

Street Railway Journal

Vol. XXI.

NEW YORK, SATURDAY, JUNE 27, 1903

No. 26.

PUBLISHED EVERY SATURDAY BY THE
McGRAW PUBLISHING COMPANY

MAIN OFFICE:

NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:

Chicago: Monadnock Block.

Philadelphia: 929 Chestnut Street.

Cleveland: Cuyahoga Building.

London: Hastings House, Norfolk Street, Strand.

Cable Address, "Stryjourn, New York,"—Lieber's Code used.

TERMS OF SUBSCRIPTION.

In the United States, Canada and Mexico.....\$4.00 per annum
Single copies, first issue of each month, 25 cents; other issues, 10 cents.

To all Countries outside of the United States, Canada and Mexico....

\$6.00
£1-5s
M 25
Fr. 31

Single copies, first issue of each month, 40 cents; other issues, 15 cents.

Subscriptions payable in advance, by check or money order. Remittances for foreign subscriptions may be made through our European office.

Entered as second-class matter at the New York Post Office.

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EDITORIAL NOTICE

Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

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

Address all communications to

THE STREET RAILWAY JOURNAL,
114 Liberty Street, New York.

There is no doubt that the lease of the Metropolitan Company to the Interurban Company in 1902 was the most desirable possible method of raising the additional capital that was required. As was shown during the trial the issue of additional bonds or stock, as recommended by Mr. Wormser, would have required a radical reduction in dividends for a number of years. As the stock is held widely for investment purposes the resulting rapid fall in its market price would have ruined many stockholders who could not afford to wait for ultimate future profits, no matter how certain the managers of the property might be that the investment would be a wise one and would ultimately pay. It seems to us, therefore, that it was a very wise plan to make a lease of this kind by which those among the stockholders who were sanguine as to the future possibilities of the system could invest their money in the stock of the Securities Company with the knowledge that they would have to wait a considerable time for dividends, while those who did not feel warranted in taking a step of this kind could retain their railway stock with a guarantee that the 7 per cent dividend would be continued. As this guarantee is backed up by a considerable additional investment, the earnings on this amount will help to pay the 7 per cent in case the system, as it originally stood, should not be able to earn the required sum.

The Three-Cent Fare Spectre

The irrepressible Thomas is at it again in Cleveland, and one may expect another epidemic of attempted legislation at the expense of the street railways. It is always an easy and pleasant task to juggle with other people's assets, and a 3-cent fare ordinance is an excellent gag for the gallery when one is playing at politics. But the most curious feature of the matter is that some apparently honest and well-meaning people, who are quite punctiliously correct in their ordinary business morals, have no scruples in these propositions for wholesale looting. They do not sympathize with bank burglars, they hold mass-meetings and demand a Congressional investigation because a private soldier has pocketed a \$2 heathen idol 10,000 miles from home, and they shudder at the enormity of workmen striking for a raise of 20 cents a day, but they do not hesitate to endorse an organized effort to bankrupt a street railway system. It is all curiously inconsistent, but we have long ceased to expect consistency in discussions of this topic. We agree that all street railways are public servants, that they profit by public franchises and are sometimes inconsiderate in their relations with the public, but the same might be said of most public officials, from the Mayor down to the janitor of the City Hall, and yet no one suggests knocking them down and picking their pockets as the first step toward reform.

Let us look at the matter calmly, not from the standpoint of the wild-eyed socialist, but merely as a simple business proposition, and try to see what a 3-cent fare really means. We will assume that the issue is not complicated by any scheme for zonal service with a 3-cent minimum, but that it means just what it purports to mean, a flat 3-cent fare with no diminution of transfer privileges. In the average city at the present time the actual cash received per passenger, not counting transfers, is 5 cents. Therefore, if the full fare were reduced to 3 cents

The Metropolitan Investigation

The long-heralded Wormser suit to revoke the lease of the Metropolitan Street Railway Company, of New York, to the Interurban Street Railway Company, was dismissed June 22 by Justice Scott, of the Supreme Court of New York, who said that after careful investigation into the evidence he could neither see any illegality in the lease, fraud on the stockholders, or intentional moral wrong-doing, and adds that while it is not his province to discuss financial problems it seems to him that the plan followed by the Metropolitan Company to raise funds was the most desirable of any which could have been adopted. The persistency of the attacks in and out of Court against the Metropolitan Street Railway Company during the last six months, and the regularity with which they have been shown to have had no foundation, would be amusing if it was not such a serious matter to any large corporation to be so constantly assailed. Last January we were treated to an investigation of the company's operating service before the Railroad Commissioners, at the instance of the Merchants' Association. Following this was the Amory suit against Mr. Vreeland, which took the form of an investigation into the company's finances and accounts. Then there was the supplementary Philbin examination, and this has been followed by the suit on the Interurban-Metropolitan lease just dismissed. The position of the company must be measurably strengthened by the regularity with which all of these attacks have failed.

the gross earnings on the present minimum of passengers would be reduced by just two-fifths, or by 40 per cent if no account be taken of transfers in either case. Now, as a mere matter of common sense, what business can have its receipts diminished 40 per cent while its expenses remain constant, and stay out of the hands of a receiver? Many accusations of stock watering have been made against street railways, and sometimes with justice, but what company on earth in the street railway business could see its gross receipts drop 40 per cent, or 30 per cent, or even 20 per cent with impunity? We have again and again scored street railways for insufficient care of their depreciation, but how many of the roads throughout the country could pay even 3 per cent into a sinking fund if their receipts fell off 20 per cent, let alone 40.

Of course, the immediate response of the smug gentleman who keeps his own business profits to himself is that the enormous increase of traffic which would result from a decreased fare would actually enhance the net earnings of the system, but the assertion stands without proof. Even supposing that increased traffic would not require a nearly proportionate increase in expense, as it, in fact, would; please fancy the result of trying to increase the traffic in New York city by 40 per cent. The roads are staggering in every large city under the burden of their physical limitations, and they simply cannot in their present state handle increase of traffic sufficient to hold up the receipts on a 3-cent fare. In point of fact there is little reason to believe that a reduction of fare would materially increase the traffic on any city road, and what little extra riding might result would be very likely to come during the rush hours when it costs all that it produces to handle it. As to the roads in small cities, too many of them are even now staring bankruptcy in the face and thanking their lucky stars that they can raise enough to pay the interest on their bonds. The 3-cent fare proposition arises, in our opinion, either from hopeless ignorance of the real conditions or from sheer buncombe.

There have been divers propositions of the sort made by men who are capable of realizing the facts, but it is noteworthy that most of them have been turned down in one way or another before anything was actually accomplished. We doubt whether anything was ever seriously intended to be accomplished in the hope of earning dividends on a 3-cent fare. Not every cut in prices is for the purpose of demonstrating the financial advantage of quick sales and small profits. We shall not expect to hear so much of 3-cent fares and public ownership after the next election. The municipal sale of gold bricks would be more profitable.

Car Wiring

We have frequently pointed out the necessity for improvement in car wiring, urging both the car builders and the operating companies to strive for higher standards, and we have been gratified by the evidence produced that serious attention is now being given this feature of the equipment. In this important work, recognition, encouragement and co-operation could reasonably be anticipated from the insurance interests, and, as a rule, the underwriters and their representatives have fulfilled these expectations, but, unfortunately, a statement recently made in an official report of an inspection bureau reflecting seriously upon the car builders of the country has obtained wide circulation through the daily press, and has been given an importance that it does not deserve. To make matters worse, the Electrical Bureau of the National Board of Fire Underwriters has incorporated portions of this report in one

of its bulletins, thus seemingly giving it the official sanction of the organization. We have reason to believe that the views thus expressed do not fairly represent the sentiment of the insurance interests, and it would be a serious reflection upon their intelligence to assume that their knowledge of the art is so limited as is indicated by the following paragraph which was selected for publication in the Bulletin from the report in question:

"I have recently visited the works of some of the representative car builders and have seen the latest types of cars. I found the lighting and motor wires run in grooves in the frame work, fastened in place with nails and metal staples; in contact with the electric bell wiring of inferior insulation; no insulating tubes of any kind through the woodwork, floors or vestibules of the cars and the general conditions indicating an absolute disregard of the fire hazard."

The young man who wrote this—he must be very young, inexperienced and indiscreet—has merely proved how incompetent he is for such a position. His desire for creating a sensation has led him into making wildly exaggerated statements, which cannot be substantiated. He has undoubtedly impaired the usefulness of insurance inspectors elsewhere who may be competent and conscientious. How can the underwriters hope to be taken seriously or have their recommendations considered with such statements staring them in the face as this "report" of one of their inspectors, reprinted in their official bulletin? It should be stated in justice to other electrical inspectors that the author of this ridiculous report is connected with the Michigan Inspection Bureau. It is to be hoped that his next effusion will be submitted to some one of mature judgment and extended experience before publication, or, better still, that he acquire at least a little practical experience in those branches of railway work upon which he presumes to act as critic.

