similar to those used in Camden for giving the order of the extras, described in the Street Railway Journal for Dec. 3, 1903. They have vertical wood strips, spaced about 2 ins. or 3 ins. apart, to suit the lengths of the cars used, and have oblique slots in which the cards are inserted. Glass doors, which lock, permit the boards to be viewed by the trainmen. Half of the seniority board shown is devoted to the conductors and the other half to the motormen. A card is filled out for each man and bears his name, number and date of employment. Each space is numbered, so that the relative rank of a man may be instantly determined. On one of the other seniority racks the longest dimension is the vertical one, and two are used for conductors and two for motormen, the former having white cards and the latter blue. As was mentioned in the Street Railway Journal some time ago, the company recently averted the unionizing of the trainmen, and, for their loyalty to the company, the men were advanced two years in seniority. This is shown on the cards by setting back the date of their employment two years from the time of actual employment. Suspensions for offenses do not affect the seniority of the men.

The running board is made up from the seniority rack, the oldest motorman being given the first choice, then oldest conductor, then the next oldest motorman and conductor and so on. This choice of runs, or "shake up," as it is called, occurs every three months on the city division. On the interurban divisions it is made every six months, or when new lines are opened, or runs changed so as to alter their desirability. Desirable special runs, such as trolley parties and observation cars, are always given to the oldest men. This running board is made up every afternoon for the following day, the changes being necessary on account of lay offs, discharges, extras, etc. At the top of the center space is placed a card with the name of the line and below on the small cards are given the number of the run, the time run, the time off and the total time of the run. At the left are placed the cards of the conductors who

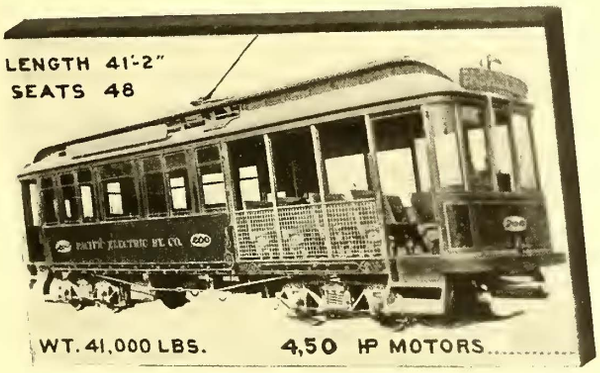

FIG. 3.—CARD RECORD BLOCK

have chosen those runs, and at the right the cards of the motormen. On one of the boards red cards are used to designate extra men.

CREWS AND EXTRAS

On the Southern division there are employed about forty regular men and twenty extras, and on the Northern division there are sixty-nine regular crews and about forty extra men. The extra lists are kept as low as possible, but on account of the frequent excursions the company is required to keep a large proportion of extra men. The extra runs are given to the extra men in rotation, so that they all receive a fair share of the work. When there is a vacancy in the regular list the senior extra man is promoted to the vacancy. Two or three crews are required to report at each of the car houses the first thing every morning, so as to cover all the runs. Arrangements are made so that all extras can be reached by telephone, and certain crews report by telephone during the day.

Bulletins for the trainmen are posted in all the car houses, and copies are sent to the general manager's office. In cases where crews live at terminal points bulletins are also posted there. On the Southern division each man is required to sign every bulletin affecting him, and these signatures are checked up every week.

WAGES

The prevailing wages on all the lines of the Pacific Electric Railway Company are 22 cents an hour for extra men, 22½

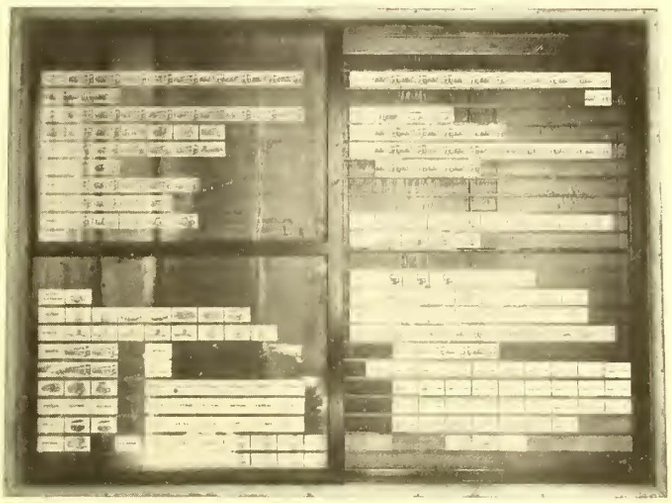

FIG. 2.—CAR EQUIPMENT RECORD CASE IN GENERAL MANAGER'S OFFICE

cents for regular employees, 23½ cents after five years, 24½ cents after ten years, and 25½ cents after fifteen years. The men generally work about 10½ hours a day, that time being preferred. The company gives the men no premiums except in exceptional cases, as has already been cited in the instance of their being advanced in seniority for loyalty during labor troubles. On the Northern division the busiest time of the year comes during the Christmas week and on New Year's Day, when the annual Tournament of Roses occurs at Pasadena. If the men succeed in handling their cars during this period without accident, as they generally do, they are given a large ball at Pasadena, Echo Mountain or other suitable point. The men are required to buy their own clothes, but the company purchases their caps and sells them to the men at cost. These caps are distinguished from those on the other Los Angeles lines by having white duck covers.

SCHEDULES AND TIME-TABLES

Elaborate schedules and time-tables are necessarily required for such a large system. For the Los Angeles division time-tables of each line, with running points, are posted in the car house, and each crew is required to copy down the schedule for its run. The superintendent and inspectors carry cards in their pockets on which are printed the time when cars should pass certain points on the lines, so that the crews may be checked up by the officials as happen to be in different parts of the city.

On the single-track interurban lines time schedules with meeting points are made out and given to the men. On the Whittier line the schedule is so arranged that, although the cars operate at nearly 60 m. p. h. they seldom have to wait over a minute at terminals. It is the intention of the company to have all its lines double-tracked, but they are sometimes opened up as single-track roads, and so operated until the construction work is completed. The Long Beach cars operate at a maximum speed of 60 m. p. h., and make the trip of 21 miles in the schedule time of 40 minutes. Morning and evening flyers cover the distance in 30 minutes, and make two railroad crossing stops and three street stops in Long Beach. The regular service to Long Beach is every 15 minutes, and to Whittier from 30 minutes to an hour.

For the lines of the Northern division the time-table shows the running time of 609 regular daily trains and contains upwards of 20,000 figures. Copies are posted at the car houses, despatcher's office and terminals. This time-table shows a service of from 7 minutes to 13 minutes on the Pasadena Short Line, a 15-minute service on the main Pasadena line, and half-

FIG. 4.—SCENE AT SHAM BATTLE

hourly service on the Monrovia and Alhambra lines. On the sheet are also printed several general instructions to the trainmen.

The company is well prepared to handle large crowds. On Sundays and holidays cars are put on to meet the demand, the Long Beach line frequently requiring cars 4 minutes apart. On such days from 16,000 to 18,000 people are often handled on that line, the record being 40,000 people for Long Beach. For the Tournament of Roses at Pasadena last New Year's Day the company carried 57,000 people over its two Pasadena lines. As many as 80,000 passengers have been carried by the company on all its lines in one day.

CAR EQUIPMENT RECORDS

A novel and comprehensive method of keeping an accurate and up-to-date record of the car equipment of the company has been devised by Joseph McMillan, chief clerk to the general manager, and is in use in his office. It consists of a wooden case, 71 ins. x 52 ins. in size, mounted on the wall, with sliding glass doors, as shown in Fig. 2. The case is divided into twenty-four horizontal rows or slots, in which are placed movable blocks to designate the different types of cars. These blocks are of wood, 3 ins. long, 1¾ ins. wide and ¼ in. thick. On each block is mounted an outline photograph of a car, as shown in Fig. 3, actual photographs of the different classes of rolling stock being used. On the margin of the block are printed the length of the car, the number of seats, weight, motor equipment, and any other descriptive information that is desired. For example, the block shown in Fig. 3 represents car No. 200 of the "200" type, such as runs on the Pasadena lines, and its description is as follows: Length, 41 ft. 2 ins.; seats forty-eight; weight, 41,000 lbs.; four 50-hp motors. For other cars of the same type the various car numbers are inserted by pen in the number spaces on front and sides of the car, which are purposely left blank.

One of these blocks is made up for every piece of rolling stock owned by the company, and they are arranged in the case after name blocks to represent on what lines they are used, whether they are "special" cars, such as maintenance of way and line tower cars, whether they are in the shops for repair, or "extras," "not in service," "freight," etc. The case is changed from day to day, in conformity with the information which is sent into the general manager's office by the division superintendents, mechanical superintendent and other officials. When the photograph, Fig. 2, was taken the case showed that twelve cars were in service on the Pasadena Short Line, thirteen standard cars, one combination mail and passenger car and two express cars on the Pasadena Main Line, and so on for all the lines; also that eight cars were in the shops, etc.

TRAFFIC DEPARTMENT

The company has a very well organized traffic and passenger department, the work of which embraces the regulation of fares, designing and issuing of tickets and transfers, handling excursions, tourist parties and holiday crowds, the operation of the observation cars, and the necessary advertising for all these features. Los Angeles is a very popular tourist city, and one of the features that helps to give the traveling public a good impression of the city, as well as a comprehensive idea of the neighboring attractions, is the facilities which the electric railways offer to reach the different points. The traffic manager

FIG. 5.—A CROWD OF 10,000 PEOPLE GATHERED NEAR LONG BEACH TO WITNESS A SHAM BATTLE—ALL RESULTS OF GOOD ADVERTISING

of the Pacific Electric Railway Company is especially energetic in getting up excursions and special features. When a delegation from another city, or a party of any nature, visits Los Angeles, the leaders of the party are looked up or communicated with beforehand, and arrangements made for whatever trips they may desire—whether it be a trip to Pasadena and Mt. Lowe, a ride to the ocean on the Long Beach line, or a visit to San Gabriel Mission. The party is then taken in private cars, which are in charge of competent guides, to explain the scenic features, and all the time desired is spent at the different points. For these excursion trips the company makes low rates, which are from 10 per cent to 30 per cent lower than the regular fares. It figures, however, that a great many more are induced to go by having the party travel together, and another advantage is that the regular daily traffic is not congested. As examples of such parties which have visited Los Angeles lately and been thus taken care of by the traffic department of the company, may be mentioned the Chamber of Commerce delegations of San Jose and Oakland, with about 200 in each, and the party of Dr. John Alexander Dowie.

When the traffic manager has no special attraction on hand to offer the public, such as dances at Long Beach or snow on Mt. Lowe he endeavors to get up one on his own account, or assists others in arranging for special features at points on the

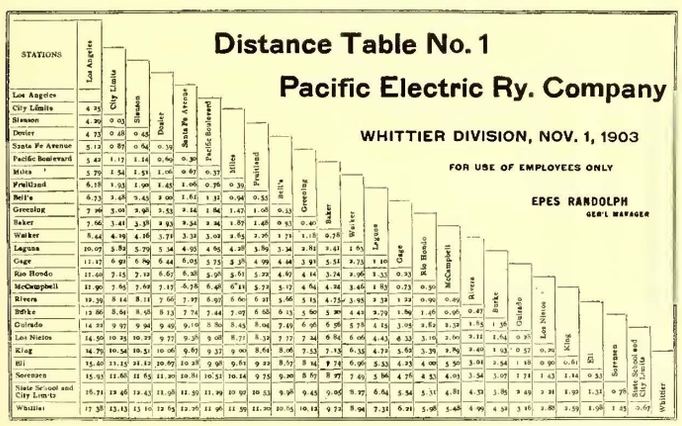

FIG. 7.—DISTANCE TABLE USED ON WHITTIER DIVISION

lines. As one notable instance of what a little energy and judicious advertising will do to help pay dividends, may be mentioned a sham battle, given by the local companies of the California National Guard last January. H. F. Stewart, the traffic manager, personally arranged for this event. A site was selected near the ocean, that could be easily reached by two of the local Long Beach lines, and the land leased for the event. The troops were given their transportation, and the company also paid for the ammunition used and for other expenses. The sham battle was widely advertised in the local papers and by placards and hand bills. The result was, that on a spot where probably no more than thirty people had ever congregated before, there assembled a crowd of 10,000 people to witness the maneuvers, Fig. 5. As each passenger paid 50 cents for the round trip it can easily be realized that the event was a money-maker for the company, the expenses being comparatively small. It was on this occasion that one car was observed carrying 160 people inside and forty-three on the roof.

One successful feature that has recently been introduced by the traffic department is the operation of an observation car over some of the lines of the Northern division. The company's parlor car, "Poppy," is used for the purpose, the leaving time being 9:00 a. m. daily. Opportunity is allowed for visits to the Cawston ostrich farm and San Gabriel Mission, and, at Baldwin's Ranch, time is given for lunch and a drive through that magnificent property. The car returns to the city early in the afternoon, thus giving ample time for it to be rented out to private parties or for special excursions. A competent guide has charge of the car, and for the trip $1 is charged. It is seldom that this car does not net the company $40 or $50 a day.

A "Seeing Los Angeles" car is operated by the Los Angeles Railway Company over its lines, but the city lines of the Pacific Electric Railway in Pasadena do not afford as good an opportunity to see that city, so the Pasadena Board of Trade has made arrangements with the railway company to meet the Los Angeles cars with tally-hos and carriages for drives about

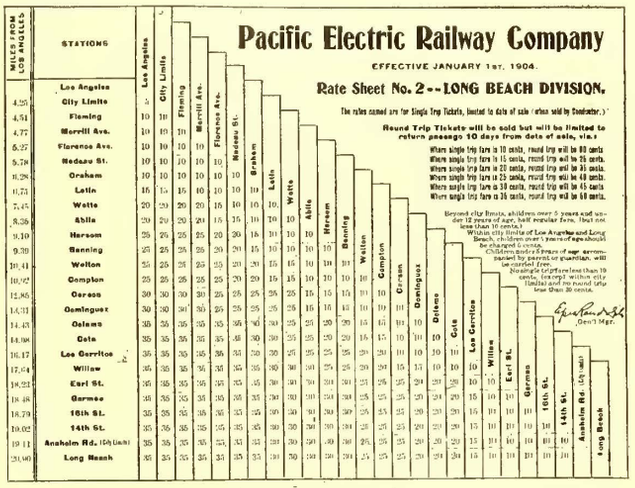

FIG. 6.—RATE SHEET ON LONG BEACH DIVISION

the city, 75 cents being charged for the trip from Los Angeles. Similar observation trips are given, which include admission to the ostrich farm and stop-over in Pasadena.

FARES AND TICKETS

The passenger rates charged are fixed for all stations according to rate sheets supplied to ticket agents and conductors, and at present run up to 35 cents for a 21-mile ride. The rates vary from 1¼ cents to 2 cents a mile, and although they are just as high, or even higher, than the fares on the steam roads, the electric railway gets practically all the local business. The round-trip fares average about 1¼ cents a mile, the highest being 50 cents where a single fare is 35 cents. Rate sheets, such as shown in Fig. 6, are made out for each line, and conductors collect for single or round-trip fares according to these rates.

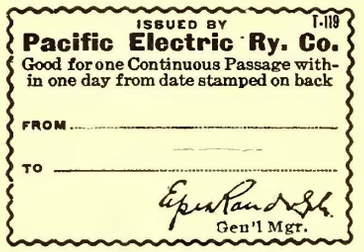

FIG. 8.—STANDARD SKELETON TICKET FOR EXCURSIONS, STATIONS TO BE FILLED IN.

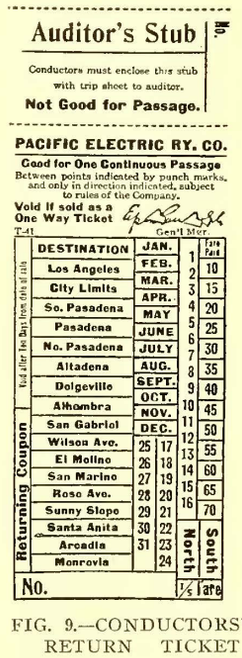

FIG. 9.—CONDUCTORS' RETURN TICKET TOTAL AMOUNT IS REGISTERED, AND THIS IS GIVEN FOR RETURN TRIP

Mileage books of 500 miles are sold for $6.25, good on all lines except the Mt. Lowe division. These mileage books may also be used for the transportation of persons accompany-

ing the purchaser. For conductors' use in determining the distances between points for mileage, or for any form of ticket, distance tables are made up for each line, such as shown in Fig. 7. When a conductor collects for a round-trip fare on a

PACIFIC ELECTRIC RAILWAY COMPANY

_____ 190____

To MEDICAL DEPARTMENT,
311-312 DOUGLAS BUILDING,
LOS ANGELES

The bearer_____is in the service of this Company and is entitled to medical and surgical treatment, except for sickness or injury resulting from vicious habits or contracted prior to entering the service.

DR. E. A. BRYANT, CHIEF SURGEON
DR. E. F. DILLON,
DR. H. G. CATES,
DR. G. L. HUTCHINSON, ASSISTANT SURGEONS

Signature_____

Title_____

OFFICE HOURS: 10 TO 12 A. M. 2 TO 4 AND 7 TO 8 P M
SUNDAYS: 10 TO 12 A. M. ONLY

Form M-D3-1M. 8-03

FIG. 10.—ORDER BLANK USED IN HOSPITAL DEPARTMENT

car he rings up the total amount on the Ohmer recording fare register, and gives the passenger a return ticket, such as shown in Fig. 9, on which are punched the date, the fare paid, the direction of return trip and the destination. An auditor's stub, containing the same number as the ticket, is returned to the auditor by the conductor with his trip sheet.

The standard round-trip ticket sold is similar to that used on steam roads, and consists of two coupons. There are about ten

CERTIFICATE OF EXAMINATION

_____ 190__

*Examination of*_____

AGE	NATIVITY	EMPLOYED AS	Applicant for Position as

VISION	HEARING
Right Eye = 20	Right Ear 60
Left Eye = 20	Left Ear 60

COLOR-SENSE

For Green	For Red
For Pink	For Blue

GENERAL CONDITION

Applicant is_____up to standard.

THIS IS TO CERTIFY, That the above named party has this day presented himself for examination, under properly signed permit; that I have made such examination in a careful and thorough manner, and in accordance with Company's instructions; and that the information herein contained, so far as I have been able to discover from my examination and his replies to me, is correct.

_____ M. D., Examiner.

FIG. 12.—CERTIFICATE OF EXAMINATION

varieties of this ticket, and the same ticket is used for half-fares with a large "½" printed on the face of the ticket in red. Fig. 8 is the standard skeleton ticket used for excursions and for passage to any way point from any ticket station.

SNOW ON MT. LOWE

SNOW BALL FIGHT!!

A Heavy Fall of the Beautiful. Take the Little Ones and have a GOOD OLD DOWN EAST
IT WON'T LAST LONG. Have a Taste of Winter 5000 Feet Above Sea Level at

Ye Alpine Tavern

THE BIG FIRE IS BURNING. DRAW NEAR AND POP CORN

SNOWBALLS GIVEN AWAY! THINK OF IT

PACIFIC ELECTRIC R'Y

NEW YEAR EXCURSIONS

TO

MT. LOWE

$2.—Round Trip—$2.

JANUARY 1, 2 and 3

Friday, Saturday and Sunday

Cars leave 6th & Main Sts At 8, 9, 10 a. m. 1 and 4 p. m.
LATE CAR RETURNING LEAVE ALPINE 7 P. M.

Special Cars New Years Day FROM PASADENA

At YE ALPINE TAVERN, the large open fireplace gives cheer to all

A TRIP TO MT. LOWE

Is a fine Xmas present, or to any of the following:
Old Mission San Gabriel
Baldwin's Ranch, Whittier
Long Beach, Ostrich Farm

All via Pacific Electric Railway

PHONE MAIN 900 or 1672

SEEING
San Gabriel Mission
Cawston's Ostrich Farm
and
Baldwin's Ranch

All Scenes Best Seen via the Orange Grove Route

THIS SERVICE

Consists of the elegantly appointed parlor car *Poppy* accompanied by an expert guide, who points out all places of interest, en route. An opportunity is allowed for a visit to the Cawston Ostrich Farm—the largest in existance—a stop is also made at San Gabriel Mission giving time for an inspection of the interior, as well as exterior of this fine Old Mission.

AT BALDWIN'S RANCH

Time is given for lunch and a drive through this magnificent property.

THE RETURN TRIP

Is made over the short line, via Mission Road and East Lake Park, making in all a trip long to be remembered. Saving time and avoiding dust.

The Fare for Entire Trip $1.00

This does not include admission to Ostrich Farm which is 25 cents or drive through Baldwin's Ranch costing 50 cents.

Tickets and Information, at "Seeing California Traffic Bureau" 211 West Fourth Street, or Pacific Electric Depot, Sixth and Main Streets.
Car leaves Sixth and Main Streets 9:00 a. m. daily

"Seeing Los Angeles"
OBSERVATION CARS

Three trips Daily. Thirty Miles of City Streets. Includes Business Section, Residence District, All Parks, Glimpse of Chinatown and Sonoratown. Guide Delivers Lecture en Route. Two Hour Trip. Fare 50 cents. Leaves

211 WEST FOURTH STREET
10.00 a. m. 1:00 and 3:00 p. m.
DON'T MISS IT.

WAR!
DECLARED
ON
LONG BEACH
GREAT SHAM BATTLE
SUN., JAN. 24
By Companies "A," "C" and "F"
AND
Company "I" from Pasadena
Supported by Cavalry Troop "D" and U. S. Naval Militia and Signal Corps
It has been rumored that THE PACIFIC COAST SQUADRON may also be there
BATTLE AT 3 P. M.
MARINE BAND CONCERT AT PAVILION
CARS EVERY FEW MINUTES
VIA
PACIFIC ELECTRIC RAILWAY
Phones, Main 900 and 1672 | Cars 6th and Main St. Station

DANCES
AT
LONG BEACH
Commencing at 8:00 p. m.
EVERY
Tuesday
Thursday
and
Saturday
Music by
MARINE BAND
Cars Every Few Minutes
SIXTH AND MAIN STREETS
via
Pacific Electric Railway

FIG. 11.—TYPICAL POSTERS FOR ADVERTISING SPECIAL TRIPS.

The traffic department believes in the value of advertising, and regular spaces are carried in the local papers and many of the Western magazines and guides. It also issues folders, descriptive of each line, a general guide to all its lines and several special booklets, time-tables, etc. Fig. 11 shows a collection of some of the large posters issued by the company. There are several tourist guides and pocket time-tables published by private parties, and the company's schedules are always published in these.

HOSPITAL DEPARTMENT

The company maintains a very well organized hospital department, which has under its supervision the medical attendance of all injured or ill employees, including hospital cases, examining all applicants for train service and the maintenance of "first aid" boxes in all power stations and sub-stations. The department is under the direction of a chief surgeon and three assistant surgeons. The same physicians have charge of the hospital departments of the other electric railway companies in Los Angeles, and there is a total of about 4000 men who have a right to their services. About 2100 of these men are employed by the Pacific Electric Railway Company.

When a man is entitled to medical and surgical treatment a surgeon's order blank, Fig. 10, is made out and signed by the foreman, superintendent or other official to whom he reports. This blank is delivered to the surgeon. The surgeon in charge of a case makes out an accident report for every case, and this is sent to the general manager's office, the surgeon keeping a duplicate. The surgeons also make a physical examination of all applicants for train service, examining the men especially as to their vision, hearing, color sense and general condition. A certificate of examination for each man is made out in duplicate on the blank, Fig. 12, the original being sent to the division superintendent.

FIG. 13.—HOSPITAL OR FIRST AID CASE INSTALLED IN STATIONS AND SUB-STATIONS OF PACIFIC ELECTRIC RAILWAY COMPANY

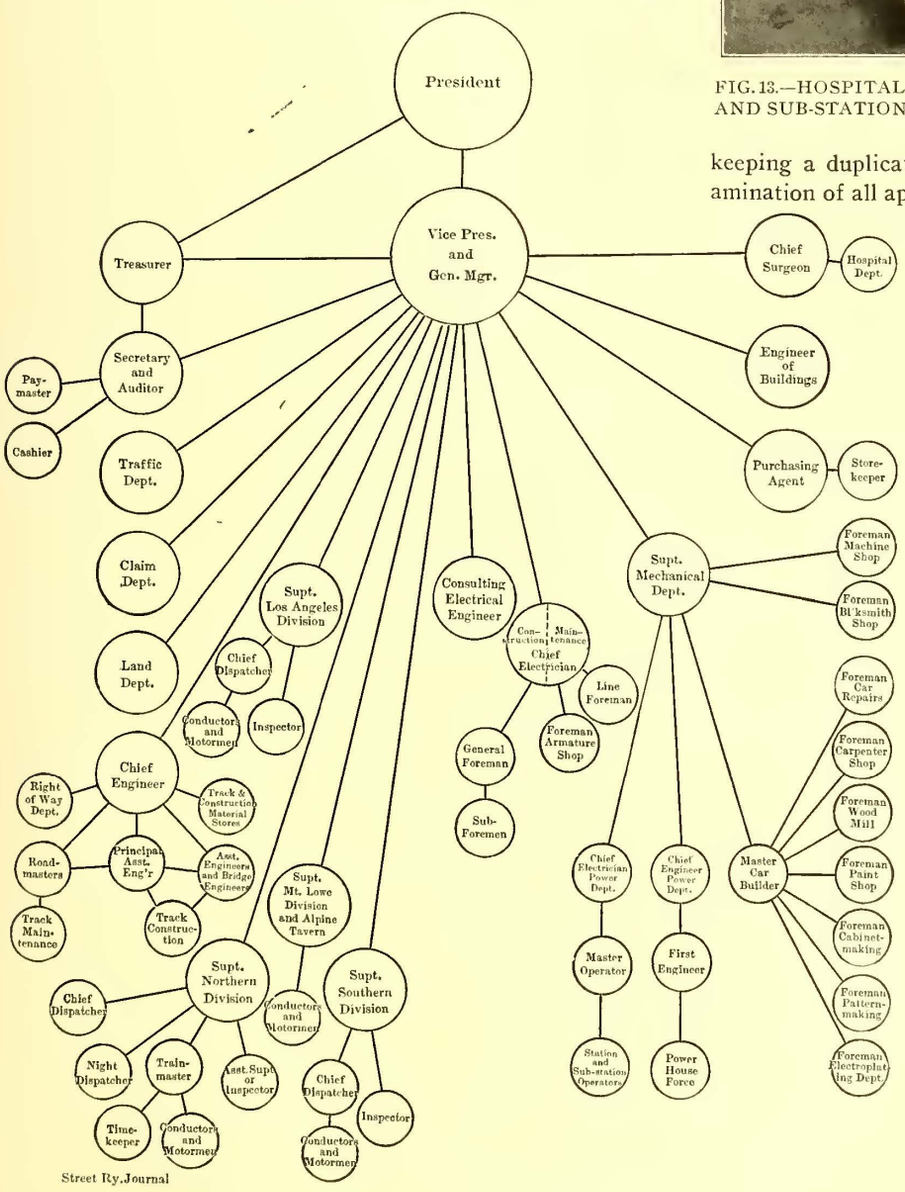

FIG. 14.—ORGANIZATION CHART

For the support of the hospital department the men are each required to pay to the company 50 cents a month, that sum being taken from their salaries. For this sum a man is entitled to medical and surgical treatment for all cases, except for sickness or injury resulting from vicious habits or contracted prior to entering the service. As a rule, the cases are treated at the employees' homes, but if serious, they are removed to a hospital, the best of attention being given in all instances. It has been found that the 50 cents a month from each employee just about pays the expenses of the department. When it exceeds the expenses the surplus goes into the fund, and when that is exhausted the company stands the extra expense.

One valuable feature of the hospital treatment is the maintenance in all the power houses and sub-stations of the company hospital, or first-aid boxes. These cases, as may be seen in Fig. 13, contain everything needed for giving first-aid treatment in case of electrical shock or burn or other accident, and in many instances limbs have been saved by the prompt use of the contents of these cases before a physician could be obtained or even called. The

equipment of a standard case is as follows: Bottle of carron oil for burns, bottle of benzine, can of absorbent swab balls, wash basin, towel, box of absorbent cotton, tin box of lint handkerchiefs, jar of Linton moist gauze, bottle of vaseline, six packages of absorbent lint, twelve Linton gauze bandages of 1-in., 1½-in., 2-in. and 3-in. sizes, four black bandages, shears, tweezers, roll of adhesive tape and book of instructions. The cases are conveniently placed, and the sub-station operators are instructed in the use of the materials and in the treatment of different cases. Each station is also provided with a stretcher for use if necessary.

ORGANIZATION AND OFFICERS

For the operation of the different departments and the handling of the large force of men hired by the Pacific Electric Railway Company, a well-defined organization is necessary, and the accompanying tree, Fig. 14, illustrates this clearly. It is seen that all the executive duties of management are centered in the vice-president and general manager, who reports directly to the president. The treasurer reports to both officials. In the case of the chief electrician there is a division made, he reporting on construction work of overhead lines to the vice-president and general manager, and on maintenance of the overhead work and the electrical shops to the mechanical superintendent. The chief engineer is shown as reporting to the general manager, but in the instance of Mr. Pillsbury, the present incumbent of the position, he reports on new and preliminary construction work directly to Mr. Huntington, the president, and really acts as an adviser to the president. As this arrangement is really made for Mr. Pillsbury on account of his long and valuable experience rather than for the chief engineer as such, it is not shown on the tree. The position of consulting electrical engineer is somewhat different than the other officials, in that Mr. Masson, who occupies that position, maintains his own office force and staff of engineers, and does work for the other Huntington corporations and for outside parties. Under his supervision are placed the designing and construction of all electrical features. The land department is really a separate corporation, known as the Pacific Electric Land Company, which handles all lands purchased in building new lines, the railway company retaining ownership only of the right of way.

The following-named gentlemen constitute the present officers of the Pacific Electric Railway Company: President, Henry E. Huntington; vice-president and general manager, Epes Randolph; treasurer, I. W. Hellman; secretary and auditor, S. C. Baxter; land agent, George S. Patton; traffic manager, H. F. Stewart; purchasing agent, C. F. Brady; superintendent Northern division, J. B. Rowray; superintendent Southern division, F. Van Vranken; superintendent Los Angeles division, J. B. Rowray (temporarily); superintendent Mt. Lowe division and Alpine Tavern, J. F. Turner; chief engineer, George E. Pillsbury; consulting electrical engineer, R. S. Masson; superintendent mechanical department, William Jennings; chief electrician, S. H. Anderson; engineer of buildings, E. S. Cobb; chief surgeon, Dr. E. A. Bryant.

THE RIVER TUNNELS IN CHICAGO

The prospect that a bill may be passed by Congress ordering the lowering of the tunnels under the Chicago River, because they are at present obstructions to navigation, has brought to a head the question as to what should be done with these tunnels by the city in case the government should require them to be lowered to permit the deepening of the river. Some are in favor of abandoning the tunnels altogether for the present. If the tunnels are lowered the approaches will have to be moved back a block or more each side of the river to avoid too steep grade. Tunnels would prove valuable adjuncts to a system of underground street railway subways in the downtown district, and this solution may be finally adopted.

THE STANDARDIZATION OF EQUIPMENTS

BY C. E. FLYNN

Many of the smaller roads that began operating electrically about 1890 have found themselves, after a few years, with a miscellaneous equipment, purchased to take care of increased traffic at various times. Especially is this true of motor and truck equipments, any of which, while in fairly good operating condition at present, are practically obsolete or odd equipments, and repair parts when purchased are difficult to obtain. If purchased at all, the cost is excessive. The result is continuous annoyance and continually increasing operating expenses. The outcome is that the company, in order to keep its miscellaneous motors, etc., in some sort of operating condition, is compelled to manufacture its own repair parts, which means an increase in the shop force. But with all this, the odd or obsolete motors and trucks are generally in a crippled condition when needed most, on holidays, during the summer time, when travel is extremely heavy. Or, if they are not actually crippled they are sent out, and generally break down on the road, causing blockades and general financial loss to the company, to say nothing of the annoyance to passengers, who vent their feelings on the management in language of "high voltage and considerable quantity." When the cause of these odd equipments giving so much trouble is investigated it will generally be found that the shop superintendent is in the habit of keeping them as extras as far as possible, and when they get out of order, and the proper repair part is not to be had, he will use some makeshift substitute that is "good enough;" or, in case there is armature or field trouble, it will get a "lick and a promise" for something better—next time.

Now, it may be that the motors are not obsolete, but simply odd equipments purchased at different times. The trouble is, there are so many kinds. In fact, it is not uncommon to find a company operating, say, a thirty-car schedule that will have approximately forty double motor equipments, including, say, eight different types of motors of practically the same horsepower. Upon looking further, it will be found that, say, about five of the odd equipments are included in twelve of the forty car equipments, and that the remaining three types are in twenty-eight car equipments. Under such circumstances I have found it good practice to standardize equipments as much as possible, and this can be done at this time at a surprisingly small cost by exchanging the odd equipments for types corresponding to those used on the majority of the cars. This can be done through one of the many dealers in rebuilt equipments, or an exchange made with other roads. Supposing that the forty equipments are distributed as follows:

Type No.	1,	15	30-hp.	equipment,	manufactured	by A. B. & Co.
" "	2,	8	"	"	"	" C. D. & Co.
" "	3,	5	"	"	"	" E. F. & Co.
" "	4,	4	"	"	"	" G. H. & Co.
" "	5,	2	"	"	"	" I. J. & Co.
" "	6,	2	"	"	"	" K. L. & Co.
" "	7,	2	"	"	"	" M. N. & Co.
" "	8,	2	"	"	"	" O. P. & Co.

For the types numbered 4 to 8 inclusive there would be extra parts in the stock room approximately as follows:

5 armatures, approximate value	$125.00	$625.00
5 sets of armature coils, approximate value	25.00	125.00
5 sets of field coils, approximate value	80.00	400.00
5 commutators, approximate value	30.00	150.00
5 gears, approximate value	12.00	50.00
5 pinions, approximate value	3.00	15.00
5 sets brush-holders, approximate value	2,00	10.00
200 lbs. field wire, approximate value	.20	40.00
5 sets brass journal bearings, approximate value	5.00	25.00
Controller and miscellaneous parts		50.00

This is supposing that the smallest practicable stock of repair parts is carried for each type.

This $1,500 does not take into account loss of interest on the

stock investment, loss of car time, insurance, and the fact that repair parts and repairs on odd equipments are, as a matter of fact, never as well looked after in actual operation as if motors were confined to one or two standards. The same remarks apply to wheels, axles and truck parts.

There are many cases where an exchange of motor equipments with some other railway company can be made on an even basis, or when made with some second-hand supply house, motors corresponding to the majority already in use on the road can be obtained in exchange for something like $150 per double equipment. When this is done it is possible to make an immediate reduction in the number of repair parts kept in stock, which goes a long way toward paying for the cost of the change. In the case under discussion, the twelve odd equipments included in types 4 to 8 in the table would be exchanged for types 1 and 2, resulting in a general lowering of the maintenance of equipment account and a consequent increase in net earnings, to say nothing of the mental relief obtained by the management.

ACCIDENTS

BY LINCOLN NISSLEY

No explanations will excuse railroad accidents, for they are results of the same old cause, repeating themselves over and over. Some one is always at fault, and investigation always shows that the trouble might have been avoided. However, explanations are always demanded and the causes are carefully compared and weighed. The busy public always takes time to do this, but having linked the chain of circumstances together, the matter is dropped, with an idea that things are not as they ought to be, but with no knowledge of how they can be corrected.

Some people ask why laws are not made to cover these cases. A reply is seldom received, for it is known that all railroads have regulations in force intended to prevent accidents. If these rules and regulations fail after years of trial and adjustment by men whose every-day work makes them thoroughly acquainted with all the details that are affected by the rules, how can it be expected that State laws will better answer the purpose?

The constant repetition of accidents shows that the provisions made to prevent them are not sufficient, or that the regulations in force are not carried out, or that accidents are bound to occur. While it is true that there is always a sufficient cause for every accident, still, an imperfection almost unnoticeable, or a cause almost inconceivable, may make trouble, and sometimes most serious trouble, while at another time a very serious defect may not have any bad result. A case comes to mind of a trolley car, under full headway, being blown from the track—lifted so completely that the track was not injured in the least. Another, when the car left the track, on a sharp curve, the track remaining in good condition, the only conceivable cause being a spike or some obstruction on the outer rail causing the car to jump the track. On the other hand, at one point on a trestle a car broke all the bolts in a rail-joint, broke the joint tie, and broke the opposite rail across from the joint, and still the car was not derailed. How can it be expected that a defect like this—a broken tie on a trestle, supporting a rail-joint with the fastenings broken, the opposite rail also broken over the broken tie—should allow a car to pass over without causing a wreck? Instance after instance could be recited to show that the results are not in keeping with the apparent causes, and that it is impossible to prevent all accidents. How a better state of things can be produced will now be the subject for consideration, and naturally leads us into a broad field.

It is evident that of the vast mileage of urban and interurban electric roads built during the last few years in this country, the larger portion are second-class roads, and that many of them have to be operated with the least possible outlay, in order that they may be operated at all. It is not to be expected that this class of road will be as substantially built as the more favorable high-class lines operating many cars daily and serving a number of populous centers. Wooden or pile trestles, for instance, can be allowed on roads running only a few cars daily, these cars being light and run at a slow speed. It would not be justifiable to make use of such structures on an important line running many fast trains at a high speed. That there is and must be a different standard of construction and equipment on different classes of roads is certainly the case.