Interurban Time Tables

As the operation of interurban railways approaches steam road standards of practice it becomes necessary to give more and more attention to the improvement of transportation details. While it is true that many of the minor features which go to make travel by steam lines easy, pleasant and reliable are not required in a modern trolley system, it is equally certain that interurban lines will never enjoy the full confidence of the public until several fundamental wants of their passengers are supplied.

These requirements vary according to the class of traffic to which the line has found it advisable to cater, whether local, through or excursion, but one of the requirements—and this is not the first reference to it in these columns—is an adequate time-table. If much attention is given to excursion traffic it will usually be found most advantageous to include in the time-table a dated map of the company's lines drawn correctly to scale. On that map should be indicated every point of interest which the cars pass, every named station en route, the boundary lines of all towns through which the highway or private right of way extends, the names of the towns in clear print, the course of rivers and important streams, names of lakes, ponds and prominent hills, location of swampy lands, roads, steam railway lines, stations, junctions and the contiguous lines of connecting systems. Nor should the north point arrow be omitted. The map ought to be printed on sufficiently tough paper to withstand plenty of rough handling in a stiff wind.

The time-table should consist of a distinctly printed tabula-

tion of the running time between every important point on the system by the shortest route. The scheduled arrival or leaving time of every car in regular service at each of these covered points should be so plainly indicated as to be unmistakable by persons of ordinary intelligence. It is, of course, unnecessary to reprint a time-table for hours which are exact duplicates, but no passenger should be required to go through intricate processes in mental arithmetic in order to find out when he is due at a certain place. It is well to distinguish morning and afternoon figures by light and heavy type. The transfer points should be thoroughly scheduled and explained in detail. The distance in miles and tenths between each point should be plainly indicated, and it is often well to give the fares in force on all parts of the system. Regular extra cars should be scheduled and so marked in operation in some cases. Extra cars, of course, fall outside the time-table's range, and cannot be posted for the public's benefit.

Lastly, if the line is in a position to handle baggage, parcels or freight, a table of rates should be printed either in the time-table or on a separate sheet, together with any special announcements, descriptions or other useful information which the road wants the public to know. Sometimes a few advertisements may be attached to the publication to the company's advantage, provided they relate to attractions along the route, such as would increase the traffic, but other advertisements had better be omitted.

The time-tables can be distributed at all stations, hotels, car houses, parks and general public gathering places on the system, and if they are kept up to date, closely followed by the car service, and indicate the connections of both through and local service, there is no doubt that they will well repay the cost of publication in the vast majority of cases. The existing time-tables of steam roads can be studied with profit by the electric railway manager or superintendent who is in charge of a modern interurban line. While the requirements of a perfect time-table are not unreasonable, as outlined above, it is astonishing how few electric interurban roads publish the complete information required by the stranger within their lines, and it is hoped that the suggestions made here will bear early fruit in the production of time-tables which are models of convenience, accuracy and compressed information.

Train Resistance Again

Mr. Blood's paper on train resistance is an interesting contribution to the history of the subject, but its title is rather a misnomer, for the latest formula promulgated by the author is about as far from being free of empiricism as it well could be. We understand a rational formula as being one in which each term has but a single independent variable, so that the completed formula takes care, term by term, of the several factors which enter into the complete solution. In the empirical formula, which is confessedly built around the results of experiment, several variables are lumped together for convenience, and the coefficients may be so chosen that positive errors in one term may be compensated by negative errors in another. Mr. Blood is obviously right in making a strong plea for the rational formula, but unhappily he does not furnish it. His preferred formula takes the following form:

$$R = A + BM + \left(C + \frac{D}{T} \right) M^{1.8}$$

Here A is the coefficient of sliding friction, B that of rolling friction, C the coefficient of lateral air resistance, and D that of head (and stern) air resistance, T the weight and M the speed.

Now, the rough grouping of the factors is that generally

adopted, but there is no denying the fact that it is somewhat imperfect. It is reasonably certain that C and D (which latter openly groups a pair of terms), while functions of the speed are not the same function, a fact which Mr. Blood recognizes. It is highly probable that C , as Aspinall hinted in his formula, is a function of the length, as is, perhaps, also the "stern" factor of D . Certainly whatever else D may be it is not a function of the weight of the train but of the cross-section and shape of its front. The presence of T is purely empirical, and merely serves to take account of various errors and omissions in the assumptions which it does more or less well, according to the skill with which the "constants" are made to fit the experimental data.

The fractional exponent is a concession to the well determined fact that formulæ containing M^2 give too high values of R when the constants are taken from experiments at moderate speeds, and the results are extended to very high speeds. It is in effect merely an abbreviation of an expansion in the integral powers, to which all exponentials can be reduced.

As regards the other terms neither A nor B are anywhere nearly constants. It is quite certain that A varies with the speed, and that B is not strictly a linear function of M . We very much doubt whether the terms in A and B can fairly be separated as a practical matter. A track is very far from being a uniform rigid plane. We do not yet know the properties of $(A + BM)$ let alone those of its component quantities. As we have many times pointed out, there is a considerable amount of evidence that the track and axle resistance is not by any means a simple function of speed, but may even remain constant or decrease above certain critical speeds. We think this is one of the important factors of the failure at high speeds of the formulæ containing M^2 . We know of no theoretical development of combined rolling and sliding friction over a flexible, rough surface, and we are not acquainted with anyone who would care to undertake it. Practically the track and axle resistance needs investigation very badly over a wide range of speeds. The great fundamental fact of train resistance is that it is unaccountably low at very great speeds, in spite of a head-air resistance, varying as M^2 . The air resistance varies, too, with the shape of the head (and tail) and with the length and smoothness of the body, but not with the weight. The track and axle resistance varies with the number and load of trucks, the condition of roadbed, track and bearings, and in an unknown resultant fashion with the speed. We doubt very much whether, even if it were possible to get a rational formula, taking account of all these variables, it would be possible to use it comfortably on account of its complication.

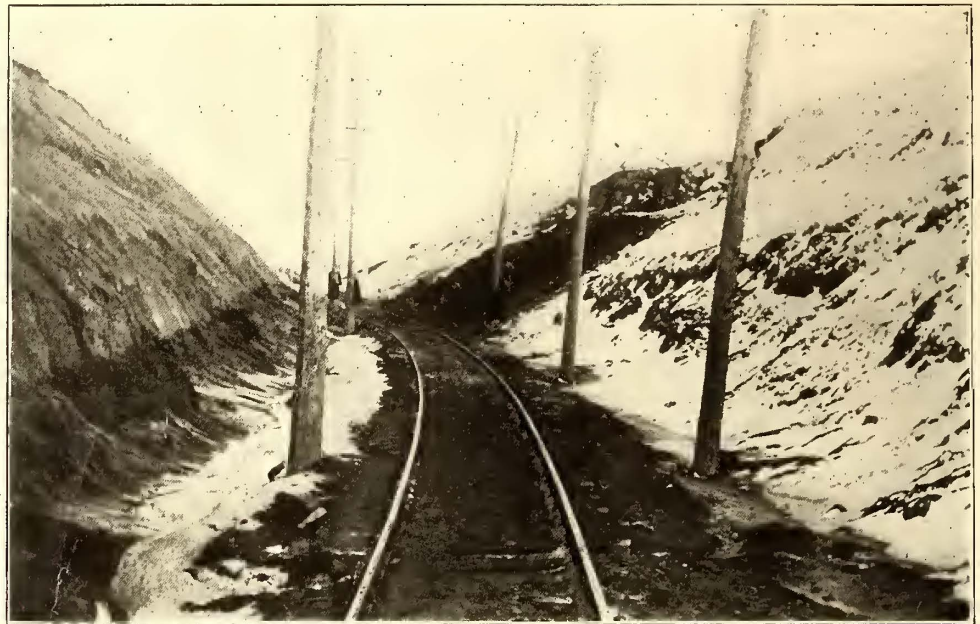
We note that Mr. Blood requires a choice of no less than thirteen integral and fractional coefficients to fit his "rational" formula to various cases of traction. We know of no empirical formula that requires more. To our mind the best formulæ are simple ones, deliberately intended to be valid over a moderate range of speed, and deliberately empirical even there. For long trains even linear formulæ are not to be despised, and integral exponents are preferable to fractional ones when it becomes necessary to depart from the linear relation, on the score of simplicity. Of late a considerable mass of data obtained in high speed has accumulated, and some competent engineer should go carefully over it and supplement it where necessary. Then we should have the material for a set of relatively simple formulæ, which would represent the facts and serve as a guide to further investigation. A rational formula would be desirable on general principles, but we are still very far from such data as would justify one.