The fact that electric railways are fast being gathered into systems, with trunk lines already extending across some States, and auxiliary lines branching off almost to every town, is a matter of considerable promise. For, if honestly operated, a far better condition of roadway and equipment can be maintained than would be possible if each line was operated separately. Methods of work and standards of construction for the trunk line will be introduced on branch lines, as fast as the business of those lines will justify. In this way a standard of excellence is established and a progressive movement started—the two things most to be desired.

Accidents may be divided into three classes:

1. Defective Roadway.
2. Defective Equipment.
3. Inefficient Service.

Of the first class, the most serious accidents are probably connected with defective bridges. The faults of all the old-style bridges have been pointed out over and over. Although an improvement over the old wooden type used for the early electric car, they were not intended for the present heavy cars and increased loads. The factor of safety that was supposed to have been a known quantity is found to be very indefinite. All roads must know the weakness of their old bridges, and any amount of watching and care cannot make them absolutely safe. The timber structures are probably responsible for most trouble, as they are subject to very rapid decay. They should be closely watched by trackmen and roadmasters. Cattle guards, when constructed as "open guards," are liable to cause trouble, should a derailed car pass over an open guard where rails are spiked lengthwise on a stringer, without the use of ties, as the truck would certainly enter the pit and a wreck would follow. All cattle guards should have good sound ties, which should be securely fastened in place, so that if necessary they would stand the blows given by derailed truck wheels.

Broken rails are a source of many accidents, and this danger is one of the hardest to provide against. The writer has a record of over 100 steel rails that broke the last ten years, seventy broke within a foot of the end of the fastening, showing the weak place to be at that point. The precautions that should be taken are to have as strong joint fastenings as can be procured. The joint and shoulder ties should be sound and full spiked, to hold the rail as firmly as possible in case it does break; and good ballast is needed to secure properly tamped ties, thus preventing joints in a great measure from getting low.

Another weak point with the maintenance of rails is that the elevated rail on sharp curves keeps working over. The base of the rail on the outside cuts into the tie until the latter are rendered unsafe, while the timber is still sound. The inside base of the rail at the same time cuts the spikes until there is danger from the rail tipping over. Tie-plates are made which, if used, will prevent the rail tipping over by keeping it from cutting into the ties. One danger from frogs, guard rails and rails in crossings is that people get their feet caught in them. Blocking has sometimes been used to overcome this danger, but it soon decays or becomes loose, and is itself a source of danger. The accidents occuring at switches and frogs are numerous,

and are frequently the result of a split switch having previously been run through by a car or train damaging the switch. Some roads use a connecting rod with a spring attachment, but these are not safe at all times; for should snow or some obstruction clog the switch-rail the lever could still be sprung to place and fastened, leaving the switch-rails in a dangerous position. Connection rods could be made, however with a coil spring compressible by passing wheels, but so stiff that a person in handling a switch could not spring it.

Dangers to be classed with those of roadway, although having very little connection with it, are that of loaded teams crossing the track and of stock running at large on public highways, either of which if struck might derail the car or train. These are things over which the railway company has no control, and the only thing that can be done is to keep the wagon road next the track and over the rails in such a condition that teams will not get stuck and delayed while passing over the track. Quite similar to the case last mentioned is that of stock being struck on the track, not on public highway. In this case trouble can be traced to defective fences or from gates being left open. The law requiring all railroads to fence their so-called right of way is a police regulation, made to protect the traveling public from accidents that are liable to happen when stock is run over. Railroads are held liable for damages, as accidents of this kind are considered to be the result of a lack in complying with the law. But it is impossible for railroad companies to keep gates at farm crossings closed, and the land owners should be made responsible by law for all damages sustained on account of such gates being left open or insecurely fastened.

Passing to the second class of accidents, those connected with the rolling stock, the item that first presents itself is that which has received so much attention in the last few years, viz., trucks. Defective wheels are sometimes responsible for accidents. A case in hand is where a wheel in the motor car broke. The base of the wheel had a circle of flaws in the center of the tread that were plainly visible on each piece of the broken wheel, and there were a large number of the pieces. There have been some accidents from trucks not being properly "trammed"—one wheel crowded the rail until the flange became worn half off, and very sharp, the other wheel not showing any sign of wear on the flange. Such trucks are very liable to catch the point of a switch-rail or frog. Brake beams and shoes get down and catch under the wheels, derailing the car. Axles and wheels break, causing wrecks. Motor suspension bolts become loose, allowing the motor to drop. Gear cases are broken by obstructions on the track, and the broken pieces are caught in the gearing, causing wrecks and derailments. These defects, like the defective wooden structures in the track, require constant watching from all employees as well as from those who are directly in charge of them.

The third class of accidents covers those that are the hardest to prevent. A mistake on the part of almost any employee engaged in the work of maintenance of road or equipment, and particularly of those in the operation of the road, brings in an element of danger which, though small, may result in a serious disaster. Still, work is done day after day without a thought of the responsibility that attends it. From the trackman who fails to find the broken rail, to the train despatcher who gives a "lap order," the same fault almost always exists, viz., the lack of close application.

Trackmen may fail to examine their track after heavy rains, or report a bad trestle, because recently examined by an engineer. Superintendents may think a wooden structure will last another year, or until men are working in that vicinity. Car repairers may neglect to repair a car because it is not needed until the rush hour, when it goes out with the rest. Trainmen may leave a switch open, expecting to pass through again soon, but an "extra" reaches there first. Motormen follow close to another car or train, when the rule is to keep several minutes behind. These and many other slips that are made are all because of lack of close application.

The best service is obtained by carefully selecting men to do the work. There should be different grades, and promotion should be the reward for careful and thorough work. It often happens that trainmen, in order to get over the road quickly, or to make up lost time, will take risks that are known to be wrong. The fact that violations of this kind are not noticed unless they result in a wreck, leads men to think that while the rules should be observed, when there is known to be danger, they are impracticable for constant application; and knowing if bad results follow they will be met with the severest punishment, it becomes to them a matter of luck whether they get into difficulty or not.

Under this state of things, constantly neglecting small matters of precaution, men become familiar with danger and a condition of things the very opposite of what should be desired gradually comes about. Every time a regulation is violated the acute sense of responsibility is blunted, when, for the sake of all concerned, it should be constantly growing stronger. To this end all rules should tend; they certainly should be made applicable at all times, and the fact impressed that it is as serious a matter to violate a rule at one time as at another.

Electric railway management is a complicated problem. It is a great and growing industry; and, considering the difficulties to be overcome, is entitled to greater commendation. That the managements of our lines lay hold of improvements as fast as introduced shows that they recognize the importance of having everything in the best possible working order. Failures point out the way for improvement, and if their voice is listened to, and the lessons they teach is rightly obeyed a progressive state of systematic improvement in all departments will exist. With experience as a guide and a willing disposition to improve, what is now known to be an unsatisfactory state of things may be changed into one that will be highly commendable.

THE BENEFITS OF INTERURBAN ELECTRIC RAILWAYS TO SMALL CITIES

Under the above title John W. Fulwider, city engineer of Lebanon, Ind., in a paper recently read before the Indiana Engineering Society, at Indianapolis, outlined the many actual advantages enjoyed by his community as the result of the construction through it of an interurban railway. In his opinion there is nothing else in this decade that adds as much to the enjoyment and convenience of the people, and especially to that of the rural population and residents of small cities. While people of the great centers may profit greatly in a commercial sense, and because of the opportunity to get nearer nature with convenience there cannot be the vital effect on their condition that there is on that of the rural population.

It is especially with conditions as they exist in Lebanon, through which the Indianapolis & Northwestern is constructed, to which the writer referred. Before the construction of the line there was a fear that some business interests would be injured, but it has not proven so. While some has been lost, much more was gained. A livery man said that his business was much better than before the advent of the line. While it cut off many long drives it added many more short and more remunerative ones. The high school of the city has been greatly benefited by the advent of the interurban, on account of the increase of attendance from those living out of town. There is also a marked increase of church attendance from the rural districts. One of the advantages most appreciated by the business men and public is the freight service. If the merchant has a call for something he has not in stock he knows he can

get it in from two to three hours time from the city. The customer knows that he can depend upon it with practically an absolute certainty.

ELECTRIC RAILWAY TESTS AT ST. LOUIS

One of the most interesting and valuable features of the St. Louis Exposition, from a street railway standpoint, will be the elaborate series of tests which will be conducted at St. Louis, under the auspices of a special commission appointed by the Exposition authorities last year. In previous fairs of this kind comparison between electric railway apparatus could be made by inspection only as the appliances were shown in the exhibit. At the St. Louis Exposition, however, the tests described will determine not only the commercial value of the apparatus shown, but also, it is hoped, some interesting and valuable results of a scientific character will be derived, which could not well be obtained by any experiments conducted under private auspices.

The personnel of the Electric Railway Test Commission has already been announced in this paper, and consists of J. C. White, New York, chairman; H. H. Vreeland, New York; W. J. Wilgus, New York; James H. McGraw, New York; and George F. McCulloch, Indianapolis. A number of meetings have been held by the commission, and some of the results accomplished can now be announced.

On the grounds of the Exposition the authorities will provide special tracks, having an almost level grade and well ballasted, for the operation and testing of railway car and locomotive equipments. These special tracks consist of one section, 1400 ft. in length, and one section 2000 ft. in length, the two sections being parallel. Upon these tracks it is proposed to carry on the greater part of the operating, acceleration, braking, coasting and motor-heating tests, which will be described below, as well as tests to determine car and train friction. That the length of the tracks is adequate for the greater part of these tests is assured when it is remembered that for a given temperature the capacity in tons per motor is practically a fixed amount, and independent of the number of stops per mile. The number of stops made by an electric car will vary from a maximum of fifteen stops per mile in city practice to a minimum of about one stop in about 5 miles in local interurban practice. Five stops per mile is a very frequent figure, even in interurban work, whereas the test track facilities admit of a rate of operating equivalent to five stops in 2 miles.

The tests for determining the heating of electric railway motors in service under different conditions of gearing and schedule, etc., can be made by operating the car continuously over a given length of track as a shuttle train, first in one direction and then in the reverse direction. In this way conditions can be kept perfectly uniform, and wind resistance, to a great extent, eliminated. The effect of passengers can be obtained by a dead weight load upon the car, and variation in the behavior of the car under light and heavy loading investigated.

In addition to the capacity and acceleration tests already mentioned, it is thought that some valuable wind resistance tests can be conducted, and the importance of this subject will readily be admitted by all conversant with railway work. Most of the data now at hand has been developed largely through tests made upon steam railroads, and very little reliable information of even this kind is available, especially as to the effect of different shaped car ends on single or multiple-car operation. When such data is determined, as expected in St. Louis, it will be possible much more accurately to adapt railway car and train equipments to economic service on the roads for which they are designed than at present.

In case the tracks at the Exposition should not be of sufficient length to conduct these train resistance or some of the other tests proposed, it is possible that they may be carried on elsewhere, not far from St. Louis. If this should prove necessary, Commissioner McCulloch has offered the use of part of the track system of the Indiana Union Traction Company. This company has a number of long tangents, one of them 8 miles in length, laid with 80-lb. rail, level and well ballasted, which would be eminently suited for high-speed running.

In addition to the trials which will be conducted on these tracks, as detailed above, the commission will carry on a number of tests in the Electricity Building.

All of these tests will be supervised by some engineer of national reputation, to be selected later, and all instruments and appliances used in connection with them will be calibrated by the National Bureau of Standards. The latter bureau will erect in the Palace of Electricity a laboratory for this purpose, equipped with all appliances needed for the accurate standardization of all the instruments, meters, etc., required.

Before deciding upon the detailed tests to be made, the Test Commission appointed four engineering committees to draw up a series of recommendation of the various tests, which, in their opinion, would cover the main branches of electric railway work as at present developed. These committees were as follows:

ENGINEERING COMMITTEE ON TEST OF CITY AND SUBURBAN EQUIPMENTS

M. G. Starrett, chief engineer, New York City Railway Company.

D. F. Carver, chief engineer, Public Service Corporation of Jersey City.

W. S. Twining, chief engineer, Philadelphia Rapid Transit Company,

ENGINEERING COMMITTEE ON TEST OF INTERURBAN EQUIPMENTS

A. L. Drum, assistant general manager, Indiana Union Traction Company.

Charles Jones, chief engineer, Elgin, Aurora & Chicago Railway.

C. A. Alderman, chief engineer, Appleyard System, Springfield, Ohio.

ENGINEERING COMMITTEE ON TEST OF HEAVY TRACTION EQUIPMENTS

F. J. Sprague, New York City.

B. J. Arnold, New York City.

W. J. Wilgus, New York Central & Hudson River Railroad, New York City.

F. R. Slater, assistant engineer to L. B. Stillwell, New York City.

ENGINEERING COMMITTEE ON NEW ELECTRIC RAILWAY SYSTEMS

B. J. Arnold, New York City.

Paul M. Lincoln, Westinghouse Electric & Manufacturing Company, New York City.

W. B. Potter, General Electric Company, Schenectady, N. Y.

The following are briefly the tests which have been recommended by the first two of these committees, and which have tentatively been adopted by the commission. A digest of the tests in the departments of heavy traction equipments and new electric railway systems will be published in an early issue.

TESTS FOR CITY AND SUBURBAN EQUIPMENT

The tests on apparatus in the Electricity Building suggested are as follows:

(1) Tests of various kinds of electric railway motor equipments under constant load, regulated by brake, to determine rate of heating (a) of the armature, (b) of the field coils.

(2) Tests of electric railway motor equipments of the various kinds, to determine the motor efficiency under different fixed conditions of operation, including a varying number of stops per mile.

(3) Tests on motor equipments to determine their torque curves and accelerating power.

(4) Tests on electric railway motor equipments under constant loads, to determine the rheostatic losses corresponding to various lengths of time consumed in application of full-current strength.

(5) Tests on electric railway motor equipments to determine at what loads, speeds and frequency of stops it becomes economical to adopt automatic control in place of hand control for single cars.

(6) Tests of hand, automatic and multiple control systems to determine their relative economy, certainty and regularity of starting motor car equipments under fixed conditions of load and track.

(7) Tests of electric railway motor equipments to determine safe load during continuous operation, as compared with rated capacity of motors.

The tests on the experimental track are as follows:

(8) Tests to determine the relative values of two-motor and four-motor car equipments: (a) as to power consumption with fixed loads, and with varying loads; and (b) as to acceleration with both fixed and varying loads.

(9) Tests to determine the proper method of mounting a two-motor equipment on an eight-wheel two-truck car, viz., on which two of the four axles shall the motors be mounted?

(10) Acceleration tests on single cars and on motor car and trailer, showing rate of acceleration and power used with both hand and automatic control.

(11) Comparative tests on different types of power brakes, both electric and mechanical, in respect to efficiency and economy.

(12) Braking tests on single car and on motor car with trailer, under varying conditions, with both hand and power brakes.

(13) Tests on single car equipments to determine motor and truck friction at different speeds.

For tests on storage battery cars the following are recommended:

(14) Tests to determine the efficiency of batteries under maximum, average and varying loads; also

(15) Tests to determine life of batteries under average and adverse conditions of service.

TESTS FOR INTERURBAN EQUIPMENT

The tests on apparatus to be conducted in the Electricity Building for interurban equipment are largely the same as those recommended for city equipment. For the experimental tracks the committee has recommended a series of tests with various classes of cars and equipments, provided time will permit. If only one type of equipment is tested the committee suggests a car body weighing 16 tons to 20 tons, exclusive of trucks and motors, with a pair of trucks weighing 8 tons to 12 tons per pair and a standard four-motor equipment of 75-hp motors, equipped with different types of hand and train controlling apparatus.

The three points to which effort will chiefly be directed, in case facilities for conduction high-speed tests are available, are as follows:

(1) The relation between the average electrical losses in the motors and the rise in temperature attained under various conditions of high-speed service.

(2) The train resistance (or power required to propel a car or train at uniform speed) at very high speeds.

(3) The performance of cars equipped with controllers so arranged that the acceleration is automatic, as compared with the performance under similar conditions, where the rate of acceleration depends upon the handling of the controller by the motorman.

In the test on electrical losses an effort will be made to determine, of course, the average losses at different schedule speeds with a given rise in temperature and with different periods of stops and lay-overs.

The train resistance tests recommended are with single cars, and also with trains made up of different numbers of cars at various speeds, from 40 m. p. h. upwards, and measured in different ways, viz., by direct measurement of instantaneous power input when running at uniform speed, and by the coasting method.

In the test of control systems it is proposed to investigate not only the efficiency of different systems of control, but the effect of automatic acceleration on the power consumption, etc.

The Electric Railway Test Commission has already taken up the subject of the scope of these tests with the American Street Railway Association, and has been assured by the executive committee of the latter that the association considers these tests of great interest and value to street railway companies as a whole. To defray the expenses of the tests, which are estimated at about $10,000, a fund is being raised by voluntary contributions, and the different railway companies in the country will be asked for small contributions to the fund.

CONVENTION OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

President Harrie P. Clegg, of the newly-organized Ohio Interurban Railway Association, has sent a letter to presidents, managers and operating officers of all electric railways in Ohio and Eastern Indiana, announcing the formation of the association. After reviewing the proceedings of the meeting of Feb. 29, which was reported in full in the Street Railway Journal of March 12, President Clegg writes as follows:

It is undoubtedly apparent to you that there are many advantages which can be derived from such an association, if properly conducted and enthusiastically entered into by all of the roads. Your active co-operation is requested in this work, and it is hoped that we may enroll you, as well as the other officers of your road, as members of this association, so that your interest may be represented at a meeting which will be held at the Algonquin Hotel, Dayton, Ohio, on Thursday afternoon, March 31, at 2 p. m.

The enclosed circular gives a brief outline of the purposes and objects of this organization, together with a synopsis of the means which will be employed to carry out same.

This invitation is issued to you for the purpose of enlisting your interest in the matter, with the hope that you will see to it that your properties are properly and adequately represented in all departments of the organization.

An early response, together with an expression of your opinion as to the advantages of such an organization, will be duly appreciated.

The circular mentioned is as follows:

THE OHIO INTERURBAN RAILWAY ASSOCIATION

The object of this association shall be to promote knowledge on all matters relative to the construction and management of interurban railways and their equipment, which may be brought before the association for consideration and discussion, to promote, encourage and facilitate the interchange of traffic, and further social relations among its members.

Any person engaged in the construction, operation or maintenance of interurban railways, or persons of distinction in the interurban railway world, and any others whom the association may wish to honor, shall be eligible for active membership.

Subjects of an interesting and instructive nature will be arranged for discussion at the meetings of the association, and also for the presentation of suitable papers in conection with subjects for discussion.

The meetings will be held on the fourth Thursday of each month, at places designated by the executive committee.

The annual dues of the association will be $3, and will be payable at the time application blank is sent to the secretary, and within thirty days after the annual meeting thereafter. The association will be carried out upon the lines of the "New York" and "Pennsylvania" associations, and also the "New England Street Railway Club," which associations stand pre-eminent and are of considerable influence in the electric railway world at the present time. These associations have demonstrated and proven by years

of experience, the absolute necessity of organizations of this kind among the electric railway men, and it is sincerely hoped that all interurban railway officials will give this association their hearty support, that the "Ohio" association may stand at the head of similar associations, as the State stands to-day ahead of any other State in the equipment and extent of her interurban properties.

J. H. Merrill, of Lima, Ohio, secretary of the new association, and chairman of the committee appointed to decide on interchangeable mileage, states that at a meeting of this committee held last week certain agreements were prepared and will be recommended to the members of the Ohio Interurban Railway Association at the meeting to be held at Dayton, March 31. Companies interested in the interchangeable mileage plan and desiring to become parties to the agreement are requested to communicate with Mr. Merrill at the earliest possible date, because it is probable that at the meeting the committee will be instructed to proceed with the printing of the mileage books, and it is desirable to have as large a list as possible as parties to the first issue of the uniform mileage.

Mr. Merrill's committee has recommended that the Thrall form of coupon mileage be adopted rather than the straight mileage, as used by steam roads. Under this plan the book will consist of 200 5-cent coupons, which will sell at $7.50. The association will make an arrangement to print the tickets in bulk, it being understood that each company will have its name printed on each coupon of the books it will sell, which will serve as identification. By means of a clearing house, coupons will be forwarded to the selling company weekly, and remittances for the same will be made not later than the tenth of each month, on a basis of 75 per cent of the face value of the coupons collected. The books are to be sold with a limit of two years, good for the individual whose name appears on the cover. In event of it becoming necessary to redeem any of the books prior to expiration, redemption will be made upon a basis to be decided upon later.

The form recommended by the committee is presented below, and Mr. Merrill requests that Ohio and Indiana managers give it careful consideration and present recommended changes or suggestions, either by communication to the chairman, or in person, at the meeting of association above mentioned.

As evidence of the ultimate success of the universal mileage movement, Mr. Merrill informs us that twelve leading Ohio companies have already agreed to adopt the mileage in its present form, these being the following:

The Dayton, Springfield & Urbana Electric Railway Company, Springfield.
The Urbana, Bellefontaine & Northern Railway Company, Urbana.
The Springfield & Western Electric Railway Company, Springfield.
The Dayton & Troy Electric Railway Company, Dayton.
The Dayton & Western Traction Company, Dayton.
The Dayton & Northern Traction Company, Dayton.
The Dayton, Covington & Piqua Traction Company, West Milton.
The Toledo, Bowling Green & Southern Traction Company, Findlay.
The Toledo, Fostoria & Findlay Railway Company, Fostoria.
The Cincinnati, Dayton & Toledo Traction Company, Cincinnati.
The Dayton & Xenia Transit Company, Dayton.
The Western Ohio Railway Company, Lima.

The form recommended by the committee is as follows:

BOOK COVER

Form..... Book No.....

Interchangeable Coupon Ticket

Sold by.....Railway

Good between all stations on the Interurban Electric Lines mentioned below:

(Probably names of 12 companies on first book printed).

Good only for the individual use of persons whose signature appears on contract and when officially stamped by Selling Agent and subject to all the conditions named in contract. Signature to contract must be made in ink.

Care should be taken to keep the coupon strips in their original folds within the cover for the convenience of the conductor in tearing coupons. Read all conditions and notices hereon.

Days of the month, name of the month and year to be printed on the margin, providing for a 2-year limit.

AGENT'S STUB

To be filled out and detached by Selling Agent and forwarded to the Auditor's office with his daily report.

Interchangeable Coupon Ticket
$7.50
Book No.....
Good only for use of
.....
.....
.....
.....
Sold at.....Station
.....190 .
This book expires.....190 .

AUDIT CHECK

Interchangeable Coupon Ticket
Book No.....
.....
.....
.....
.....
Signature of persons authorized to use this ticket.
Sold at.....Station
.....190 .
Expiration date punched in margin of cover.....190 .
The conductor will take up this audit check upon first presentation of ticket, and return same to Audit office with other tickets.

CONTRACT NO.....

1. This cover when accompanied with money strip consisting of 5-cent coupons, all of which must be attached to cover in consecutive order, entitles the purchaser, whose name appears as signature to this contract, to transportation over any of the electric railways herein mentioned, and will be hereafter bulletined, providing the signature on back of coupon made in the presence of the conductor agrees with signature affixed to contract.
2. Failure on part of conductor to note discrepancy in signature on coupon does not forfeit Selling Company's privilege to demand surrender of ticket at its option.
3. Mutually agreed that if this reduced rate ticket is presented by any other than the original purchaser, or if the conductor demands the surrender of the ticket and payment of full fare, said ticket to be surrendered and application for rebate made on company from whom the original purchase was made. No attempt to be made with the object in view of adjusting differences with the conductor.
4. All coupons will be null and void unless attached to cover in same consecutive order as originally purchased, and good only when torn by conductor in the presence of the passenger.
5. Conductor will detach sufficient number of coupons to cover local fare on his train.
6. This ticket does not permit of checking baggage gratis.
7. This ticket good over lines heretofore mentioned for two years from date of purchase. No rebate will be allowed for unused portion of ticket at expiration of time limit as punched on margin.
8. Minimum fare to be collected limited to 10 cents.
9. Sign in ink.

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The electric railways centering at Toledo recently suffered losses from floods for the third time this winter. High water in the Maumee River completely tore up 400 ft. of track on the Waterville line of the Maumee Valley Railway & Light Company, and three stone piers and a portion of a trestle of the bridge of the Toledo Urban & Interurban Railway were carried away, inflicting a loss of $10,000. The Toledo Railways & Light Company saved its power house from another tie-up by building a brick wall around the station. The Lake Shore Electric Railway again suffered between Toledo and Fremont. The company practically sealed the walls of its power house, which had previously been flooded by high water, and kept the plant free from water by the aid of pumps installed on the boiler room floor.

CORRESPONDENCE

KEY WAYS IN WHEEL SEATS

March 21, 1904.

Editors Street Railway Journal:

I notice a reference in your last issue to the use of keys in seating car wheels. The advisability of doing this has been a mooted question on our road, but I have always maintained that it is better not to use keys. A key way of half an inch on the axle and of a similar depth on the hub necessarily weakens both the axle and the hub. That is, if the axle is 6½ ins. in diameter, its strength is practically only that of 6 ins., so that the burden of proof as to the value of keys is certainly with the advocates of their use. The only argument which can be presented for the use of keys is, of course, that the wheels will not become loose, but I have never known of any actual instance where a wheel has become loose when it has been properly pressed on the axle without a key. On the other hand, the use of keys tends to poor work on the part of the wheel fitter. If he realizes that a key is used he will become careless in fitting on wheels, whereas, without a key he will realize that the fit must be close and good, otherwise the wheel will not hold.

Master Mechanic.

MAINTAINING THE SCHEDULE

Denver, March 15, 1904.

Editors Street Railway Journal:

As an observer of street and interurban railway traffic in the East and West, certain points have come to my attention that carry an operating interest to those concerned with the maintenance of schedules. The subject is not altogether new, to be sure, but the problem is always with us, and it may not be out of place to emphasize some of the vital factors which bear upon it. Broadly speaking, it is difficult to point out anything which causes a greater falling off in public good will and confidence than frequent failure to cover a given run between terminal points in the advertised time.

One could multiply dozens of illustrations of the discomfort, inconvenience, exasperation and loss of time induced by breakdowns in railway schedules, if it were essential. From the business man trying to catch a train to the small boy who is kept after school for tardiness, there is just one opinion of the service which is responsible for their predicaments. The financial loss to the operating company induced by the higher cost of service per car mile and car-hour, the greater cost of power per ton mile in making up lost time, the diminished receipts per car-hour—these and other cogent reasons demand a perfect schedule from the company's standpoint. Clearly it is a loss all around when the cars are late.

It is surprising how many little things affect the schedule, and how much it can be benefited by close attention to details. That the motorman must know the "feel" of his car over every foot of the route almost goes without saying. There are few places in the entire transportation industry where sound judgment draws greater interest. Then there is the conductor, the man of many duties. Promptness in giving the bell signals, quickness and accuracy in making change, skill in replacing a lost trolley, alertness in helping passengers on and off the car, sharpness of observation and a thorough knowledge of the route all come into play in covering the required distance in the established time. One small feature, although an unimportant one, used in Denver for saving time to the conductor, is the cash carrier, in which different varieties of change are carried in small parallel cylinders, and change can be made in the fraction of a second. The proper use of sand by motormen and the careful handling of the controller so as not to cause delays by blown fuses, might also be mentioned in this connection.

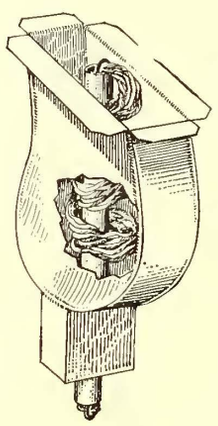
No better illustration of the importance of schedules could be given in conclusion than the studies of the Boston Elevated Railway Company prior and subsequent to the operation of its train system. For months before wheels turned upon the elevated structure, engineers plotted speed-time distance curves in every conceivable combination; the alignment and grade was gone over with templates, planimeters and patience, and the effect of every change estimated. The road began operation, and from that day to this it is safe to say that the schedule problem has never been lost from sight. Stop-watch tests by the hundred have been made, and the whole problem studied in the light of that experience which only active operation can give.

Observer.

OIL FOR MOTOR LUBRICATION IN UTICA

The Utica & Mohawk Valley Railway Company, of Utica, N. Y., is now using oil for lubricating the motor bearings of all of its double-track car equipments. The results have been so satisfactory from every standpoint that oil will be used on the single car equipments as well. The motors employed on this road are the Westinghouse No. 56 and No. 68, which are primarily designed for grease lubrication. When oil was first substituted for grease the boxes were filled by a man stationed at each end of the line, who simply poured a quantity of oil into the old grease boxes of the motors. The journals, however, ran quite hot and gave considerable trouble, and it was found that in pouring in the oil into the boxes a good deal of dust would find its way in, too. As a rule, this dust and dirt would come from the tops of the box lids and from the sides of the motor casing.

To avoid this trouble the oil cup illustrated herewith was designed by the chief engineer of the Galena Signal Oil Company, whose oil was being used, and was put in service last July. The results have been very satisfactory, as the oil bill has been reduced one-third. Standard steam railroad oil is used. The boxes are made of tin, and of the somewhat peculiar shape shown, so as to fit into the present grease boxes of the motors. The old grease box covers of the motors fit over them and keep them dust and dirt proof.



OIL CUP USED FOR LUBRICATING MOTOR BEARINGS IN UTICA

It was first thought by some of the officials of the railway company that the oil cups would feed all the time, but such has not been found to be the case. The feed depends upon the number of woolen strands used, and can be regulated to a nicety by varying the number of strands employed. The present practice of the road is to regulate the feed to three or four drops per minute. Once a week the cups are taken out and cleaned. They are filled once a day, and do not require refilling, even on cars which run 10 hours per day.

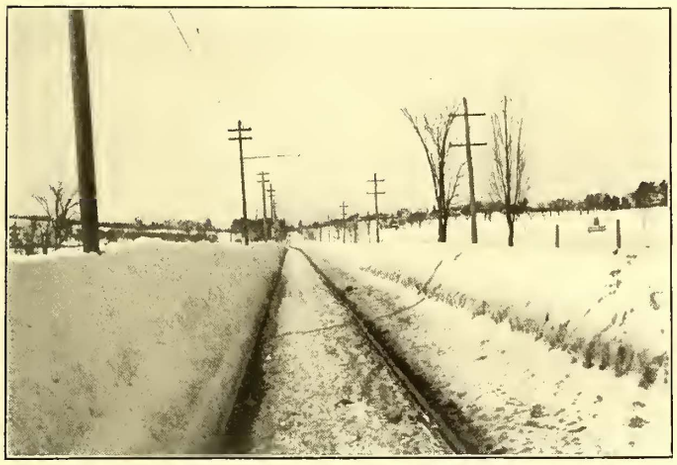
In this connection it might be said that the Utica & Mohawk Valley Railway Company is using almost entirely at the present time solid motor bearings instead of split bearings. The mechanical department of the road has also taken out the oil rings that were furnished with the motors by the manufacturer, and has cut oil ways in the new solid bearings, for use in connection with the oil cup illustrated.

The State Senate has passed the Heinlein bill, giving the right of eminent domain over private property in cities to electric railways. The bill restricts this power to railways desiring entrance to a city or for straightening tracks, but prohibits power houses, car houses or terminals under the provisions. The bill is now pending in the House.

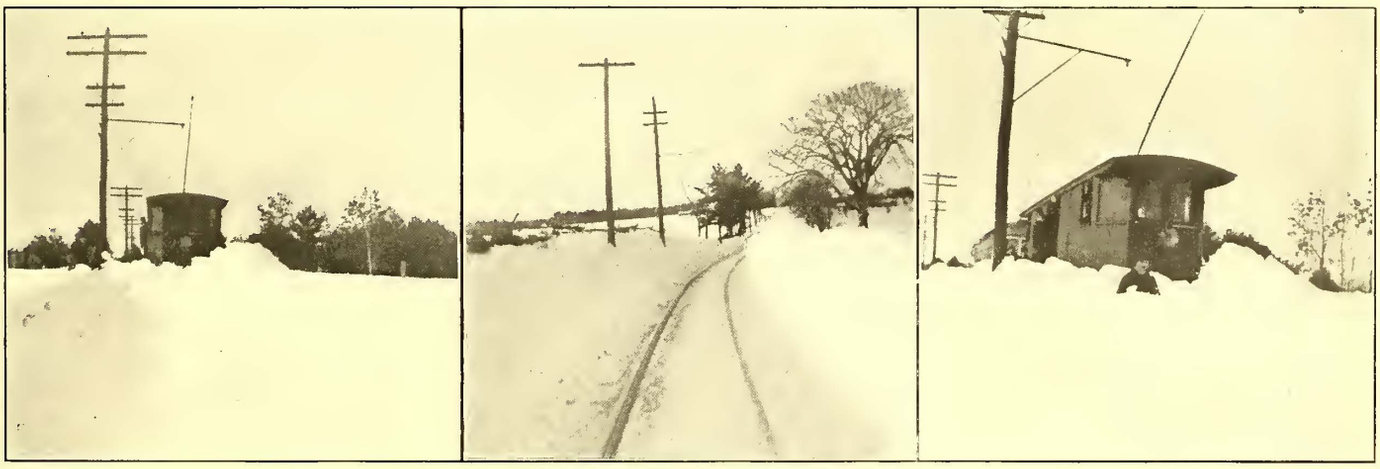
SNOW REMOVAL IN NEW ENGLAND

The term, "a real old-fashioned New England winter," is familiar to many of the readers of this paper, and it has possibly been used in the editorial columns of the paper during the present season in connection with the subject of the removal of snow from electric railway tracks. To those who know the meaning of the term only by hearsay, however, a visit to some of the Northern States in New England during the cold months will be somewhat of a revelation. Snow storms are not only frequent but heavy, and the snow piles up on the track in a way to defy anything but the heaviest and most powerful plows.

The accompanying engravings, which were furnished through the courtesy of D. A. Belden, president of the New Hampshire Traction Company, illustrate some scenes on the lines of that road during February. Mr. Belden states that the views depicted are in no way exceptional, but can be taken as a fair indication of the conditions in Northeastern Massachusetts and Southern New Hampshire during January and February of this year.



TYPICAL SNOW SCENES ALONG THE LINE OF THE NEW HAMPSHIRE



As shown in the views nose plows are used, and wings clear the track for a short distance on one side the car, to give access to it. The company has fifteen double-truck four-motor Taunton snow-plows of the heaviest type. The work performed by these plows has been very satisfactory, but after succeeding storms the snow becomes so high on every side of the track that the company has come to the conclusion that nothing short of a rotary snow-plow is effective under these extreme conditions. As the company has had no rotaries this year shoveling has been resorted to in some cases.

The annual meeting of the Lake Street Elevated Railroad Company, of Chicago, has been postponed until March 31.

THE WESTINGHOUSE SINGLE-PHASE RAILWAY SYSTEM

Some interesting details of the power station and car equipments of the new single-phase motor system of the Westinghouse Electric & Manufacturing Company have recently been made public. From advance proofs of an article by Clarence Renshaw, in the "Electric Club Journal," the following particulars are taken:

GENERATING AND DISTRIBUTING SYSTEM

Two-phase generators are preferable to single-phase on account of the increased output for a given amount of material. The two phases should be kept separate, and should supply different parts of the road. An insulator must, of course, be placed in the trolley wire to separate the two parts of the line thus served. Where three-phase machines are already installed, they can be utilized by carrying off three separate single-phase circuits, and dividing the line into three sections instead of two.

The standard frequency of 3000 alternations, or 25 cycles, has been adopted for single-phase railway work.

The voltage of the transmission line, which supplies the high-tension side of the transformer stations, may be chosen in the same manner as the voltage of any high-tension transmission line, with reference to the distance of transmission and the general local conditions.

Power will be supplied to the trolley through transformer stations located along the line. Each station need contain only a single transformer unit, since the stations will be placed so close together that in case of accident to one of them the adjacent ones can supply sufficient power to enable the cars to still operate over the portion of the line ordinarily fed by the damaged transformer station. In general, with a trolley voltage of 1000, a car equipment not larger than four 100-hp motors, and with a schedule such that no more than two cars will at any one time be located between two adjacent transformer stations, the transformer stations may be placed from about 6 miles to 8 miles apart without requiring any 1000-volt conductors other than the trolley wire and the track rails.

There will be no moving machinery in these transformer stations, and, therefore, constant attendance will be unnecessary. As transformers require only a comparatively small space, the transformer station buildings may be small and comparatively cheap. Fig. 1 gives a general idea of the connections of the apparatus in a transformer station containing the following apparatus:

One oil-insulated self-cooled transformer.

Two high-tension fuse circuit breakers, with the necessary barriers.

Two low-equivalent lightning arresters for protecting the high-tension transmission lines.

Two choke coils for use with lightning arresters.

One automatic oil circuit breaker in the low-tension circuit between the transformer and the trolley, so arranged as to open only on a continued short circuit, or a fuse and a switch.

Two knife switches to disconnect the circuit breaker from the trolley, to enable inspection or repairs to be made.

One low-tension lightning arrester.

The voltage which may be used on the trolley is limited in general by the insulating material which is available. A high-voltage trolley will require different line material from the present standards. Line material for 1000 volts can be readily obtained in the market at present, and it is not known that such material for any higher voltage is now on the market. Hence, approximately, 1000 volts (i. e., 1100 volts at the generator or transformer station) is, in general, the maximum allowable at present, and this is considered as standard. Lower trolley voltages may be used where local conditions require it.