IMPROVEMENTS ON THE CLEVELAND & SOUTHWESTERN INTERURBAN SYSTEM

The Cleveland & Southwestern Traction Company, until recently known as the Cleveland, Elyria & Western, presents an example of a system built up piece-meal to answer the demands made by thriving towns for better communication with the neighboring large city. The railway enters Cleveland as a single line, but beyond the city it spreads out like a huge fan, touching nearly all the important towns in a southerly and westerly direction within a radius of 40 miles to 50 miles, and now includes 113 miles of road, divided into seven divisions or branches. Extensions are now being built or are planned, which in a few years will probably make it one of the largest systems of interurban electric railways in the country.

The foundation for this system was laid in the 70's, when a horse-car line was built to connect the village of Berea with a railway station, 2 miles distant. In 1891 the owners of the road, Joseph Nichols, E. W. Bishop and O. D. Pomeroy, conceived the idea of building a 10-mile line to connect with the city lines in Cleveland. This was opened the following year with a storage battery equipment, and it was the beginning of the present enormous system now owned by the Pomeroy-Mandelbaum syndicate, including over 500 miles of roads in five States.

Oberlin line was extended to Wellington, 9 miles. In 1901 a 9-mile spur line was built from Elyria to Grafton, while in 1902 the Berea line was extended to Medina, 17 miles, and a new line was built from Oberlin to Norwalk, 24 miles. This year will see the Medina line extended to Wooster, 27 miles, and next year the Wellington line will undoubtedly be extended to

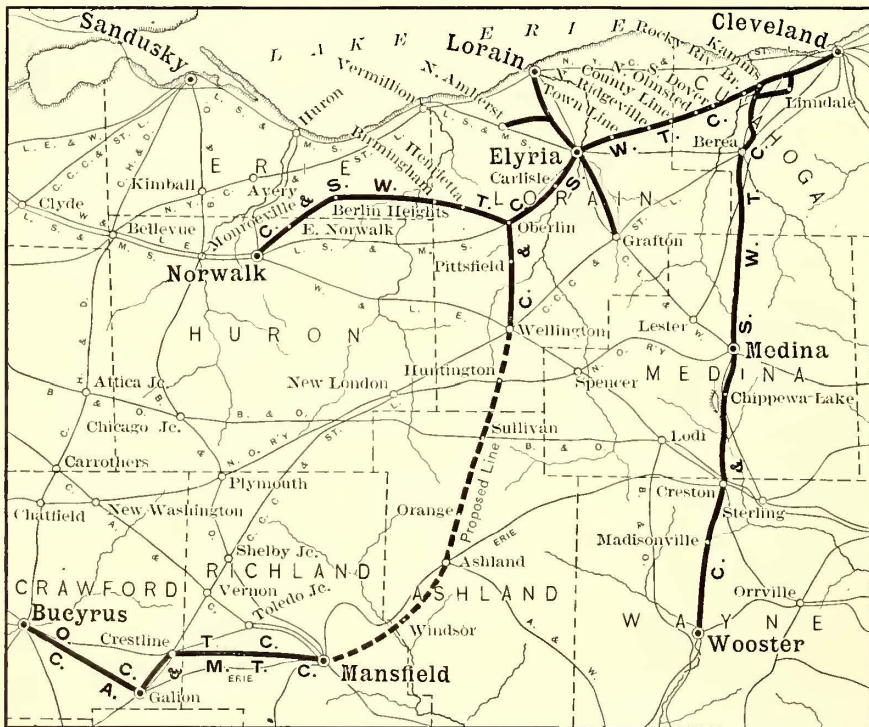


35-FT. CUT NEAR BIRMINGHAM, SHOWING LANDSLIDE

Mansfield, 40 miles, where connections will be made with the Ohio Central system, which is owned by the same interests.

ROADBED AND TRACK

In point of construction and equipment the new divisions of this system are thoroughly up to date and probably equal to anything of their class in the country. All of the roadway built during the last two years has been wholly on private right of way, and steam-road practice has been followed as closely as conditions permit. The Oberlin-Norwalk extension is particularly interesting in this connection. It is distinctively a cross-country line with right of way from 50 ft. to 80 ft. wide. A considerable portion of the line was secured by condemnation proceedings, and in one case the road cuts diagonally across a 160-acre farm. Only one grade is over 1 per cent, this being at a deep cut approaching Vermillion River. The accompanying illustration shows the character of this cut as well as the disastrous effects of a recent landslide which buried the track under hundreds of yards of earth. All curves can be taken at the highest speed with safety, and there are several long reverse curves. Several good-sized fills have solid stone-arch culverts. The track is drained on both sides, and there are heavy tile drains at all crossings. Cattle guards are placed at crossings, and the right of way is enclosed on both sides with American Steel & Wire fencing. There are but two grade crossings, and these are protected by derailleurs. The



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MAP OF THE CLEVELAND & SOUTHWESTERN AND THE OHIO CENTRAL RAILWAYS, AND THE PROPOSED CONNECTING LINE BETWEEN MANSFIELD AND WELLINGTON

In 1895 a line was built from Cleveland to Elyria, a distance of 22 miles. Two years later this was extended to Oberlin, 9 miles, and a three-legged road was built connecting Elyria, North Amherst and Lorain, a total of 14 miles. In 1898 the

road crosses the Lake Shore Electric Railway near Berlin Heights, and parallels it for several miles into Norwalk, entering the center of that city over the tracks of the other company.

The track is laid with 70-lb. 30-ft. length A. S. C. E. rails, on 6-in. x 8-in. x 8-ft. ties spaced 2 ft. apart. The ballast is shale obtained from the right of way, and handled by a steam shovel and steam locomotive with dump cars. Four-bolt fish-plates are used for rail joints, and the rail-bonds are the Chase-Shawmut 0000 flexible soldered type placed under the plates. Rails are cross-bonded every 1000 ft., and all frogs and switches are bonded around with long cross-bonds. Switches are about 4 miles apart, to provide for half-hourly service, and they are 500 ft. long with 85-ft. approaches. No. 10 frogs, spring switches and low-stand targets are used at turnouts.

OVERHEAD WORK

The overhead construction on the new division is substantially the same as that of the Ohio Central Traction Company, which was described in the STREET RAILWAY JOURNAL, April 25, the engineering features of both systems having been designed for uniformity by Walter H. Abbott, consulting engineer for the syndicate. The only point of difference is that in the present case the high-tension wires have been installed and are in use. These are on the three-phase system and are seven-strand No. 2 aluminum cable. At present only the Medina and the Norwalk extensions have high-tension transmission, but it is the intention eventually to substitute it on the entire system.

POWER PLANT IMPROVEMENTS

With this in view extensive improvements are being made at the main power station located at Elyria, the load center of the system. These improvements include the installation of two 1000-hp Parsons turbines, which will be directly



JUNCTION OF THREE DIVISIONS AT ELYRIA PUBLIC SQUARE

connected to alternating-current generators, and it is the intention to install additional units of the same type at some later date, to take care of the extensions now building and proposed. The Brunswick high-tension lines goes across country a distance of 18 miles, and another line is being installed from Brunswick to Chippewa Lake, where another sub-station is being erected to operate the extension to Seville and Wooster, which will be completed this summer. The sub-stations are identical and of the type illustrated herewith. The front portion is divided into passenger room, waiting room and express room, while the rear-half is devoted to the electrical equipment; an interior view of this portion of one of the sub-stations is presented. The equipment of each station consists of one 300-kw rotary converter, three 200-kw static trans-



JUNCTION OF TWO DIVISIONS AT OBERLIN COLLEGE CAMPUS, SHOWING HISTORICAL ELM IN FOREGROUND

formers, together with high-tension and low-tension switchboards and static interrupters, the entire outfit being furnished by the Westinghouse Company. In each station there is space and foundations for a second converter. The buildings are sufficiently high for the installation of a crane so that one converter may be lifted over another, and there is a large double door at one side, through which a track extends so that a car may run into the station.

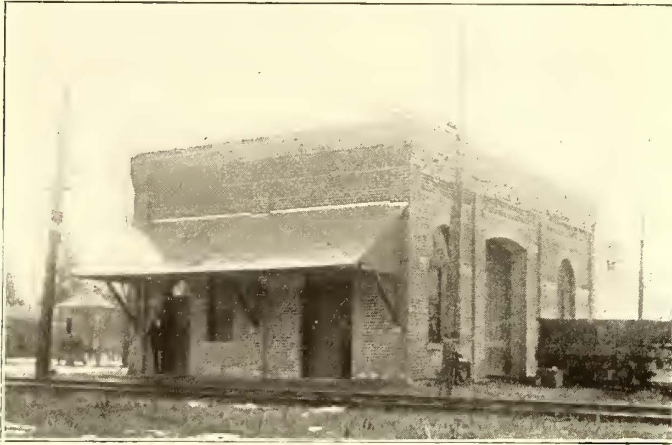
The Medina and Norwalk extensions are operated from sub-stations located at Brunswick and Birmingham respectively. Power for these is furnished temporarily by means of two 300-kw inverted rotary converters located at the Elyria power

connected to alternating-current generators, and it is the intention to install additional units of the same type at some later date, to take care of the extensions now building and proposed.