An equipment can readily be arranged to operate at two different trolley voltages, so that, for instance, a high-voltage trolley may be used in open country and a lower-voltage trolley in towns or cities. This arrangement can be provided for by means of a low-voltage tap on the high-tension side of the main auto-transformer on the car and a double-throw switch, so that the wire from the trolley can be connected to either one of the two taps on the main auto-transformer. Figs. 2 and 3 show how low-voltage sections of trolley may be supplied. If the low-voltage section is adjacent to a transformer station fed by the high-tension transmission line, an extra tap from the low-tension side of the transformer will suffice.

Where it is necessary to pass over tracks already occupied by cars using direct current, an additional trolley wire may be placed alongside of the direct-current trolley wire to carry the alternating current. The voltage of this alternating- current trolley may then be made approximately the same as that of the direct-current trolley.

Should a direct-current car place its trolley on the alternating-current wire, the inductive resistance of the motors would prevent sufficient current flowing to damage them, and

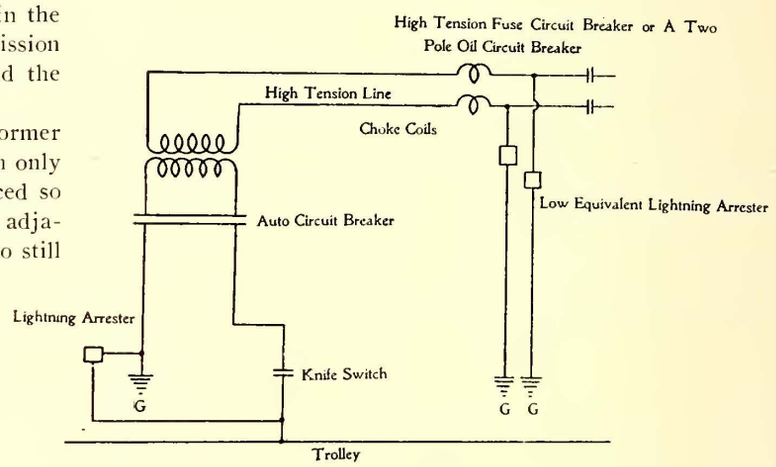


FIG. 1.—CONNECTIONS IN TRANSFORMER STATION.

the error would be quickly evident from the fact that the car would not operate. Should the trolley of an alternating-current car be placed on the direct-current wire, a large current would instantly tend to flow through the transformer, but this would open the circuit breaker at once, and damage would thus be prevented.

CAR EQUIPMENT

The essential details of car equipments are shown in Figs. 4 and 5. Starting from the trolley, these include the circuit-breaker, main auto-transformer, induction regulator (or hand controller), reverse switch, motor cut-out switch and motors. Lighting transformer, lightning arrester, lamps, sockets, wiring, etc., are also included.

Any standard equipment for use on cars where compressed air is available (i. e., cars with air brakes) can be supplied with induction regulator control. When this is used the regulator, reverse switch and circuit breaker will be operated by compressed air from the brake system of the car, and controlled by means of a master switch through electromagnetic valves. These valves will be similar in general to those used on direct-current unit-switch control and on the signaling systems of various railroads. The action of the induction regulator may be easily understood by reference to Figs. 6 and 7. The regulator is essentially a transformer with the primary core and winding movable with respect to the secondary. With the primary, as in Fig. 6, the maximum voltage is generated in the secondary of the regulator, and it opposes the voltage of the main auto-transformer. With the primary at 180 degs. from this position, the voltage of the regulator will aid that of the auto-transformer. With the primary of the regulator as in

Fig. 7, the voltage of the secondary is zero, so that it neither aids nor opposes the voltage of the auto-transformer.

The car is started with the voltage of the regulator a maximum, and opposing that of the auto-transformer. The regulator is then moved gradually until the position is reached where its voltage is a maximum and aids that of the auto-transformer. This is then the full-speed position. The induction regulator control can be readily adapted for multiple-unit train operation, with slight additions in the way of apparatus and wiring.

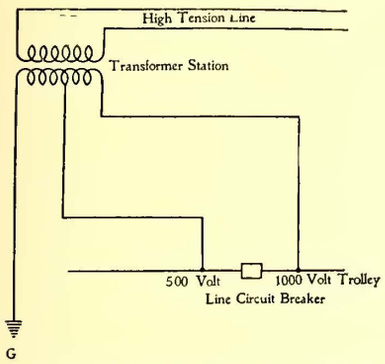


FIG. 2.—METHOD OF FEEDING TROLLEY WIRE SECTIONS OF DIFFERENT VOLTAGES

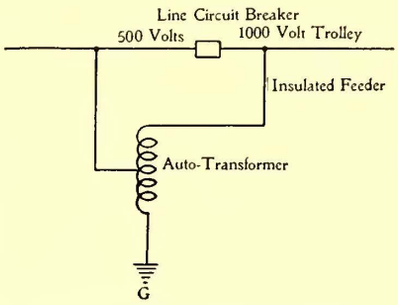


FIG. 3.—CONNECTIONS ON CAR FOR TROLLEY WIRE SECTIONS OF DIFFERENT VOLTAGES.

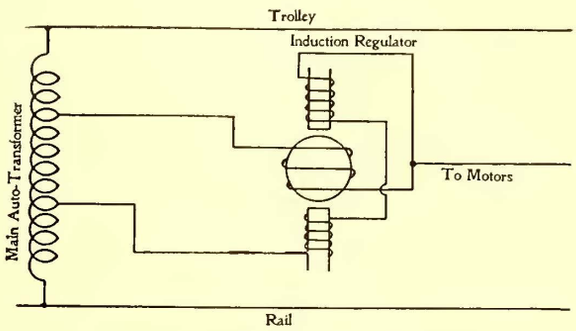


FIG. 6.—DIAGRAM SHOWING ACTION OF INDUCTION REGULATOR ON CAR

For small equipments hand control may be used. This will consist of platform controllers similar in general to the present direct-current controllers. With the hand control, as now proposed, the motors will be connected successively to different taps on the main auto-transformer, as shown in Fig. 5. The voltage applied to the motor thus depends on the position of the contact point *D*. This control will have a definite number of steps similar to the direct-current control, but the motors can be run continuously on any step, and there will be no rheostatic losses.

As may be seen from Figs. 4 and 5, the motor voltage is entirely independent of the trolley voltage. A standard motor voltage of 250 has been adopted for single-phase railway motors, regardless of the trolley voltage used.

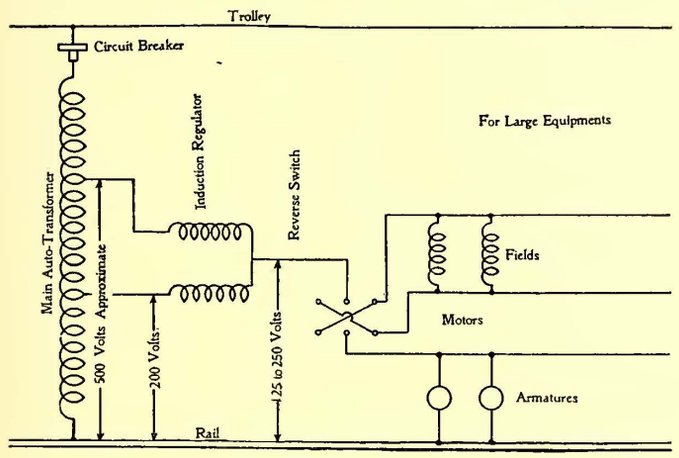


FIG. 4.—DIAGRAM OF CAR CONNECTIONS FOR LARGE EQUIPMENTS

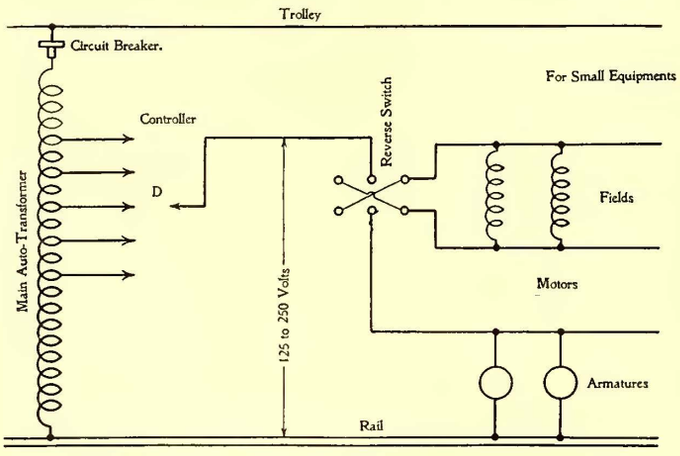


FIG. 5.—DIAGRAM OF CAR CONNECTIONS FOR SMALL EQUIPMENTS

In general, the lights in the car will be supplied by a small auxiliary transformer reducing the trolley voltage to approximately 50 volts. If electric heaters are desired, these may be operated from the main auto-transformer. The air compressor for supplying brakes and operating the induction regulator will be operated by a series alternating-current motor taking current from the lighting transformer.

As a rule, the motors will be connected permanently in parallel, both in two and four-motor equipments. The use of voltage control makes series-parallel connections unnecessary and inadvisable. The fields of all of the motors will also be connected permanently in parallel, substantially as shown in Figs. 4 and 5, thus allowing a simple reverse switch. Such an arrangement is permissible with alternating current, although not with direct current, since with the former the currents automatically adjust themselves to give equal field strength in each motor.

In general, the motors will weigh approximately the same as direct-current motors of the same capacity. In general, also the regulator and transformer for a four-motor equipment will, together, weigh approximately the same as a single motor. A complete equipment, including all apparatus, will weigh approximately 15 per cent more than a direct-current equipment of the same capacity. Since the weight of an equipment usually forms only about one-fourth of the total weight of car, equipment and load, however, an alternating-current car should in general exceed the weight of a direct-current car by less than 5 per cent.

For single cars, run at speeds not over 60 m. p. h., and with trolley voltage of approximately 1000, it is proposed at present to use standard direct-current trolleys, except that an insulating base will be provided. Protection in handling the trolley rope will be afforded by insulators between the rope and the trolley, and by having a grounded metallic end on the part of the rope which is handled. For very high speeds, or where cars are to be run in trains at all times, a form of bow-trolley will be used.

Motors of 50 hp, 75 hp, 100 hp and 150 hp are being built, and are considered standard sizes. In general, the external appearance of the motors will be similar to that of direct-current motors. The construction, however, will be slightly different. The entire magnetic part of the field will be laminated, the field being built up of annular punchings, with poles projecting radially inward. The punchings will be held together in a steel

frame. The motor will thus be of the box type, the armature being put in or taken out through the ends. The field coils will be of copper strap of large cross section, and there will be but few turns per coil. The armature will, in general, be similar in all essentials to the armatures of direct-current railway motors.

The horse-power ratings which are given to these motors correspond, in general, to the nominal horse-power ratings which are given to direct-current railway motors. That is, it is the load which the motors will carry at rated voltage for 1 hour, with a rise in temperature of approximately 75 degs. C. in the windings. The temperature is measured by thermometers. In general, in actual service, these motors will carry continuously from 45 per cent to 50 per cent of their full-load current at the reduced average voltage which would be placed upon them under these circumstances, with a rise in temperature of approximately 60 degs. C. As the armature may be momentarily short-circuited without damage to the motor, there should be no tendency to flash across between brushes, or from the brushes to the frame of the motor.

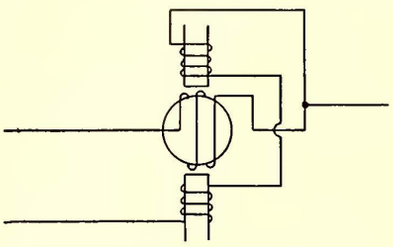


FIG. 7.—DIAGRAM SHOWING ACTION OF INDUCTION REGULATOR ON CAR

The apparent input of an alternating-current motor may be divided into two components at right angles to each other. One of these is called the energy component and the other the inductive component. The energy component represent the power input to the motor, and includes not only the useful input which appears as output at the shaft of the motor, but also the losses. The relation between these two components is such that the sum of their squares is equal to the square of the total apparent input.

The power factor of a motor is the ratio of the energy component to the total apparent input, and since it is merely the ratio of two quantities, the power-factor alone gives no idea of the value of either quantity. In judging whether the performance of a given motor is good or bad, a knowlege of the power factor alone is thus of little value. The important considerations in any given case are the actual magnitudes of the energy and the inductive components and the proportion of the former which represents useful energy, and in order to determine this, further information is necessary. If the apparent input, for instance, is known in addition to the power factor then the value of the energy and inductive components can be readily found. If the efficiency is also known, the useful energy may then be found from the total energy.

Many engineers hold the idea that high power factor in a motor is desirable under all circumstances, in the same way, for instance, as a high efficiency would be desirable. This idea is mistaken and misleading.

The effects which are ordinarily attributed to a low power factor are really due to a large inductive component. If the value of this inductive component is kept the same for any given output, and the power factor raised by increasing the energy component, the general conditions will be worse rather than better. If two motors, for instance, have the same inductive component with a given output, but the efficiency of the first is less than that of the second, then the energy component of the first will be greater than that of the second, and, consequently, the power factor of the first will also be greater than that of the second. In this case, however, the motor with the higher power factor is the poorer of the two, since it has the same inductive element and at the same time requires a greater actual power input.

In the alternating-current railway motor the inductive component depends on the current. Since approximately the same current is required to produce a given torque, whether the motor is merely at the point of starting or whether it is running at full speed, the inductive component will be practically the same for a given torque whether the motor is starting or whether it is running at full speed. When the motor is running at full speed, however, there is a large output, and, consequently, a large energy component, thus giving a high power factor. At the moment of starting there is no output, and the only energy component in the motor is that due to its losses. If the internal losses are low (which will be the case with an efficient motor) then the power factor of the motor when starting will also be low.

Since the alternating-current railway motor has a high power-factor at full load (approximately 90 per cent or more), it is evident that the value of the inductive component under these circumstances must be relatively small. It has already been noted that when the motor is starting with full-load torque the inductive component is the same as at full load. Since there is no power developed when starting (due to the fact that the speed is zero), the only energy component which there can be is that due to the losses. A motor of low efficiency, therefore, would show a fairly high power-factor under these circumstances, since it would have a fairly large energy component. The fact that the power-factor under these circumstances is not high, thus shows that the losses are not high—that is, that the motor is an efficient one.

In considering the matter of power-factor when starting, the alternating-current railway motor must be carefully distinguished from the induction motor. In an induction motor, to produce full-load torque at the start, there must be an expenditure of full-load energy in the secondary circuit, and for other starting torques a proportionate amount of energy is required. In an induction motor, therefore, the energy component at starting is in general taken as an indication of the torque, although a large expenditure of energy does not necessarily mean a large torque.

In induction motors, as in all alternating-current motors, it is desirable to keep the inductive component as small as possible, and since a large energy component is necessary to produce a large torque at starting, a high power-factor when starting with large torque is in general taken to mean a low inductive component, and consequently a favorable condition. A high power-factor at the start in an induction motor, however, does not necessarily mean a low inductive component, and hence does not necessarily mean a favorable condition.

In starting any alternating-current motor, it is impossible to avoid the presence of an inductive component. In starting an induction motor, however, an energy component proportionate to the torque developed is also required in addition to this inductive component. In the alternating-current railway motor, however, the torque developed depends on current only, and the development of a given torque does not require the expenditure of any given amount of energy. The inductive component or wattless current has the same effect in producing torque as an energy current of the same amount. In the alternating-current railway motor, therefore, since the inductive component will be present in any case, it is desirable to utilize this current for producing as much of the necessary torque as possible, thus keeping the energy current (and the energy) for a given torque as small as possible. That is, with a given inductive component it is desirable to reduce the power-factor at starting to as low a value as possible, since this means that the losses will then have as low a value as possible.

The fact that a low power-factor at starting represents an advantageous condition rather than a disadvantageous one with the alternating-current railway motor, may be seen in another way. In order to produce a given torque, a certain current is necessary. With a direct-current car, practically the same cur-

rent per motor would be required to produce a given torque as with an alternating-current car, provided the conditions of gear, ratio, etc., are the same. In the direct-current car, however, the product of the current and volts would represent the energy taken from the circuit. In the alternating-current car the product of current and volts would be approximately the same as that for the direct-current car, but this product would represent only apparent energy and not real energy. Since the power-factor in the case of the alternating-current car would be low, usually from about 30 to 40 per cent, the real energy supplied to the alternating-current car would be only this percentage of that supplied to the direct-current car for producing the same torque.

There has been a tendency on the part of engineers who have not fully understood this point to criticise the fact that the alternating-current railway motor has a low power-factor when starting. It will be seen from the above, however, that this low power-factor when starting represents a favorable condition instead of an unfavorable one. It is evident that a certain current is necessary to produce a good starting torque, and if this current can be obtained without a corresponding expenditure of energy, so much the better.

COMPARISON WITH DIRECT-CURRENT SYSTEM

The operation of direct-current railway systems has been eminently satisfactory for two main reasons: First, because the direct-current series motor, owing to its variable field, has speed torque characteristics which make it particularly suitable for traction work; and, second, because only a single trolley is necessary. The direct-current railway system has, however, a number of disadvantages, the most serious of which, perhaps, is the comparatively low trolley voltage which is necessary. This feature has hampered, to a considerable extent, the development of such roads.

Owing to the ease and economy of voltage transformation with alternating current, the use of alternating-current motors would permit a high trolley voltage, and at the same time a low voltage at the motors, since a transformer could readily be placed on the car to reduce the trolley voltage for use at the motors. Until recently, however, the only alternating-current motors which were available were of the polyphase induction type, and such motors, in addition to not having the proper characteristics for railway work, had the further disadvantage of requiring at least two trolley wires.

The alternating-current railway system which the Westinghouse Company has recently placed on the market possesses the two main advantages of the direct-current system, since the motor which is used has the same speed-torque characteristics as the direct-current series motor, and since single-phase circuits obviously require only one trolley. In addition to possessing these two main advantages of the direct-current system, this alternating-current system overcomes a number of its limitations. This is best shown by the statements in parallel columns, which follow:

DIRECT-CURRENT SYSTEM	ALTERNATING-CURRENT SYSTEM
(1) The voltage of a direct-current circuit can be changed only by the use of rotating machinery. It is thus, in general, necessary to utilize power at approximately the same voltage at which it is generated. A high voltage is desirable for transmitting power, in order that the currents necessary for a given output may be small. On the other hand, the voltage for which motors of the commutator type can be made is limited. A voltage of nominally 500, but actually as high as 600, has been adopted as the standard for direct-current railway work. This is a compromise—being low from the transmission standpoint and high as regards the use of commutator type motors.	(1) The ideal arrangement of high trolley voltage, giving economy of transmission, and low motor voltage, giving minimum motor trouble, can be obtained by means of a transformer on the car.
(2) Power can be transmitted with reasonable economy by direct current at nominally 500 volts for from five to ten miles from the generating station. For greater distances than this the cost of conductors becomes excessive. A long-distance railway would thus require power stations located from ten to twenty miles apart.	(2) Long-distance roads can be supplied by means of transformer stations, instead of rotary converter sub-stations. These will be comparatively cheap, will contain no synchronous or moving machinery, and will consequently not require constant attendance.
To overcome this difficulty, power is often generated as alternating current and transmitted at high voltage. It is then changed into direct current by means of lowering transformers and rotary converters located in sub-stations at suitable intervals along the road. Such a system is much less expensive to install and maintain than would be a number of separate power houses. In general, however, the cost of installation and maintenance of a sub-station is such that the use of such a system may be looked upon as a method of making long-distance railways possible, rather than as a means of reducing the cost of direct-current feeders.	The omission of synchronous machinery renders the service less liable to interruption, since momentary short-circuits, or similar troubles, which might interrupt the service where synchronous apparatus were used, would in many cases cause no interruption in a system where such apparatus was not used. Moreover, in case of a shut-down from any cause, service on a system without synchronous apparatus can be resumed much more quickly than in the case of one in which it is necessary to synchronize a number of rotary converters before power can be put on the line.
(3) Variable voltage for starting and regulating the speed of the motors is obtained by connecting the motors in series or parallel, thus obtaining two economical speeds. Additional speeds are obtained by the use of a rheostat in connection with both of these combinations. As ordinarily installed, the capacity of the rheostat is such that it may be left in circuit for only a very short time, so that, except momentarily, only two speeds (i. e. series and parallel) are available for continuous running with a given torque.	Although the rotary converter is a highly efficient machine, some losses necessarily take place in it, especially where it is operating with a low load-factor. The omission of rotary converters, and their consequent losses, should thus add materially to the general efficiency of the power system.
(4) The motors are connected in series or in parallel and to the various resistance steps by means of a controller, which, in general, consists of a number of contacts bearing on a revolving drum. The circuit is partially opened whenever the connection is changed from one resistance step to another; and in changing from series to parallel, or in cutting off the power, the circuit is completely opened. A powerful magnetic blowout is used to break the arc which is formed on opening the circuit, and thus prevent burning of the contacts.	A trolley voltage much higher than is at present in use is allowable with alternating-current railway motors, supplied by means of a transformer on the car, and this, combined with the cheapness of transformer stations, will, in general, allow the latter to be placed sufficiently near each other to render any feeders other than the trolley wire unnecessary. Moreover, in order to bring about this condition, these stations will, in general, not reqire to be placed much closer together than would rotary converter sub-stations.
(5) When starting a car the rheostatic loss is large, since almost the entire voltage of the line is taken up in the rheostat.	(3) Owing to the ease and economy of voltage transformation with alternating current, any desired voltage may be applied to the motors without the use of resistance. Motors may thus be run continuously at full speed, or at any lower speed, and the power consumption at all speeds will be proportional to the energy actually expended in driving the car.
(6) The use of direct current on grounded circuits is always attended by electrolysis. In large cities considerable difficulty is now experienced from this cause. In future the difficulty will probably be even greater, since the number of cars in operation will increase and greater currents must hence be used.	(4) Instead of a controller making and breaking a circuit on each step, the motors (in all equipments except those of small size) will be controlled by means of an induction regulator. Such a regulator is simple and substantial in construction, and has to make and break contacts or similar wearing parts. In changing from one voltage to another, this change is produced gradually instead of by definite steps, the control being effected through magnetic, instead of by direct, action on the circuit.
	(5) Since there are no rheostats, there will be no rheostatic loss.
	(6) With the use of alternating current instead of direct current, electrolysis will practically disappear.

In concluding this description of the various features of the single-phase railway stystem, and its advantages as compared with the present direct-current system, it should be borne in mind that the advantages accruing from this system are due primarily to the use of alternating-current, rather than to any advantages of the alternating-current railway motor over the direct-current railway motor. It is, in general, sufficient praise for the alternating-current railway motor to say that it weighs no more than the direct-current motor, that it has equally good characteristics, and that it is almost as efficient. The credit for the entire advantage gained, however, must be given to the alternating-current railway motor, since it is the development of this motor which has made the exclusive use of single-phase alternating current on railway systems practicable.

CARS FOR THE RUTLAND STREET RAILWAY COMPANY

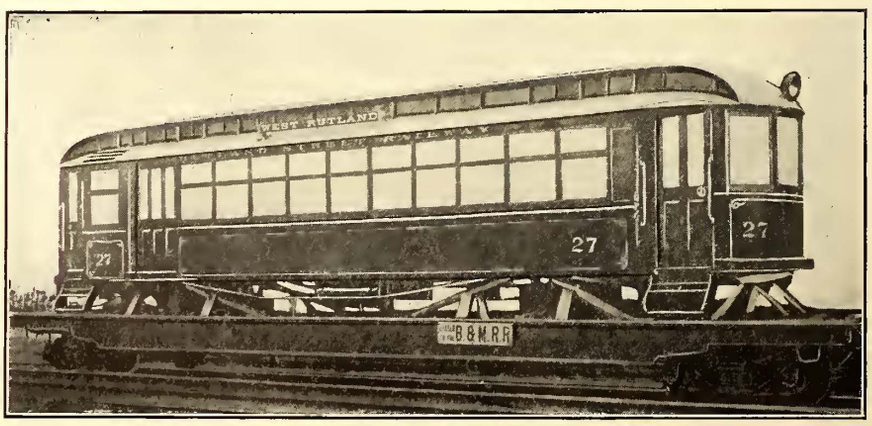
The Rutland Street Railway Company, of Rutland, Vt., has placed in operation recently for suburban service a number of combination passenger and baggage cars, built by the Laconia Car Company, of Laconia, N. H. One of these cars is shown in the accompanying cuts.

The car is 45 ft. 11 ins. long over all. It is of the semi-convertible type, the windows being arranged to drop flush with the window-sills. The car body is placed on Laconia 9-B-3 trucks having 3-ft. wheel base and fitted with 3-in. double-plate wheels. The operating equipment includes G. E. 64-hp motors and Christensen air brakes.

The interior finish is of red birch with inlaid marquetry

INTERIOR OF CAR FOR RUTLAND STREET RAILWAY

work. The ceiling is of decorated quartered oak. Elaborately shaped center clusters, as well as lamps along the sides, serve to light the car. The seats in the passenger compartment are of the Wheeler type, made by Heywood Bros. & Wakefield Company, and are upholstered with Chase figured plush. The baggage compartment is furnished with folding seats for smokers. The car is equipped with Providence fenders, Sterling-Meaker registers, Consolidated car heaters, Ham trolley catchers and the Curtain Supply Company's curtains.



EXTERIOR OF CAR FOR RUTLAND STREET RAILWAY

The Toledo & Western Railway Company is experiencing great difficulty in handling all the freight that is now being offered by the grain elevators along its line. Large elevators at Matamora and Lyons are full of grain, and companies have been organized to build elevators at Pioneer, Fayette, Morenci and Adrian. The Toledo & Western has leased a number of cars from steam roads, and will purchase additional freight rolling stock in the near future.

IMPROVEMENTS IN DRAFT RIGGING

Two patents have been issued recently to W. T. Van Dorn, of Chicago, covering improvements recently incorporated in the Van Dorn automatic couplers and draw-bars. As these couplers are so extensively used by elevated and interurban railway companies, the accompanying illustrations showing these improvements will be of interest. Fig. 1 shows an improved draft rigging, which provides for an up and down motion of the draw-bar without causing uneven wear on the draw-bar springs. The draw-bar slides through a casting attached to the bottom framing of the car. This casting is hol-

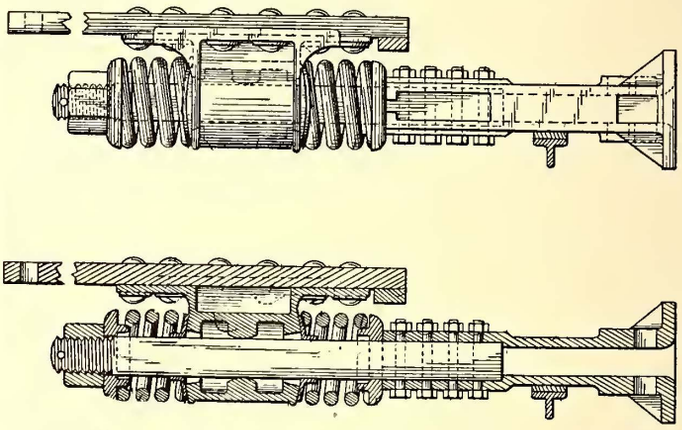


FIG. 1.—SHAFT RIGGING PROVIDING FOR UP AND DOWN MOTION OF DRAW-BAR

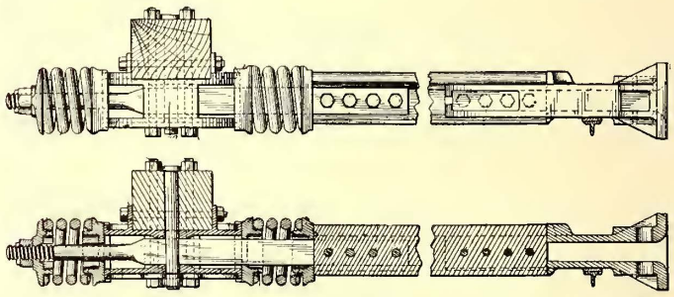


FIG. 2.—METHOD OF ATTACHING DRAFT RIGGING TO BOTTOM TIMBERS

low, but has a rib in its center which carries the draw-bar. The springs at either end bear against collars, which work on the ball and socket principle, as the draw-bar rises and falls.

In Fig. 2 is shown the method of attaching draft rigging to the bottom timbers, which is said to be an improvement on anything heretofore employed in connection with these draw-bars. Where possible the two parts of the draw-bar pass each side of the king-bolt. If the truck is too far back for this the draft rigging is attached to some other cross timber nearer the end of the car.

CARS FOR THE GRANITE CITY AND ST. LOUIS RAILWAY COMPANY

The Laclede plant of the St. Louis Car Company has recently turned out for the Granite City & St. Louis Railway Company some cars which are good examples of double-truck cars of moderate length. Fig. 1 is an exterior view of one of these cars just before shipment, and Fig. 2 an interior view. This car is 37 ft. over all, with a car body 27 ft. long. The width over all is 8 ft. 6 ins., and the height from rail to top of roof 12 ft. The car is equipped with St. Louis Car Company's reversible cross-seats, having a seating capacity of thirty-six. The interior finish is cherry. The trucks are the builder's short-wheel base No. 47. The cars will be equipped with air brakes and also hand brakes operated with the company's vertical hand wheel. This type of brake wheel is bevel-geared to the regular brake staff, and is furnished usually with the company's vestibule cars.

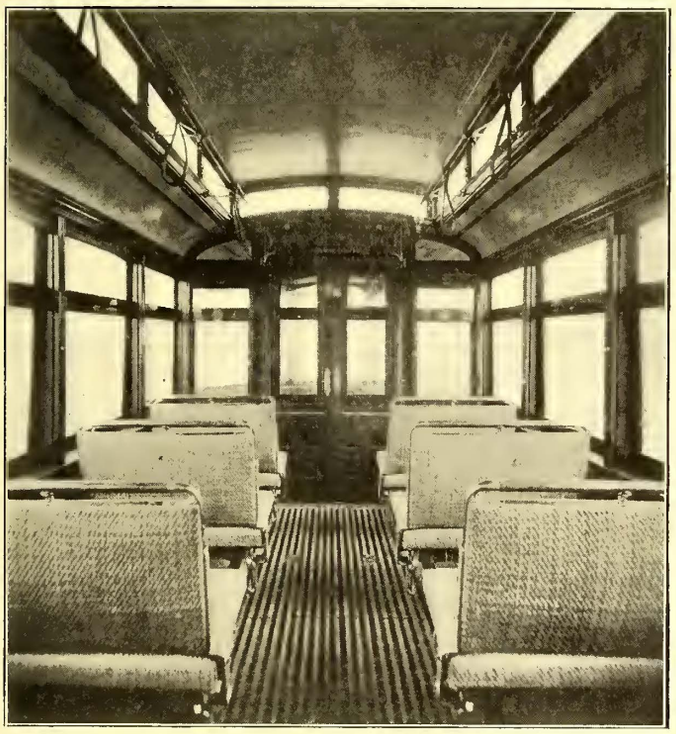


FIG. 2.—INTERIOR OF CAR FOR GRANITE CITY & ST. LOUIS RAILWAY

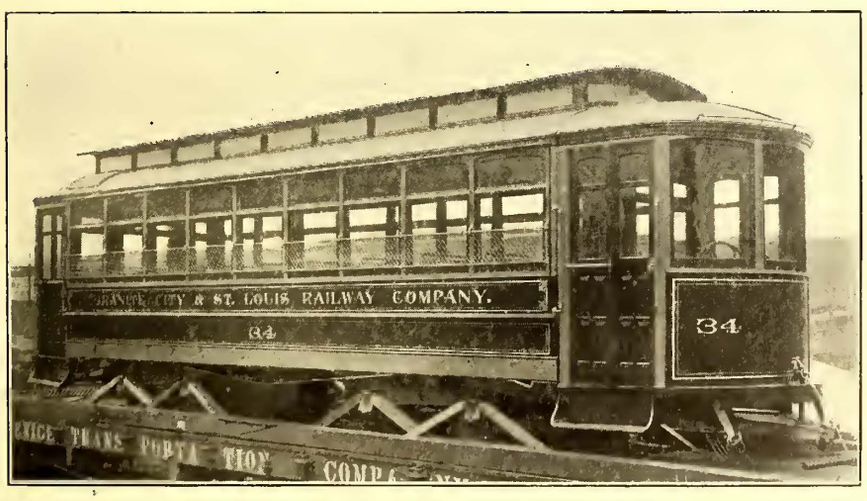
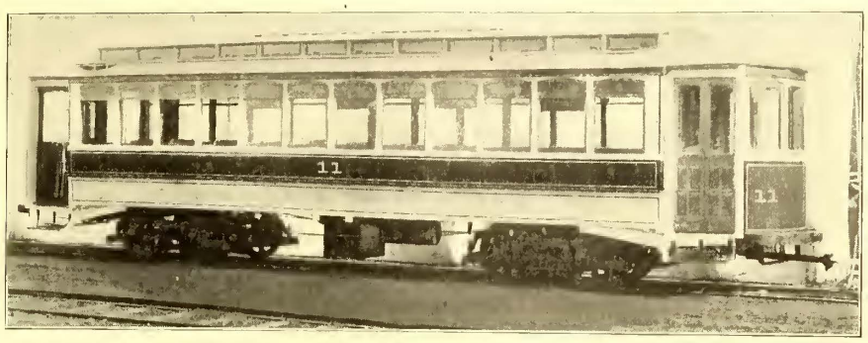


FIG. 1.—CAR FOR GRANITE CITY & ST. LOUIS RAILWAY COMPANY

FINE CAR FOR LEWISTOWN & REEDSVILLE RAILWAY

The Lewistown & Reedsville Electric Railway Company has lately received from the J. G. Brill Company the handsome car shown in the accompanying illustration. The railway company is extending its lines and adding to its equipment. Between the two towns is a long mountain range, and the traffic from the two valleys in which both towns are important centers, is over one route through the only break in the range. Until the trolley line was constructed all intercourse was by stage or wagons. Lewistown is the county seat of Mifflin County, and is known throughout the State chiefly from the fact that Bucknell University is located there. The company controls an amusement resort, known as Central Park. This place is but a short distance from the town, and is popular both summer and winter, because of its picnic grounds and skating lake.



CAR FOR LEWISTOWN & REEDSVILLE RAILWAY

The car body is 33 ft. 4 ins. long over end panels, and is seated for forty-eight passengers. The upper sashes of the windows are stationary, and the lower arranged to drop into wall pockets furnished with covers. The interior is finished in natural ash with ceilings of decorated birch. Upper truss rods, 2 ins. x ⅜ in., are shouldered on the side posts, 19½ ins. from the floor; and under truss rods are 1⅛ ins. in diameter. The center platform timbers are reinforced with angle-irons, offset for the purpose, and bolted at the outer ends to the crown pieces. They are 14 ft. 6 ins. long, extending back from the center of the body bolster 4 ft. 9½ ins. This is the standard practice of the builders, and provides a firm platform. The length of the platforms from panels over vestibules is 4 ft. 8½ ins., and the total length of the car over vestibules 42 ft. 9 ins.; thickness of side sills, 4¾ ins. x 7¾ ins., with 6-in. x ½-in. plates on the inside, turned at the ends and bolted to the 5¾-in. x 6⅞-in. end sills. The center sills are 3½ ins. x 4¼ ins., and the crossings, 3½ ins. x 4¼ ins.; corner posts, 3¾ ins., and side posts 2¾ ins. thick. The distance from the rail to the tread of the platform steps is 16½ ins., and from the step to the platform, 14½ ins.; from platform to car floor, 8⅛ ins.; from track to under side of side sills, 32¼ ins. The car is mounted on Brill No. 27-G trucks, with 4-ft. wheel base, and equipped with four 25-hp motors. Platform and conductor gongs, channel-iron radial draw-bars, ratchet brake handles, and other patented specialties of the builder's make, are included in the furnishings.

A bill has been introduced into the Ohio Legislature placing the numerous express companies operating on electric railways under the same taxation laws as regular express companies that operate on steam systems.

FINANCIAL INTELLIGENCE

Wall Street, March 23, 1904.

The Money Market

The natural inclination at this season toward contraction of bank reserves, has been observed in the operations of the last few weeks. Currency has not yet begun to move out to the interior in response to the usual demands for spring trade, but the inward movement has ceased. At the same time the banks are losing to the Treasury, although, owing to the decline in revenue-bearing imports, this loss is not as great as it has been in previous years. It is quite to be expected that local cash holdings will continue to fall off for another month at least. This prospect, however, is hardly disturbing, in view of the exceedingly strong position of present bank resources. Surplus reserve still stands above $27,000,000, which is the highest total for the period in eight years. The check upon the winter's bank loan expansion is also most reassuring. Last week's statement, to be sure, showed a small addition to the loan account, owing to renewed advances to the Stock Exchange, but the extraordinary borrowing by corporations has stopped, and this is the most important fact for consideration. The only doubt admissible regarding the immediate money market is as to whether or not gold will have to be exported this spring. Shipments have already been made in some volume to South America, but these are irregular transactions. Sterling has risen this week to the highest of the season, within less than one cent in the pound below the customary point at which gold can be sent to Europe at profit. The bank of England maintains its 4 per cent discount rate, and the continental markets have not so far recovered from the recent strain to show signs of early reaction. Relatively, credit is cheaper here than abroad, and should this disparity continue, our export trade balance being on the decline, it is exceedingly probable that within a few weeks we may be sending gold to Europe. Even this, however, if it does not occur, will probably not cause any perceptible hardening of money rates. If the Panama Canal settlement, which now seems to have been indefinitely postponed, should come along at the time these other influences are at work the outflow of gold might be heavy enough to effect the market, but these are possibilities not in the foreground of present banking discussion. The chances are that quotations for money will remain about as they are, until the end of the summer. All the loaning business now going on distinctly favors the borrower. Cases are continually being reported of loans made as low as 3¾ per cent for long periods, while for the shorter maturities bankers are forced to make concessions in order to obtain custom. Call money is quoted at merely nominal figures, 1¾ per cent being the renewal rate on the Stock Exchange.