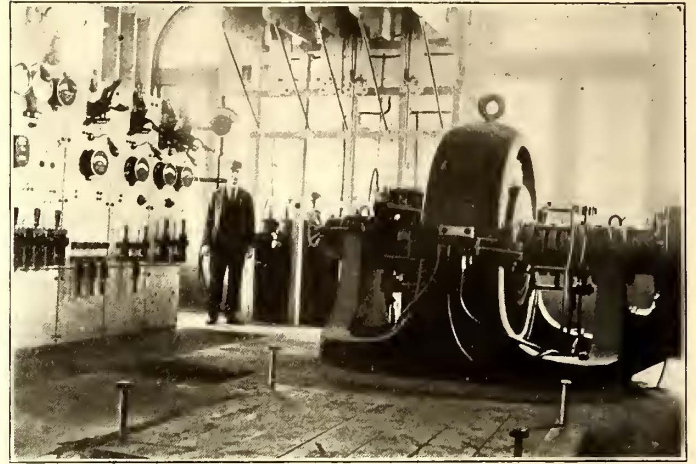
ROLLING STOCK

The company is making some interesting additions to its rolling stock. Six very handsome passenger coaches have just been delivered by the G. C. Kuhlman Car Company, of Cleve-

company will abandon most of its combination cars and will operate exclusive express cars. The Kuhlman Company furnished three express cars of a new design, which are here illustrated. They are 49 ft. over all, with 46-ft. body, and 9 ft.



TYPICAL SUB-STATION AT BIRMINGHAM



INTERIOR OF SUB-STATION

land. They are 47 ft. over all, 8 ft. 3 $\frac{3}{4}$ ins. wide, and 9 ft. 2 ins. from top of sills to bottom of roof. They have the monitor-type roof, are finished in cherry with carved moldings,

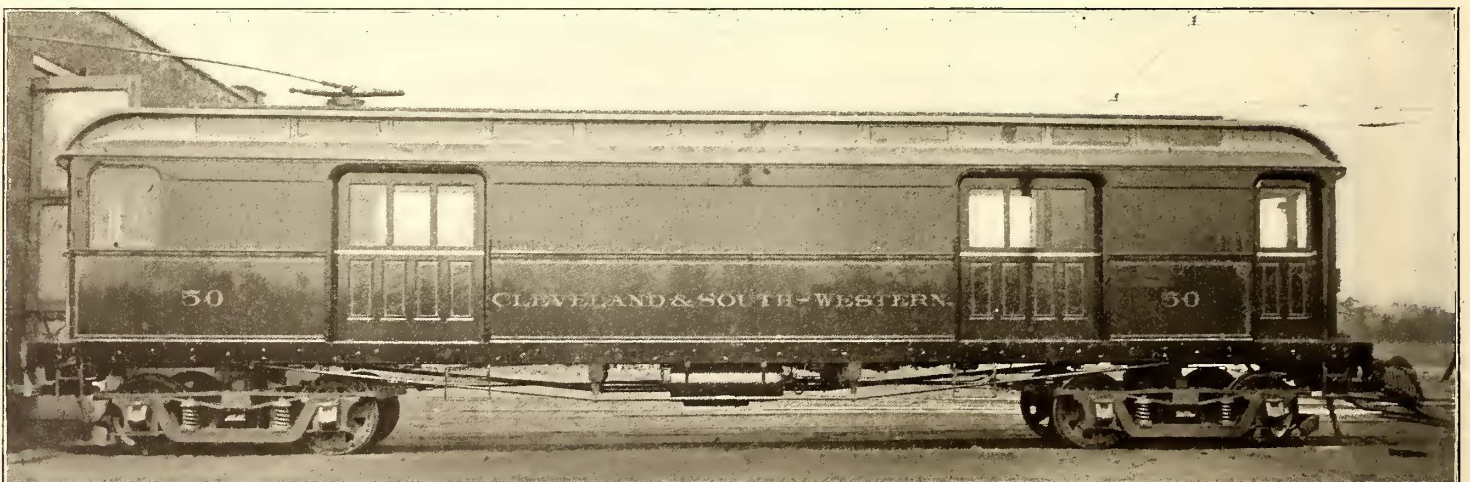
high, and are open from end to end, there being no partition for vestibules. The bottom framing is of long-leaf yellow pine. Two side sills are of 8-in. channels, 18 lbs. to the foot, running



STANDARD PASSENGER CAR

and there are cocoa mats on the floor. Hale & Kilburn walk-over seats and adjustable tables, which may be put in place between seats for card playing or refreshments on special trips,

the whole length of the car, with bumpers of $\frac{3}{4}$ -in. x 12-in. steel plates. The end sills are of $\frac{5}{8}$ -in. oak, held in place by heavy angle-irons bolted on each side to the center sills and on

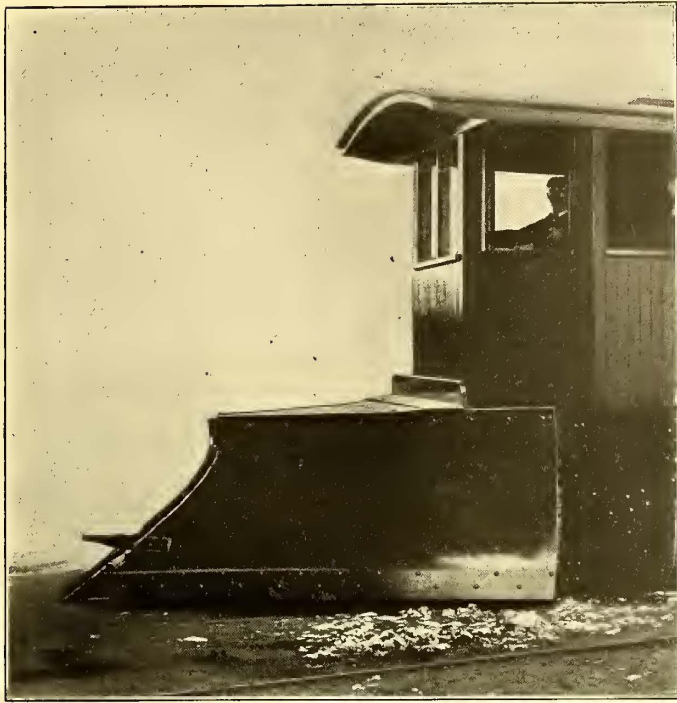


BAGGAGE AND EXPRESS CAR

are provided. The sides are of sheet panel, and the car bodies are mounted on Peckham trucks and are equipped with four 75-hp motors.

To take care of its rapidly growing express business the

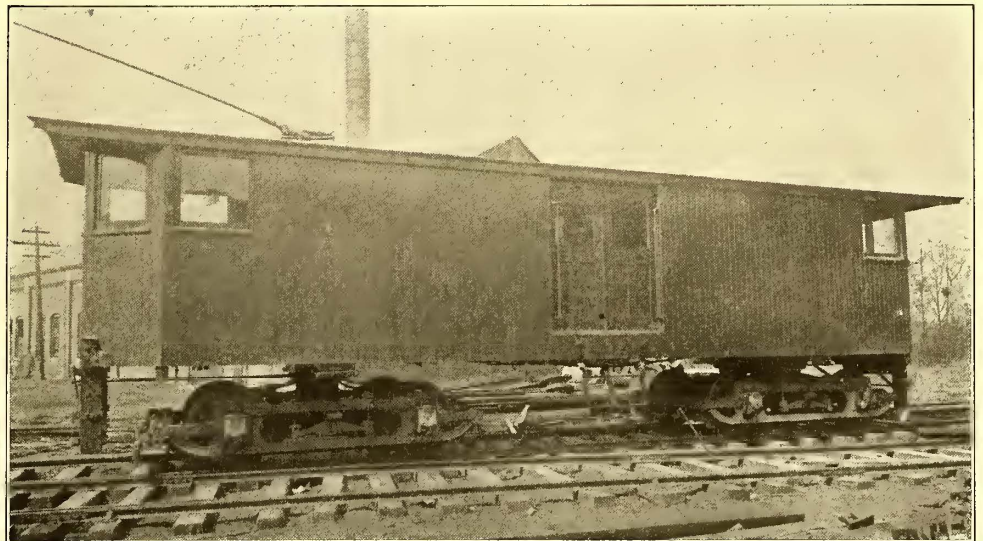
the inside to the side sills. Cross sills are of $\frac{5}{8}$ -in. yellow pine tied together by $\frac{3}{8}$ -in. rods running the full width of the bottom. The center sills are of 7-in. I-beams filled in on both ends with yellow pine and the whole bolted firmly together.