The Stock Market

The past week has been noted for several important incidents, first, a general advance in prices, following the discovery that the Northern Securities decision was not the serious factor for the market that had been anticipated, second the spectacular collapse in cotton accompanying the Sully failure, and finally enormous buying of all securities concerned in the great Northwestern merger. These three episodes have entirely transformed the character of the market from what it was a fortnight ago. Trading has become very active, the outside public has reappeared to greater extent than at any time since the boom of 1902, and in fact Wall Street has taken on again the familiar characteristics of a vigorous speculation for the rise. In this column a week ago the bearings of the Supreme Court decision were discussed in some detail, and it is unnecessary to rehearse them now. It is sufficient to say that the dealings of the past week have justified the optimistic conclusions that were drawn immediately following this event. The market too refused to be shaken by the disastrous sequel to the cotton corner. On the contrary, this was regarded as a distinct help to the financial situation, inasmuch as it removed what might have been a serious restraint upon the export trade, as well as a cause of great disturbance to domestic industry. It is upon the sensational movement in the group of Northwestern Securities that the market's attention is now converged. An abrupt advance of 15 points in Northern Securities stock on the curb, an eight point rise in Union Pacific on tremendous transactions and extremely heavy purchases of all the bonds and stocks associated with the merger enterprise, foreshadowed the announcement made this morning of the dissolution of the Northern Securities Company on terms which will be very advantageous to all the participating securities. It is too early at this writing to consider the effect upon the general market, but it is hard to see how it can be anything but favorable, inasmuch as the distribution of the merger company is arranged so as to guarantee permanently harmonious relations among the great railroad interests in the Northwest. Other and more routine topics have been set aside this week by the excitement aroused over the developments referred to. Railroad earnings, such as have come to hand, however, have given satisfactory assurance that the strain of the severe winter is now over, and that losses as compared with a year ago will henceforth not be heavy. This assurance has helped materially toward the market's recovery, as has the breaking of the drought in the winter wheat territory, and the fall in prices of all farm commodities.

In the local traction group the movement has corresponded so closely with the general market movement that it calls for no separate analysis. It has become pretty clear that the heavy drop in Metropolitan two days ago was due to special liquidation, rather than to anything unfavorable in the condition of the properties. The stock has rallied easily during the past week, and has been well bought. Allowing for the recent dividend, Manhattan Elevated sold this week a half point above its high price of January. Brooklyn Rapid Transit has been an active favorite with bull traders, and professional Wall Street continues to be particularly well disposed toward this stock.

Philadelphia

The active speculative favorites in Philadelphia have all risen sharply during the week. Improvement in general market conditions rather than any special developments in connection with individual properties, has, of course, been the animating cause. Union Traction was the strongest stock on the list, advancing from 47½ to 48¾, on what appeared to be chiefly investment buying. Philadelphia Company common rose from 39¼ to 40¼ on heavy transactions, and the preferred sold at 44 and 44¼. Philadelphia Electric was very active also between 5 15-16 and 6⅛. A few hundred shares of Rapid Transit changed hands at an advance from 13¾ to 14⅛. One hundred Union Traction of Indiana sold at 35. Consolidated Traction of New Jersey gained a half per cent to 63, on sales of 300 shares. Philadelphia Traction was unchanged at 95½. Fairmount Park Transportation sold for an odd lot at 21¼. American Railways was dull, but firm, between 43¼ and 43½.

Chicago

The most notable incident of the week in Chicago was the sharp recovery of nearly 10 points in Metropolitan Elevated preferred. A little over a week ago the stock sold down to 41. It sold at 50½ on Saturday last, and at 50 on Monday. Metropolitan common also rallied two points to 17. The fact that transactions at the rising prices were comparatively light strengthens the other evidence, pointing to the true cause for the recent decline being forced liquidation by one or two large individual holders, and not anything either actual or prospective unfavorable in the condition of the property. Further proof that the Union Traction group of securities have ceased to be pressed for sale, has been afforded during the week. North Chicago stock recovered to 73, or 9 points above its recent low record, 200 shares of West Chicago sold at 44½, while Union Traction was active and strong around 6. City Railway, selling ex-dividend, recovered to 161½. South Side gained a point and a half to 91½, Northwestern common sold at 16½, and Lake Street at 2⅛.

Other Traction Securities

The Boston dealings have not developed the life that might have been expected in view of the week's revival of speculative interest in the general market. Boston Elevated sold up to 139½, which is the highest price reached in some time, but reacted later to 138⅞. West End common went to 93 for an odd lot, but most of the sales were made at 92½. The preferred sold between 109 and 109½. Massachusetts Electric common was exceeding dull, ranging as low as 18 and as high as 19. The preferred changed hands between 72¼ and 73. In Baltimore the United Railways securities were fairly active and strong. The income bonds rose from 53⅜ to 54, the general 4s sold between 90¾ and 91⅛, and 800 shares of the stock were dealt in at an advance from 7⅜ to 8. City & Suburban (Baltimore) 5s were strong, gaining five-eighths of a point from 112½ to 113⅛. Charleston Consolidated 5s, on the other hand, lost

a point and a half, selling at 83½. Other sales for the week comprised City & Suburban (Washington) 5s at 90⅜ and 90¾, Baltimore City Passenger 5s at 108, Central Railway extension 5s at 113, and Atlanta Consolidated 5s at 105¼. The active feature on the New York curb was Interborough Rapid Transit. Two thousand shares sold on the rise from 103½ to 108½; at the higher level heavy profit-taking appeared, and on sales of 1000 shares the stock fell back to 108¼. Six hundred New Orleans Street Railway common sold at 9, and 200 more at 9½. Three hundred St. Louis Transit sold between 12 and 12¼. Washington Traction preferred was heavy, declining from 45 to 44¾ on sales of 1500 shares.

Continued rumors of a deal in Cincinnati, Newport & Covington Light & Traction gave the issues of this company another bullish movement in Cincinnati last week. It is reported that the company is to be absorbed by outside interests, but all efforts to secure any confirmation of the rumors are unavailing, and the statement is made that no such deal is under consideration. The common stock of the company advanced from 29⅞ to 32½ on sales of over 1900 shares, while the preferred had a range of from 84⅞ to 87¼ on sales of about 1000 shares. Detroit United, which has been quite active, suffered a decline the middle of the week due to the report that the dividend on the stock would be deferred for one month. The company has announced that this action is taken in order that the semi-annual bond interest and the quarterly dividend shall not fall on the same date. The stock opened at 63½, declined to 61¾ and advanced again to 64. Sales about 1000 shares. Cincinnati Street Railway was rather quiet, sales about 200 shares, with a range of from 137½, for a very small lot, to 139. A small lot of Miami & Erie Canal sold at 11, the outlook for this proposition seems more promising. Cincinnati, Dayton & Toledo sold at 20¾, and Columbus Railway preferred at 106½. Several lots of Cincinnati, Dayton & Toledo 5s aggregating $10,000 worth sold at from 79 to 80½.

Continued demand from Cincinnati for Cincinnati, Dayton & Toledo dislodged about 150 shares at 20¾ in Cleveland last week. Northern Ohio Traction & Light advanced from 15 to 15⅛ on sales of 110 shares. A small lot of Cleveland Electric sold at 71¾, a slight decline. Miami & Erie Canal came into the trading at an advanced figure at 11⅞, and then went to 13. Monday a small lot of Cleveland Electric sold at 72.

Security Quotations

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

	Closing Bid	
	March 15	March 22
American Railways	43	43
Aurora, Elgin & Chicago (preferred)	a55	—
Boston Elevated	138¼	138½
Brooklyn Rapid Transit	41⅜	43
Chicago City	157	*158
Chicago Union Traction (common)	5	6
Chicago Union Traction (preferred)	30	30½
Cleveland Electric	72	73½
Consolidated Traction of New Jersey	62	63
Consolidated Traction of New Jersey 5s	105¼	105½
Detroit United	61	64
Interborough Rapid Transit	105	108¼
Lake Shore Electric (preferred)	—	—
Lake Street Elevated	1¾	1¾
Manhattan Railway	*141¼	143¼
Massachusetts Electric Cos. (common)	18	19
Massachusetts Electric Cos. (preferred)	71½	72
Metropolitan Elevated, Chicago (common)	14	16½
Metropolitan Elevated, Chicago (preferred)	43¼	a48½
Metropolitan Street	107½	112⅛
Metropolitan Securities	77¾	77
New Orleans Railways (common)	8	9
New Orleans Railways (preferred)	29	29
New Orleans Railways 4½s	78	79
North American	88¾	85¼
Northern Ohio Traction & Light	14¾	14½
Philadelphia Company (common)	38	40
Philadelphia Rapid Transit	13½	14
Philadelphia Traction	*95¼	95½
St. Louis Transit (common)	12¼	12
South Side Elevated (Chicago)	90	90½
Third Avenue	114	120½
Twin City, Minneapolis (common)	88½	92
Union Traction (Philadelphia)	47½	48½
United Railways, St. Louis (preferred)	51	54½
West End (common)	91½	90
West End (preferred)	109½	109½

a Asked. * Ex-dividend.

Iron and Steel

Reports from the iron trade, while rather more conflicting during the past week than they have been recently, are still in the main encouraging. Demand for pig iron continues heavy and, although the majority of consumers are still buying only from hand to mouth, there are a number who have begun to place orders for as long as three months ahead. In the finished branches of the industry the situation is more uncertain, the railroads are still keeping their purchases at a minimum, the volume being less than half what it was a year ago. This is being felt to such an extent in the steel billet manufacture that there is some question as to whether lowering of prices will not be necessary. The threatened strike in the building trade in New York is another possibility which cannot be viewed without some uneasiness. Quotations are as follows: Bessemer pig iron $13.80, Bessemer steel $23, steel rails $28.

Metals

Quotations for the leading metals are as follows: Copper 12½ cents, tin 28¼ cents, lead 4⅝ cents, and spelter 5 cents.

ANOTHER CAR HOUSE FIRE IN CHICAGO

On March 20, just one week after the destruction by fire of the car houses of the Chicago Union Traction Company at Blue Island Avenue and Leavitt Street, the car house of the company at Western Avenue and Division Street was destroyed. There has been some talk of incendiaries, the two fires occurring so close together. It is stated, however, that the Western Avenue fire was first seen in the vicinity of a sand drier. The wind was high at the time, the flames spread rapidly and soon the building was totally destroyed, together with 103 cars. In the fire of the week before 250 cars were lost. The total loss in the last fire is variously estimated at $100,000 to $250,000. Of the cars destroyed 41 were summer cars, 60 closed cars, and the balance sweepers and snow plows. Thus, within a week, the company lost 273 cars. Both losses, however, were fairly well covered by insurance. A dispatch from Chicago says the receivers of the company will order 100 new cars in a few days.

ANOTHER RACE ON THE KANSAS CITY-LEAVENWORTH LINE

There was telegraphed to the East a few days ago and printed in the daily papers a story of a race between an electric car on the Kansas City-Leavenworth Electric Railway and an express train of the Missouri Pacific Railroad, in which the electric car beat the locomotive. Stories of this kind are being published with increasing frequency, and there seems to be little reason why they are given such prominence. On the Kansas line it is nothing new for electricity to vanquish steam, and the only excuse for the publication of the article seems to be that the trial was arranged "with malice aforethought," as the managers of the electric railway and other officials were aboard the electric car. One newspaper in the East has gone so far as to expatiate upon the subject editorially, and, taking itself seriously, tells its readers that "the Kansas City race was picturesque and even suggestive, but it does not really prove anything as to the relative speed capacities of the two motive powers."

TO INCREASE NUMBER OF COMMISSIONERS IN NEW YORK

Governor Odell of New York has sent to the Senate for confirmation the nomination of Frank M. Baker to be State Railroad Commissioner, to succeed himself. The nomination has been referred to the committee on railroads.

The expectation that the Legislature will pass, and Governor Odell will sign, a bill increasing the number of State Railroad Commissioners from three to five, received corroboration March 22, in the introduction by Chairman Bedell, of the Assembly railroads committee, of a bill to that effect. There is already before the Assembly a bill to this end, introduced by Mr. Wallace in behalf of the board of trade and transportation. The Bedell bill not only provides for two additional commissioners but also allows the expenditure of $100,000 by the board (instead of but $60,000 as at present), exclusive of rent and cost of printing the annual report.

The Wallace bill requires that the two additional commissioners shall be residents of New York City and civil engineers. The Bedell bill makes no specifications as to the additional members, either as regards their residence or otherwise, save that they, like the present three commissioners, shall be appointed by the Governor.

FROM BUFFALO TO ROCHESTER

George A. Ricker, chief engineer of the Buffalo & Depew Railway, which is to run through to Rochester from Buffalo, says that no time will be lost in rushing the work just as soon as the weather modifies. Ten miles of the heaviest grade east of Depew were completed last fall, when the cold weather stopped operations. It is the intention of the company to connect Buffalo and Batavia this year. The line as located passes through one of the most fertile and productive sections of the State. When this extension is completed the cars will leave Buffalo at a point near the Soldiers' Monument, in front of the Buffalo Library, and passing to and out Genesee Street to Pine Hill, where the present double-track line to Depew begins. After passing through Depew and Lancaster, the line parallels the New York Central, a short distance north of the latter company's tracks to Batavia, continuing through Grimesville, Looneyville, Wende, Crittenden, Corfu and West Batavia. After leaving the city of Batavia the line continues to the eastward, passing through the villages of Stafford, Le Roy and Caledonia. The line then continues through the village of Mumford, and from this last point by private right of way, after which the cars may run at high speed through Clifton and Chili to Maplewood, which is just south of Rochester. From Maplewood to Genesee Street at the southerly line of the city of Rochester, the line is in the River Road, where the traveler may enjoy the beautiful scenery of the Genesee Valley.

Entrance to the city of Rochester will be made by way of Genesee Street and the cars will run to the famous "Four Corners." It is expected that terminal negotiations with the International Railway of Buffalo and the Rochester Railway Company will be concluded in a short time.

When the entire line is completed and in operation there will be hourly service between the two cities.

THE OPPORTUNITIES IN THE ELECTRICAL BUSINESS

The electrical section of the Western Society of Engineers, of Chicago, listened to a paper on the above subject by George A. Damon, the evening of March 18. Mr. Damon had collected statistics from one hundred young, successful electrical men in Chicago. It is interesting to note that nearly all of those to whom Mr. Damon's list of questions was addressed responded. These questions deal with the technical training and preparation which had been enjoyed by these men and also with recommendations as to the training of the coming generation. The results of Mr. Damon's inquiries were presented in an attractive way, and in a way which made them valuable. The general interest in the subject was manifested by the fact that it proved to be the largest meeting ever held in the Western Society rooms. The entire evening was taken up with a discussion of the paper, which had been sent out in advance, and as much more time could have been profitably taken up by the discussion had it been available.

THE FIFTH ANNUAL CONVENTION OF THE SOUTHWESTERN GAS, ELECTRIC & STREET RAILWAY ASSOCIATION

A joint meeting of the Southwestern Gas, Electric & Street Railway Association and of the Southwestern Electrical Associaion is to be held in Dallas on April 25, 26 and 27. The convention will be held at the auditorium of the Commercial Club and the headquarters of the associations will be at the Oriental Hotel. Preliminary plans have also been worked out for the consolidation of the two associations, and if this step is approved by both organizations, the consolidation will be effected at the meeting in Dallas. The membership of both organizations is about 200.

The territory of the Southwestern Electrical Association is Indian Territory, Oklahoma Territory, Kansas, Arkansas and Texas; of the Southwestern Gas, Electric & Street Railway Association is Indian Territory, Oklahoma Territory, Arkansas, Louisiana, Texas, New Mexico, Old Mexico.

The following subjects among others will be discussed at the meeting next month: "Advantages of the Combination of Gas and Electric Light Plants," The Operation of the Single-Phase Motors from the Central-Station Standpoint," "Framing of City Franchises for Public Service Corporations," "Combination of Public Utilities in Small Cities," "Water Purification Processes and their Values," "Economics of the Meter," "Benefits and Evils of Telephone Competition," "Accidents on Street Railways and Damage Suits," "Central-Station Accounting," "Electricity and Risks, Requirements of the National Board of Underwriters in the Southwest," "Development of Interurban Railways in the Southwest," "The Development of the Modern Gas Plant."

THE RAPID TRANSIT BILLS IN NEW YORK

The attempt to extend the municipal credit of New York beyond the $50,000,000 bond limit authorized by law for the construction of tunnels in New York, has resulted in queer complications at Albany. To carry on the extension of the rapid transit system, as planned, a bill was sent to Albany abolishing the restriction of $50,000,000. The passage of that bill would allow the commission to go ahead and let the extension in Manhattan, on which the New York City Railway Company is anxious to bid in competition with the Belmonts, and the extension of the Brooklyn tunnel. This bill was consolidated with two Elsberg bills left over from last year, the intention being to defeat the new bill, so it is said. The Rapid Transit Commission voted Friday, March 18, to send representatives to the committee hearing this week to urge the separation of these bills and the passage of the one extending the power of the commission to spend money for more subways. That bill has nothing to do with municipal ownership and operation. The Elsberg bill, however, aims at direct municipal construction of future subways and separate contracts for operation, with the alternative of operation by the municipal authorities themselves. Under the present law the commission contracts for the construction of the subway with funds advanced on the credit of the city, and the contractor is bound to equip and operate the roads and by way of rental to pay the interest on the city bonds and provide for their liquidation at the end of the contract period, when the whole property will come into the city's possession without any cost to itself and with the privilege of making new contracts for operation. If there should be a separate and independent contract for construction, without any assurance that the contractor would have the privilege of operating the new lines, this advantage of rapid and economical work would be lost.

REORGANIZATION OF THE KUHLMAN CAR COMPANY

As already announced in these columns, a deal has been effected whereby the J. G. Brill Company obtains control of the plant and business of the G. C. Kuhlman Company, of Cleveland. At a meeting of the company held last Tuesday, Samuel N. Curwen, of Philadelphia, was elected president of the reorganized company to succeed Fayette Brown, of Cleveland. Charles A. Ricks, secretary of the company, continues in office. The Cleveland members of the new directorate are: R. A. Harman, C. E. Cowen, P. M. Hitchcock and D. B. Dean.

THE RIGHT TO REGULATE FARES IN MASSACHUSETTS

The decision of the Massachusetts Supreme Court declaring that the right to regulate street railway fares rests solely with the Legislature, acting through the Railroad Commissioners, is of such import that it is the purpose here to give a brief outline of the case, supplementing the announcement of the decision made in the Street Railway Journal of March 12. The decision, of course, makes it useless for the Selectmen of towns and the municipal officers of cities, in granting franchises, to attach provisions regulating the rate of fare to be charged.

The question was brought before the court by Albert Keefe, of Somerville, who sued the Lexington & Boston Street Railway Company for 5 cents. Mr. Keefe claimed that he was overcharged this sum on Oct. 5, 1902, when riding from Concord to Arlington Heights. Attorneys for the railroad claimed that the Selectmen of Concord and Bedford had no authority to impose the regulations as to the fares, which the plaintiff alleged had been violated. The defendant's attorneys further claimed that even if the restrictions were found to be legal, the interpretation of the company should be adopted, and finally that the charge was entirely reasonable and proper under any interpretation. The court brushed aside the latter two points and decided the case on the broad ground of the illegality of the provisions as to fares.

In the opinion, drawn by Chief Justice Knowlton, it is said that the statute gives to the directors primarily the right to fix and regulate fares and then makes their action subject to revision by the Railroad Commissioners, who are to act upon broad considerations of public policy. The court says: "With street railways extending long distances and passing through numerous towns and cities, it would be unwise and inexpedient to permit each town to fix the fares within its boundaries, as a condition to granting a location. The purpose of the Legislature to prescribe broad and general provisions for the regulation of fares is further emphasized by the statute of 1901, which puts street railways upon precisely the same grounds as railroads as to provisions relative to changes and regulations of their fares."

EXPERIMENTING WITH TRAINS FOR RUSH-HOUR SERVICE IN CLEVELAND, OHIO

The Cleveland Electric Railway Company is experimenting with large, double-truck trail cars for rush hour and summer service. A two-car train has been placed in operation on Euclid Avenue, and on one trip recently carried 220 passengers. The motor car of each train is equipped with four 40-hp motors, and both cars are equipped with air brakes. The company is making this experiment with a view of purchasing a number of convertible trail cars of a new type, designs for these cars having been submitted by the J. G. Brill Company. The vestibule will be at the side and there will be no platforms. The capacity will be forty-nine passengers. It is the plan to have two conductors, and on the trains tried recently there was an extra trolley man.

STREET RAILWAY PATENTS

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

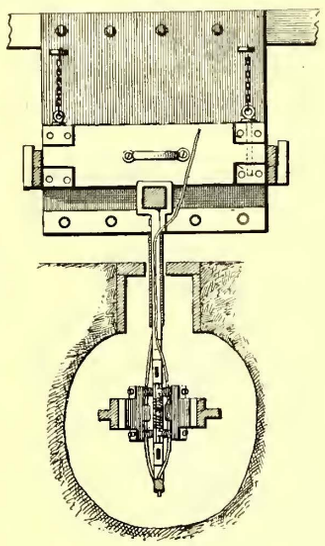
UNITED STATES PATENTS ISSUED MARCH 15, 1904

754,473. Guide Wheel; Alexander H. Mathesius, Brooklyn, N. Y. App. filed Feb. 14, 1901. The cross section of the conductor and the tread of the trolley wheel are so related in shape as to reduce slipping and abrasion of the contact surfaces.

754,551. Emergency Car Brake; Stephen A. Duvall, Penrith, W. Va. App. filed Dec. 8, 1903. Spring-pressed rail grippers are hung in a suspension-bar held normally elevated, but adapted to be lowered to grip the rails.

754,603. Mechanism for Operating Car Brakes; John L. Peacock, Buffalo, N. Y. App. filed Sept. 3, 1903. Comprises a pinion on the lower end of the brake-post, a gear in mesh with the pinion and integral with a spiral brake-chain drum adapted to operate with a variable leverage, the spiral tapering downward to a cylindrical part and of parabolic curve in its broadest portion.

754,778. Trolley Wheel Retainer; James A. Kilpatrick, Niles, Ohio. App. filed Dec. 19, 1903. A pivotally mounted retainer frame normally held horizontal by gravity and retainers carried by the frame normally extended across the conductor wire.



No. 754,832.

754,832. Electric Railway Plow; John H. Akers, Washington, D. C. App. filed Aug. 8, 1903. An electric railway plow having vertically hinged frames with horizontally projecting arms, shoes mounted on said arms to slide thereon and springs to force the shoes out and allow them to yield inwardly.

754,894. Self-Adjusting Wheel; Edgar A. Root and Charles M. Wallace, Huntington, W. Va. App. filed May 23, 1903. Details.

754,921. Brake Shoe and Method of Producing Same; Charles G. Ette, St. Louis, Mo. App. filed Oct. 30, 1903. The method consists in first producing an insert, coating it with a material which is a non-conductor of heat, and then casting the body portion of the shoe about the coated insert, whereby chilling and shrinking of the body portion about the insert is prevented.

PERSONAL MENTION

MR. PERCY CLIFTON, formerly superintendent of the White Line Electric Railway, of Sandusky, Ohio, has been appointed master mechanic of the Toledo & Indiana Railway, of Toledo, Ohio.

MR. JESSE SPALDING, a prominent capitalist of Chicago and a director of the Chicago Union Traction Company, died at his home in that city March 17. Mr. Spalding was seventy-one years old.

MR. G. P. ALTENBERG, manager of the foreign department of woodworking machinery in the world, is on his way to Europe. of woodworking machinery in the world, is on his way to Europe. He will visit England for a few weeks, and then tour the Continent. He expects to be abroad for several months. Letters will reach him, if addressed to Mr. G. P. Altenberg, No. 31 Boulevard Haussmann, Paris, France.

MR. CLARENCE O. SCRANTON has been appointed auditor of the Stark Electric Railway Company, of Alliance, Ohio. He formerly was auditor and general passenger agent of the Lake Erie, Alliance & Wheeling Railroad (steam).

MR. ALFRED BAKER, formerly manager of the London County Council Tramways, and now manager of the Birmingham Corporation Tramways, has been elected president of the Tramways & Light Railways Association, of Great Britain.

MR. A. BETLES has sold his interest in the Coeur d'Alene & Spokane Electric Railway, of Spokane, Wash., and has resigned as second vice-president and general manager of the company. He is succeeded in his official positions by Mr. R. F. Blackwell.

MR. W. H. PAPE, formerly general manager and purchasing agent for the Butler Passenger Railway Company, at Butler, Pa., has resigned his position to become associated with the Galena Signal Oil Company, whose headquarters are at Franklin, Pa.

MR. H. M. HEATH has resigned as president of the Lewiston, Brunswick & Bath Street Railway, of Lewiston, Maine, in order to devote all his time to his private law practice. Mr. T. L. Peters, of New York, will act as president of the company until the annual meeting in May.

MR. JOHN J. LANDERS, formerly cashier of the Conneaut & Erie Traction Company, has been appointed general manager of the company, succeeding Mr. George E. Moffett, who has gone with an electric railway in Washington. Mr. Landers was formerly with a company at Scranton, Pa.

MR. GODFREY MORGAN, for some time superintendent of the Youngstown & Sharon Railway, of Youngstown, Ohio, has resigned, and will be succeeded by Mr. G. J. A. Paul, formerly chief engineer of the People's Light & Railway Company, of Streater, Ill. Mr. Morgan tendered his resignation some months ago, but it was not accepted until recently.

MR. G. G. CRANE has resigned as master mechanic of the Columbus, Delaware & Marion Electric Railroad Company, of Delaware, Ohio, to become master mechanic of the Joliet, Plainfield & Aurora Railroad, of Joliet, Ill. Mr. Crane's resignation from the Columbus, Delaware & Marion Company becomes effective April 1.

MR. PHILETUS W. GATES and MR. HENRY W. HOYT, respectively general superintendent and second vice-president of the Allis-Chalmers Company, are about to retire from active participation in the management of that company. Mr. Gates was president and Mr. Hoyt secretary and general manager of the Gates Iron Works for fifteen years prior to the incorporation of the Allis-Chalmers Company in 1901. They have been prominently connected with the manufacturing interests of Chicago and have taken an active part in all of the manufacturers' associations. Messrs. Hoyt and Gates, after a well-earned vacation spent in traveling, will re-engage in business in Chicago.

MR. MATTHEW R. BOYLAN has been appointed general auditor of the street railway department of the Public Service Corporation, of New Jersey, to succeed Mr. E. N. Hibbs, who resigned to take a position with the United Railway Company, of San Francisco. Mr. Boylan began his street railway career as stenographer to the late Mr. Charles B. Thurston, then president of the Jersey City & Bergen Railroad. When that road was taken over by the Consolidated Traction Company, and later by the North Jersey Street Railway Company, Mr. Boylan was appointed an inspector, and subsequently went through all the grades up to the position of assistant to Mr. Hibbs. Mr. Alonzo Dickson has been promoted to the position of assistant auditor.

MR. MATHEW C. BRUSH, who was recently appointed assistant to Mr. Adams D. Claflin, president of the Boston Suburban Electric Companies, has been promoted to the newly created office of general manager of the following companies, controlled by the Boston Suburban Electric Companies: Newton Street Railway Company, Newton & Boston Street Railway Company, Lexington & Boston Street Railway Company, Wellsley & Boston Street Railway Company, Commonwealth Avenue Street Railway Company, Westboro & Hopkinton Street Railway Company and the Norumbega Park Company. Until further notice Mr. Brush will have general charge of the operation of all the foregoing companies. The department of supplies has been abolished and all matters pertaining to the purchasing of materials and supplies will be hereafter in charge of Mr. Brush. All superintendents will report directly to him, and all matters relating to the operation of the companies will be in his charge.

NEWS OF THE WEEK

CONSTRUCTION NOTES

MONTGOMERY, ALA.—The City Council has passed an ordinance granting the Montgomery Street Railway Company a franchise to build on Cleveland Avenue from Stone Street to Mill Street, and thence on Mill Street west to the city limits.

OAKLAND, CAL.—It is rumored that H. E. Huntington is projecting an electric railway system in Richmond and Oakland. It is believed that rights of way, some on public thoroughfares, others on private lands, are being secured for the Huntington system.

OAKLAND, CAL.—Residents of the Peralta Heights district have undertaken the task of securing from J. H. Macdonald the assignment, in favor of the Oakland Transit Company, of the franchise for the piece of road known as the "Fourth Avenue Cut-off, and originally applied for by the Oakland Transit Company. When the franchise was advertised for sale, however, it was coupled with another on College Avenue, and after spirited bidding the two franchises were awarded to J. H. Macdonald, representing parties who, for the time being, have failed to make known their identity.

SACRAMENTO, CAL.—The Board of Supervisors has granted a franchise to construct and operate a street railway over the J. Street Road to the Sacramento Gas & Electric Railway Company.

SAN FRANCISCO, CAL.—In reference to the talk of electrifying part of the Southern Pacific Company's lines, General Manager Kruttschmitt, of the company, who has just returned from New York, says that plans are under consideration for changing the motive power of the local system in Oakland from steam to electricity, but that no definite plans have yet been decided upon.

SANTA CRUZ, CAL.—The right of way has been secured for the extension of the Santa Cruz, Capitola & Watsonville Railway to Capitola.

NEW HAVEN, CONN.—It is announced that the Wallingford Tramway Company, which holds a franchise to build an electric railway from the terminus of the Meriden Electric Railway in Wallingford to Montowese, will begin work very soon. The new road will be 7 miles long. A traffic arrangement by which cars will be run from Wallingford into New Haven had been entered into with the Fair Haven & Westville Railroad before the recent sale of the latter to the New York, New Haven & Hartford Railroad. The completion of this line will furnish an electric railway from Hartford to New Haven by the way of New Britain, Southington and Meriden, which is an indirect route. The New York, New Haven & Hartford now owns both the Meriden line, which forms an important feature of this through trolley route, and the Fair Haven as well, which will form its southern terminal. The Wallingford Company has an authorized capital stock of $500,000.

ATLANTA, GA.—At the next regular meeting of County Commissioners, which will be held on April 6, J. J. Spalding and Forrest Adair, representing the Atlanta Water & Electric Power Company and allied interests, will apply for a franchise for an electric railway from Atlanta to Bull Sluice. The right of way of the projected line extend along the Roswell public highway, and the road will be in operation by May, 1905, when Bull Sluice will be opened to the public.. The Atlanta Water & Electric Power Company is spending $1,500,000 on the big dam and other improvements at Bull Sluice, while the Morgan-Smith Company, of York, Pa., owners of 1000 acres of land fronting on the big lake, will expend a large sum in beautifying its property.

JERSEYVILLE, ILL.—The City Council has granted to the Central Traction Company a franchise to construct an electric railway in the city on Prairie, State and other streets, covering a distance of 3 miles. The company expects to begin work within a few weeks. The line will also be extended to Hardin, Calhoun County.

STERLING, ILL.—The Dixon, Rock Falls & Southwestern Railway Company plans to begin the construction of its proposed line April 1. H. L. Sheldon, of Rock Falls, says all the preliminaries are fast being arranged.

EVANSVILLE, IND.—W. N. Harding and F. J. Shultz, representing Indianapolis and Chicago capitalists, spent a week here inspecting several routes for proposed interurban electric railways from this city.

FORT WAYNE, IND.—It is stated that work will be started at once on the Fort Wayne-Goshen line, the cost of which is estimated in the neighborhood of $2,000,000. The line will run northwest from Fort Wayne, passing Blue Lake, Churubusco, Syracuse, Lake Wawasee, Goshen and other important cities and lake resorts, and will proceed thence to South Bend by way of some of the most thriving cities in Northern Indiana.

GOSHEN, IND.—The voters of this city and township have rejected the proposition to vote a subsidy of $50,000 to the Winona, Warsaw & Goshen Traction Company. The sentiment expressed was that the company asked too much.

HARTFORD, IND.—Interests concerned in the Oil Belt Traction Company state that arrangements have been made in the East for the financing of the company. The construction mapped out for this year includes a line from this city to Fairmount and Alexandria, the ultimate object being to construct an extension to Celina, Ohio. J. P. McGeath, of this city, is interested.

JEFFERSON, IND.—Local capitalists headed by Hon. Louis Schneck and George H. Voight, have employed competent hydraulic engineers to examine Fourteen Mile Creek and the Tunnel Mill property with a view to utilizing the falls of the natural tunnel for developing power. If the report is favorable, and it is almost sure to be, a company will be formed to establish a power house for generating electricity by water power. The experts say that sufficient fall can be had to furnish 10,000 hp. It is the intention to operate an electric railway connecting this city and New Washington by this power.

LIBERTY, IND.—A fifty-year franchise has been granted by the commissioners of this county to the Interstate Traction Company, which proposes to extend the line from Dayton and Camden, Ohio, through this town, to Connersville, Ind.

NEW CASTLE, IND.—The Richmond & Northwestern Traction Company, recently reorganized, announces that the enterprise has been amply capitalized by Eastern financiers, and that the road will be built this spring. The City Council of New Castle has granted the company a franchise.

RICHMOND, IND.—The Commissioners of Wayne County have declared the franchise of the Union City & Traction Company forfeited. The franchise was granted two years ago, with a provision that the road should be in operation within that time. Subsidies were voted to the road, but never collected. The Columbus, Greensburg & Richmond now proposes to build through the same territory and the residents are encouraging the enterprise.

RUSHVILLE, IND.—The Columbus, Greensburg & Richmond Interurban Company has secured free right of way for its line from Greenfield and Carthage to New Salem, at which point the Greenfield line will connect with the main line from Columbus to Richmond.

CEDAR RAPIDS, IA.—The Eastern Iowa Railway Company has been organized with a capital stock of $10,000, to purchase, acquire, construct, maintain and operate railways of all kinds within Iowa and adjoining States. The officers are: A. F. Groeltz, president; A. D. Barnes, vice president; W. W. Chamberlain, secretary and treasurer. All the officers are residents of Cedar Rapids.

IOWA CITY, IA.—The City Council has voted a franchise to the Iowa City, Davenport & Muscatine Electric Railroad Company. The company plans to build from Iowa City to Davenport, a distance of 53 miles.

SIOUX CITY, IA.—The Sioux City Traction Company plans a number of important improvement during 1904. The principal improvements will be the double tracking of the East Fourth Street line, the broadening of the gage of the stock yards line down Iowa Street from Fourth Street, and the completion of the double track of the Riverside line. Rails have been unloaded for the East Fourth Street track. The gage of these tracks and all other new tracks will be standard. Ten new trailers for the Riverside service are being built at the shops of the company. Six new cars for the stock yards line are also being constructed. In the construction of these six cars nine of the old short cars of the inside lines are being used.

LOUISVILLE, KY.—The Council has passed the ordinance granting the Louisville & Southern Indiana entry to this city. The ordinance granting the company the right to build a viaduct to connect with the Big Four Bridge was also passed.

LEXINGTON, KY.—Judge Phil. T. Van Site, of Detroit, Mich., attorney for Senator George B. Davis, of that city, who proposes to build electric railways from Lexington to Versailles, Frankfort, Richmond and Nicholasville, Ky., says: "I have heard some talk to the effect that Cincinnati and Hamilton capitalists would build the road between Lexington and Frankford. They may do it, but they will certainly not build it over the right of way obtained by Senator Davis. We have spent in the neighborhood of $100,000 in securing the franchise and grading for the road, and we do not propose to give up now. I want to state most emphatically that Senator Davis has the capital behind him to build the roads, and we propose to begin work on them in the very near future. All told, we expect to build in the neighborhood of 100 miles of road, which will cost us at least $12,000 per mile. This talk about County Court of Fayette and other counties taking away our franchise is nothing more than talk, for the very reason we propose to build our lines along private rights of way, and will not touch a single country turnpike. We paid a considerable amount of money for our country franchises, but I doubt if we will use any of them, but you can make the positive statement that every road in which Senator Davis is interested will be built, and we will begin work on the road between Lexington and Frankfort very soon." As stated several weeks ago, Cincinnati and Hamilton capitalists composed of O. M. Bake, F. W. Whitaker and Mr. Rice, of the Equitable National Bank, stated that they would in all probability build the road from Lexington to Frankfort, and over the route Senator Davis had laid out for his road.

NICHOLASVILLE, KY.—The Fayette Interurban Traction Company is applying for franchises in Woodford, Jessamine, Clark and Madison counties. The line to Versailles will be undertaken first and ground will be broken within a very short time. The Winchester line will likely be completed in the summer. The incorporators of the Fayette Interurban Traction Company are L. Gognets, J. W. Rodes, C. J. Bronston, Peter J. Powell, W. N. Bayne, T. H. Bronston.

SUMMIT, LA.—A survey has been completed for the electric railway between Summit and Magnolia.

SOUTH THOMASTON, MAINE.—The promoters of the Rockland, Owls' Head & South Thomaston Railway were here recently, and drove over the route of the proposed road. It is said that the contract for constructing the line will be let in a few weeks. Wm. H. Hill, Jr., has accepted the position of secretary of the company. Mr. Hill is a son of Wm. H. Hill, of Richardson, Hill & Company, bankers, of Boston.