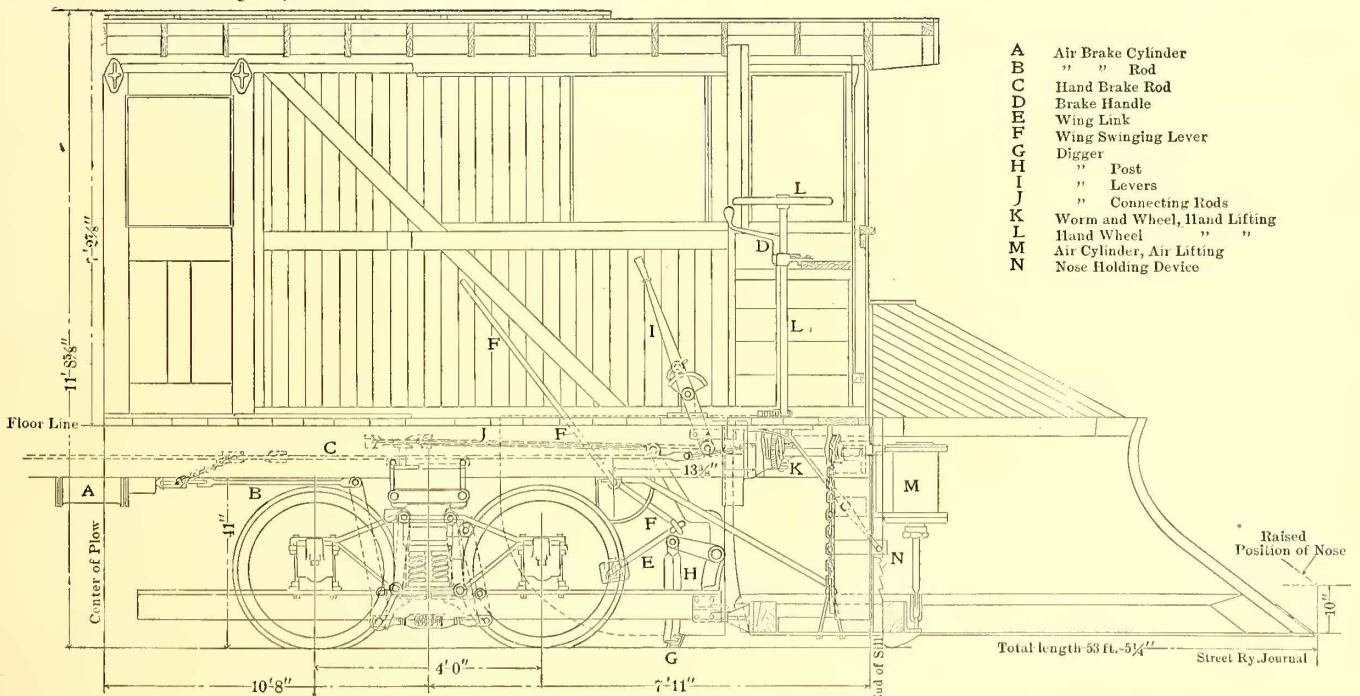
NOSE OF PLOW ATTACHED TO FREIGHT CAR

Another departure in rolling stock is a combination freight car and snow-plow, two of which have recently been furnished by the Taunton Locomotive Works. They are 52 ft. 4 ins. over all, 37-ft. body, 8 ft. wide, 11 ft. 3 ins. high, and are fitted with noses on each end, which are 3 ft. 10 $\frac{3}{4}$ ins. high and have a spread of 10 ft. 8 ins. with a lift of 9 ins. The wings may be raised or lowered or thrown in or out, and they are equipped with air cylinders by which the whole plow may be raised. The plows may be readily removed, as they are provided with hooks so that they may be handled by means of a crane. The sills are of long-leaf pine with oak plow sills, the main sill running from end to end of the car, and the end sill forming a strong bumper when the car is used for hauling freight. There are two drop windows and one large door on each side, the door being mounted on overhead roller bearings. The roof is of the curved pattern, constructed of steel, covered with heavy canvas, and having a running board down the middle for the trolley stand. The floors are double. The sills are trussed with 1 $\frac{1}{2}$ -in. iron rods, connected at the bolsters with turnbuckles and further trussed by a flat iron band, $\frac{1}{2}$ in. x 2 ins. wide, which is attached through the bumpers at the end of the car and runs up from the posts immediately above bolsters. Needle beams and braces are arranged crosswise underneath the car. The trucks are St. Louis No. 23-B, with 4-ft. 9-in. wheel base, and motors hung inside, 5-in. axles, 33-in.

The under trussing consists of four 1 $\frac{3}{8}$ -in. round iron rods, with turnbuckles and struts to support them. There is one truss rod under each end of the side sills and two under the middle. The truss needle beams are of 8-in. x 6-in. white oak, extending the full width of the car and strengthened with two $\frac{3}{4}$ -in. truss rods fitted with necessary washers, struts, etc. The flooring is double, the upper portion being 2-in. plane sawed oak. The corner posts are 6-in. x 8-in. white ash, and the intermediate posts are 5 ins. x 6 ins. There are two doors on each side, 5 ft. wide and 5 ft. 10 ins. high, with two windows in each door. These cars are mounted on St. Louis M. C. B. trucks and have four 50-hp motors.



FREIGHT CAR TO WHICH NOSE PLOW MAY BE ATTACHED



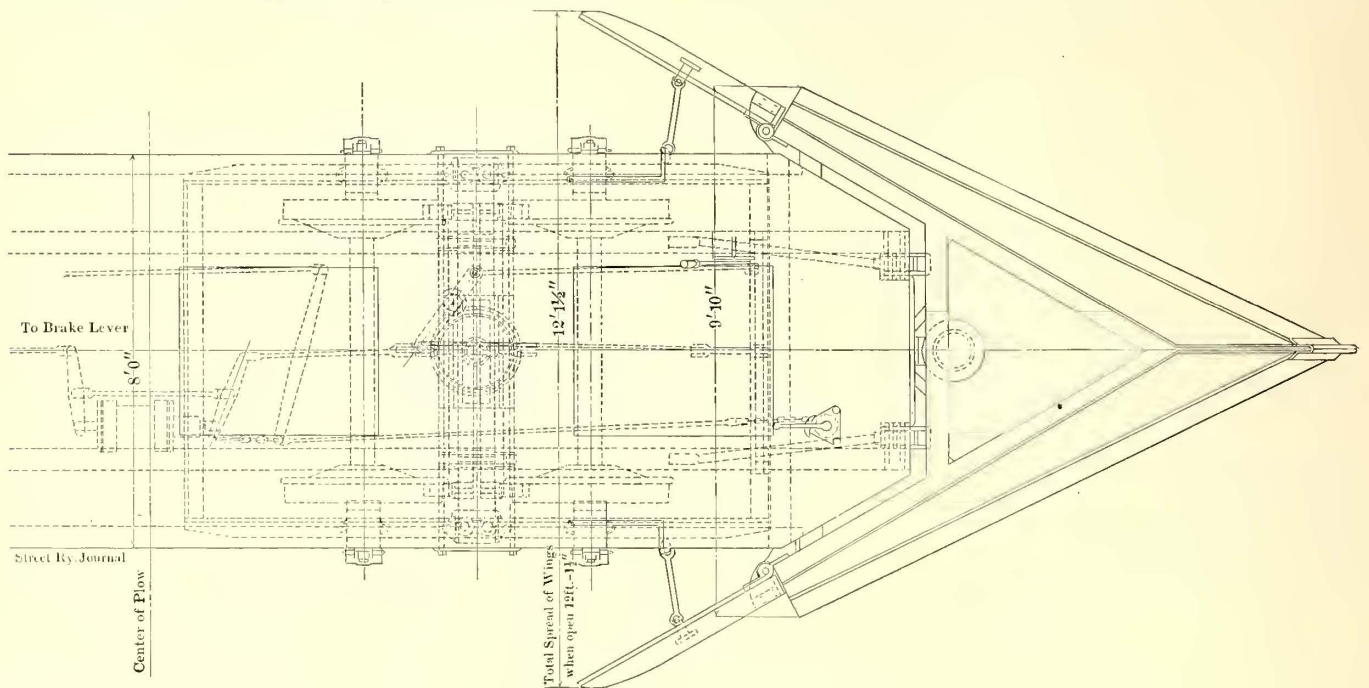
SIDE ELEVATION, SHOWING HALF OF FREIGHT CAR WITH NOSE PLOW ATTACHMENT

wheels with 1-in. flange, and boxes of standard M. C. B. dimensions.

For clearing heavy cuts on the southern division the company has purchased a Ruggles rotary snow-plow of unusual

SPECIAL STEEL BRIDGE

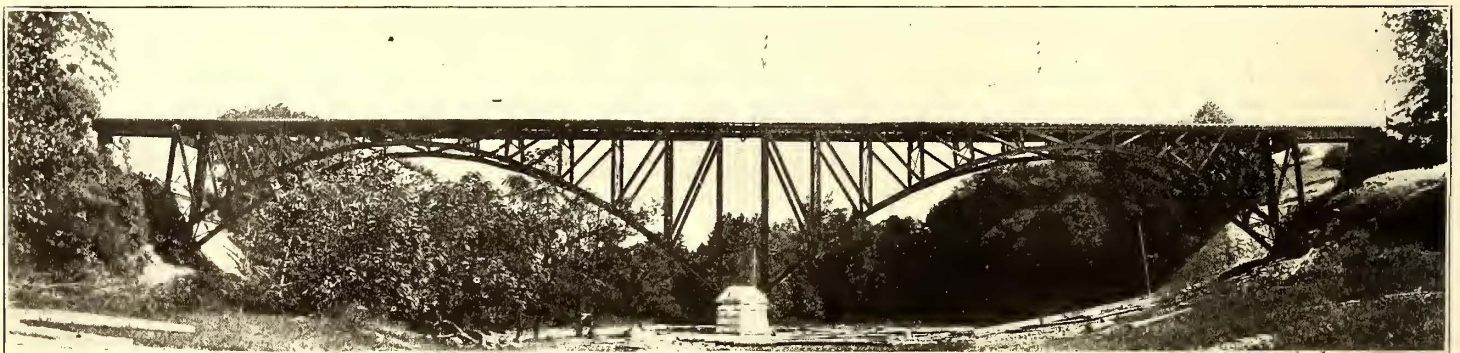
In crossing the Vermillion River with its Norwalk extension the company erected a steel bridge which is worthy of more than passing notice. It is located in a place of great



PLAN OF NOSE PLOW ATTACHMENT TO BOX CAR

size and power. It is of the double truck pattern, 39 ft. over all, and is built to run either way. At both ends of the car are beveled steel knives which revolve at a high rate of speed, propelled by motors carried inside the cab, which are attached to a longitudinal shaft provided with clutches for operating

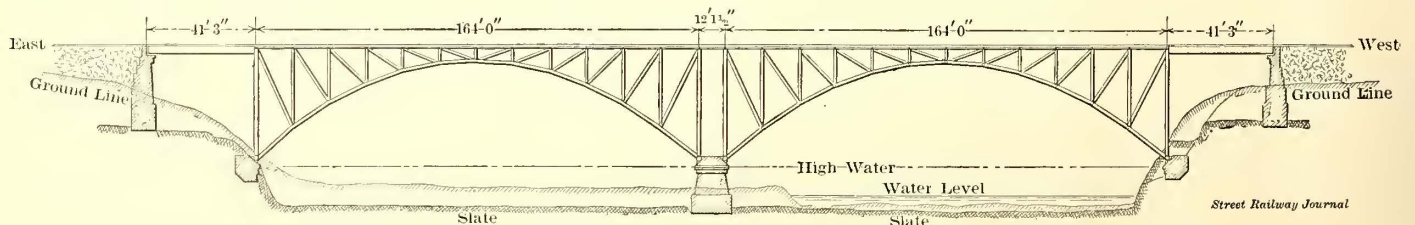
natural beauty, and it was felt that a structure should be built which would be in harmony with the surroundings. The bridge has the arch type of truss, the arches being 164 ft. long between centers of end pins. They have a parabolic lower chord with a rise of 37 ft. On each end are plate girder spans



BIRMINGHAM BRIDGE FOR CLEVELAND & SOUTHWESTERN RAILROAD

either set of knives. The knives are surrounded by steel scoops which run close to the rails and are the extreme width of the machine, the scoops extending about 18 ins. each side of the track. The snow is received on the rapidly revolving knives and expelled laterally through chutes near their upper periph-

40 ft. in length, and the total length of the steel structure is 423 ft., the height above the river being 63 ft. The foundations are carried to the hard blue shale rock which lies at about the elevation of the river bed, and is exposed on the sides of the river valley. The end skew-back piers are formed of an inde-



ELEVATION OF CLEVELAND & SOUTHWESTERN BRIDGE OVER VERMILLION RIVER AT BIRMINGHAM

pendent structure for each shoe, set well back in the shale to avoid any possibility of the foundation or backing being destroyed by the disintegration of the shale, which takes place rapidly where the shale is exposed to the air. The center pier is a heavy piece of masonry, 18 ft. x 36 ft. at its base, and ex-

pendent structure for each shoe, set well back in the shale to avoid any possibility of the foundation or backing being destroyed by the disintegration of the shale, which takes place rapidly where the shale is exposed to the air. The center pier is a heavy piece of masonry, 18 ft. x 36 ft. at its base, and ex-

tending about 23 ft. above its bed and 14 ft. above the ground line, the elevation of the shoes being just high enough to clear the high-water mark. The center pier is able to withstand the thrust of either one of the arches in case the opposing arch is removed, and is provided with a heavy cutwater on its upstream face. The feature of these piers is the large skew-back stones, 2 ft. 10 ins. thick, 6 ft. 6 ins. long and 3 ft. 9 ins. wide, weighing over $3\frac{1}{2}$ tons each. The measurements for dressing the faces of the piers were made with a 200-ft. steel tape, which was compared with the 100-ft. standard bar at the Case School of Applied Science, Cleveland. Spring balances were used in making the measurements, and allowance was made for the

the superstructure was built by the Canton Bridge Company, of Canton, Ohio.

REPAIR SHOPS

This company does all its own repair work of every description, and while the shops, located at Rockport, were well adapted for the requirements of the original line to Elyria, they have become crowded with the work of the entire system. The main building is 233 ft. x 58 ft., with an average height of 17 ft. below roof. The machine shop is 88 ft. x 22 ft.; winding room, 50 ft. x 9 ft.; stock room, 30 ft. x 8 ft.; paint and carpenter shop, 55 ft. x 47 ft.; the balance of the building being devoted to operating offices. A pit, 160 ft. in length,



PORTABLE PNEUMATIC JIB CRANE

stretch of the tape. The tapes used by the inspector in the shop were compared with this standard, in order to avoid any error due to differences in length of tape. The steel arches forming the superstructure are of the three-hinged spandrel braced type, all connections of main members being made by pins. The depth at the ends is 42 ft. and the crown 5 ft. The trusses are placed 15 ft. centers and carry a steel floor system. Wooden trolley poles are used, and these carry high-tension wires across the bridge. The spans were erected upon false work, beginning at the abutments and working toward the center, and after the spans were swung free of the falsework it was found that the chamber was just what it was designed to be, proving that there was no appreciable error in the measurements. The bridge was designed by the Osborn Engineering Company, of Cleveland, which superintended its erection, and

with concrete floor and a narrow-gage track for hoists, piped with air throughout, and a novel system of lighting are features worthy of mention. The motor or pit jack is operated by air and is mounted on a truck running on a track of 30-in. gage. The track is even with the concrete bottom of the pit, giving a smooth bottom for men to work on, and obviating difficulty in finding small parts that may be dropped. Cars are jacked by means of portable pneumatic jacks, consisting of cylindrical tanks, 40 ins. x 18 ins., and having a capacity of 5 tons each. For general hoisting and handling trucks, wheels and other material the company employs the pneumatic jib crane here-with illustrated. It was designed by William Lintern, master mechanic of the shops, and was built by the Garry Iron & Steel Company, Cleveland, which furnished all the pneumatic equipment in the shops. The crane is mounted on a Brill single-

truck with wheel base lengthened to suit the requirements. Two No. 12 Westinghouse motors are mounted outside the axles for propelling, so that the crane may be used on the road as well as in the shops. Hoisting, racking and revolving is accomplished by air, which is supplied by a self-contained Christensen compressor outfit. The crane has a lifting capacity of 5 tons, and it has been found of great value in both shop and road work. The company turns all its own axles, keeping a stock of forgings on hand at all times, thereby greatly facilitating the work. A 5-in. axle has been adopted, but as many of the motors will not permit of this diameter, special axles having a 5-in. cross-section at the ends with 4-in. sections at the points where the motors are mounted, are turned. Solid steel gears

just inaugurated for summer traffic there will be half-hourly service from Cleveland to Oberlin, the through cars alternating to Norwalk and Wellington. The generally accepted system of despatching is followed. But one form of order is used and the cars report only when late or when ordered to do so. The conductor takes the message and writes it on a slip. He repeats it to the despatcher and receives his o. k. The conductor then reads the order to the motorman who repeats it back after the slip has been handed to him.

A rather unique signal has been installed for the benefit of the patrons of White's Villa, a resort located a short distance outside the city and much frequented by society people. At a switch, 1½ miles west of the hotel, a couple of ties were taken out and a box installed beneath the rail. The weight of the car in passing over this point causes the rail to be depressed, thus closing a circuit within the box, the switching device being a simple door-bell contact. By means of a bell circuit a large gong rings in the hotel entrance, notifying guests that an east-bound car will pass in four or five minutes.

The Cleveland & Southwestern Traction Company has a capital stock of \$5,000,000, of which \$2,000,000 is preferred and the balance common stock. The outstanding bonded indebtedness is \$2,200,000, which covers also the extension to Wooster, a total of 130 miles, making the bond issue a trifle over \$16,000 to the mile. Officers are: A. E. Akins, president; A. H. Pomeroy, first vice-president; S. C. Smith, second vice-president; F. T. Pomeroy, treasurer; E. F. Schneider, secretary.



TRAIN DESPATCHER'S HEADQUARTERS

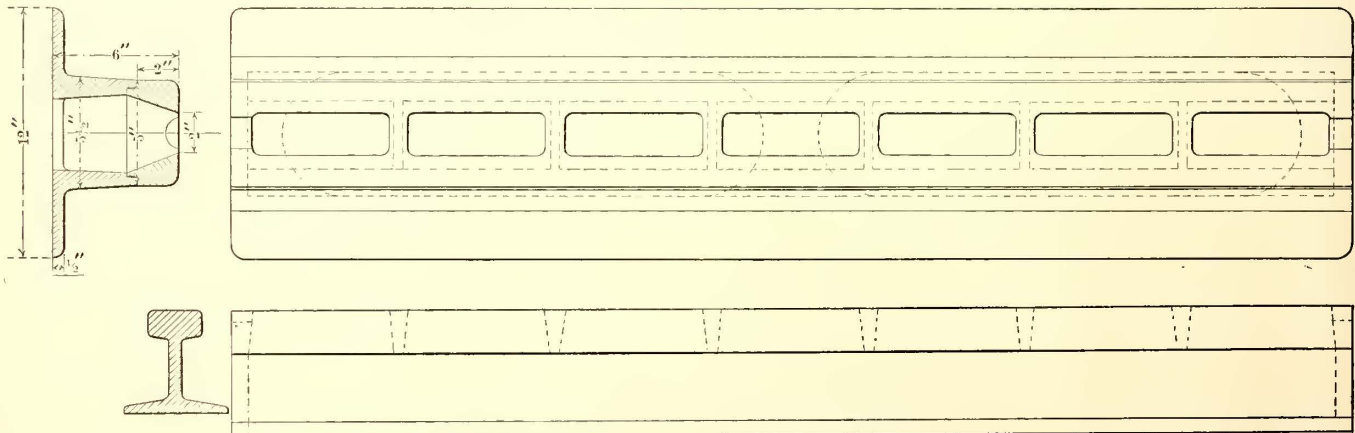
are used instead of the usual split gears, and they have been found very satisfactory for high-speed work.

TRAIN DESPATCHING

A wing has recently been added to the office portion of the shops for the exclusive use of the train despatcher. The room is large and airy, the operating table and switchboard occupying a bay at the front, while partitioned off at the rear is a coat and wash room for the operators. The despatchers work in three tricks of eight hours each. The despatching boards are in duplicate, and, together with the line boxes and instruments, were installed by the Rawson Electric Company, of Elyria. The movement of cars on all of the seven divisions of the system are controlled by the one operator, but as four of the divisions are operated as spur lines with only one or two cars, these divisions require very little attention. Under the system

DRAINING STREET RAILWAY TRACKS

The question of securing proper drainage for its tracks has been very carefully investigated by the Twin City Rapid Transit Company, with the result that a system has been worked out which has proved very satisfactory in practice. The essential feature of the method employed is illustrated in the accompanying cut, which shows a casting provided with slots opening into a drain connected with the city sewer system. These castings are located in the tracks, between the rails, where surface water would be apt to settle. The plan is very simple and effective, and in the form adopted by the company excellent results are obtained, as the drainage is gradual and leaves no accumulation of dirt or rubbish on the track. As the track is kept constantly dry the life of the roadway is prolonged, and the equipment is similarly benefited, as there is a general improvement in operating conditions.



Street Railway Journal

Track Drip No. 1—Length 4 ft. 2½ ins, for:
 52-lb. Girder Rail.
 54-lb. " "
 78-lb. " "
 75-lb. Guard Rail.

Track Drip No. 1—Length 4 ft. 2½ ins, for:
 92-lb. Guard Rail.
 97-lb. " "
 100-lb. " "
 Track Drip No. 2—Length 4 ft. 5¼ ins, for:
 45-lb. Girder Rail.

Track Drip No. 2—Length 4 ft. 5¼ ins, for:
 51-lb. Guard Rail.
 50-lb. T-Rail.
 60-lb. " "
 80-lb. " "
 70-lb. " "

DRAINING TRACKS IN SEWER SYSTEM

ENGLISH INTERURBAN LINE

An interesting electric railway system has been recently completed by Dick, Kerr & Company, of London, in Hampshire, England, the line extending from the outskirts of Portsmouth to Horndean. The line is distinctly an interurban line, or light railway, as they are called in England, and serves a purely country district. Though strenuously opposed by land-owners and residents, the promoters were able to fully demonstrate the utility of the system to the Light Railway Commissioners, before whom such projects must be brought, and at the end of 1899 the order was confirmed by the Board of Trade.

In a sense, the line may be stated to be an actual extension of the municipal tramway system which was completed some months ago. The recently completed line is owned by the Hampshire Light Railways Company, and an agreement has been made under which the Municipal Corporation undertakes to run certain cars over the lines owned by the company.

The line passes through districts of more than ordinary interest. On leaving Cosham a good view is obtained of Portsmouth with its ancient castle, where, during the French Revolution, nearly 8000 prisoners were confined; as also were the Dutch prisoners taken at the battle of Camperdown in 1797.

From the top of Portsdown Hill, nearly 400 ft. high, a magnificent view of both sea and land is obtained. The dockyard, the town hall and the parish church of St. Mary's stand out in bold relief. Beyond Portsmouth is seen the Isle of Wight with all its beauties of hills and dales, downs and cliffs.

Continuing the journey from the top of Portsdown Hill the cars pass along a delightful road through the pretty villages of Purbrook and Waterlooville, and thence to Horndean.

seekers, there is little doubt that it will be ultimately largely used for through traffic.

The work carried out by the contractors, Dick, Kerr & Company, comprised all of the track construction, the overhead equipment and the generating and sub-station plant. The

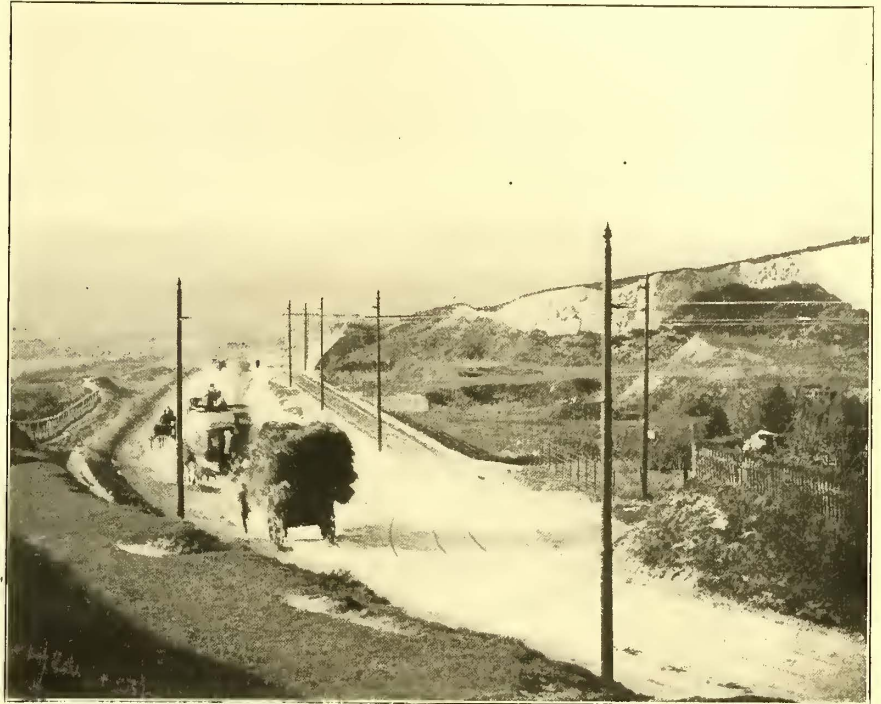


FIG. 1.—LINE PASSING FROM COUNTRY ROAD ONTO SPECIAL TRACK

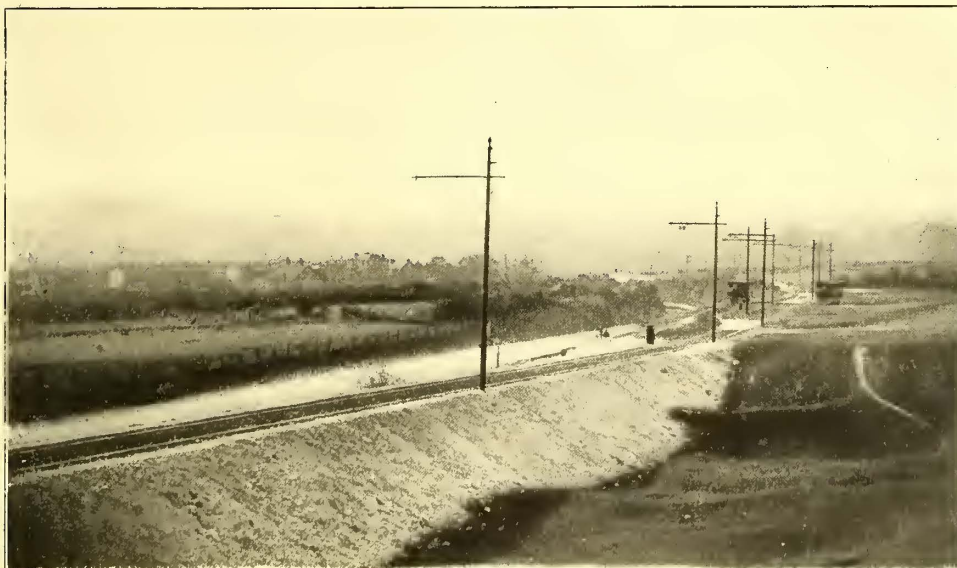


FIG. 2.—SHOWING EMBANKMENT WORK

The necessary electrical energy for the operation of the line is purchased from the Portsmouth Corporation, and the manner in which the joint arrangement has been carried out suggests that other English country districts might be effectively linked up with town tramways, even when the two systems are operated by different authorities.

The commercial prospects of the line are excellent, and though in a sense it will be mainly patronized by pleasure

cars were supplied by the British Electric Car Company. TRACK CONSTRUCTION

The length of line is 6 miles from the terminus at Cosham to the terminus at Horndean, and is of single-line construction with turn-outs. The track is practically divided into three sections owing to the different forms of construction rendered necessary by the nature of the country.

Section No. 1, from the junction with the Portsmouth Corporation Tramways to the top of Portsdown Hill, is about 1 mile in length. This section presents all the features of ordinary railway construction, the line being taken across country some distance back from the country road, but parallel to it. There are three bridges in this section, one over the London & South-Western Railway Company's line at Cosham, and two others over roads crossing the line of the track. About three-fourths of a mile of the track is carried on embankments, and the remaining one-quarter is carried through cuttings. The rails are laid on longitudinal concrete stringers, 18 ins. wide by 12 ins. deep, and are kept to gage by tie-bars spaced about every 7 ft., the whole being ballasted up to the base of the head of the rail. This construction is

general for this section, except in places where the depth of the fill is considerable. In these instances the rails are supported on timber framing, the uprights of which extend right through the fill to a substantial concrete foundation. This form of construction was adopted to insure the stability of the track should the filling material settle at any time.

Section No. 2, from the junction with Section No. 1 at the top of Portsdown Hill, through the village of Purbrook to

Waterlooville, is a distance of about $2\frac{1}{2}$ miles. This portion of the line is laid on the county road, and the form of construction is that of ordinary English street railway, that is, a foundation

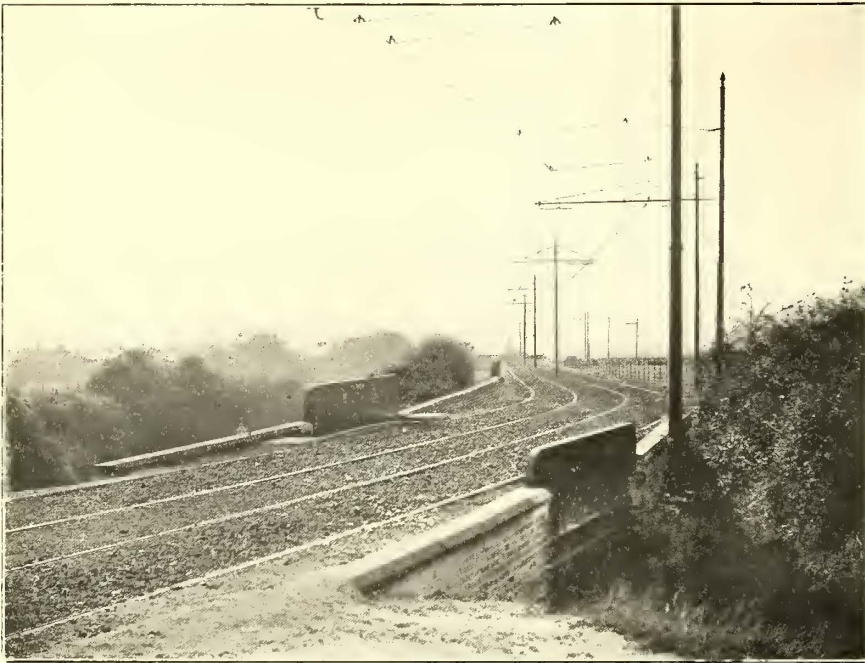


FIG. 3.—THE LINE CARRIED ON EMBANKMENT OVER MAIN ROAD

of 6 ins. of concrete extending over the whole width of the track. The rails are laid on this foundation, and the pavement laid with 6-in. granite blocks.

Section No. 3, from the junction with section No. 2 at Waterlooville to the terminus at Horndean, about $2\frac{1}{2}$ miles in length. This portion of the line is laid on the waste ground at the side of the county road, the construction of the track being exactly similar to that of section No. 2, that is, the rails are laid on the longitudinal concrete stringers, and the whole being ballasted up to rail level.

The rails used are of the ordinary grooved type, weighing 96 lbs. to the yard, and are laid in lengths of 45 ft., with a percentage of shorter lengths, to avoid cutting rails in the con-

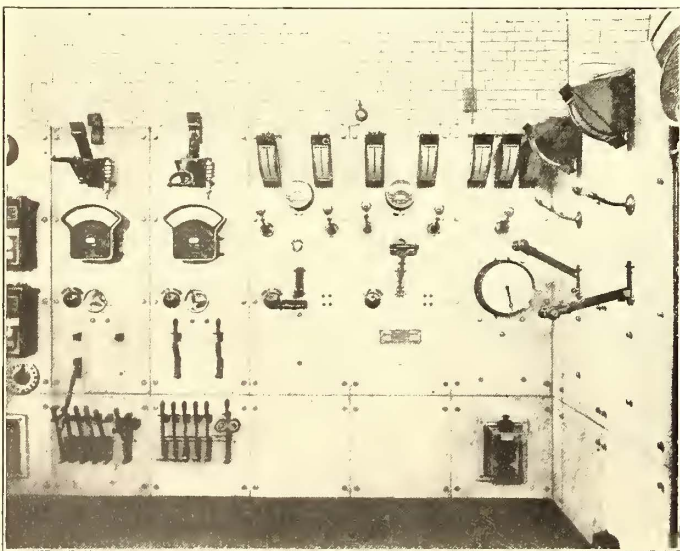


FIG. 7.—EXTENSION OF SWITCHBOARD AT MAIN POWER STATION

struction of the loops. The joint plates are of the Dicker patent combined sole-plate type, and weigh approximately 100 lbs. per pair, and are secured to the rails by means of six $3\frac{1}{2}$ -in. x 1-in. steel bolts.

Tie-bars, as before stated, are spaced every 7 ft., and weigh 14 lbs. each. The switch points are 8 ft. in length over all, and are of the manufacture of F. H. Lloyd & Company, Ltd., of Wednesbury, cast from the best crucible steel, and are of the symmetrical or equilateral type.

The crossings are 10 ft. in length, built up from the rails themselves, and were constructed at the Kilmarnock works of Dick, Kerr & Company, Ltd.

The track is bonded and cross-bonded with 0000 copper Neptune bonds of high conductivity. Figs. 1 to 4 show the different examples of track construction.

OVERHEAD CONSTRUCTION

The overhead construction is somewhat unique, combining a special form of construction for light railway work with the ordinary form of bases, brackets, etc., for those parts of the line going through towns and villages. The trolley wire, which is No. 00 B. & S. gage, is in duplicate and carried over the center of the track. Where double track exists center pole construction is adopted, and where the track is single side poles with brackets are used, and on some parts of the line where the roadway is particularly wide the span-wire system is in vogue.

The type of brackets for light railway work,

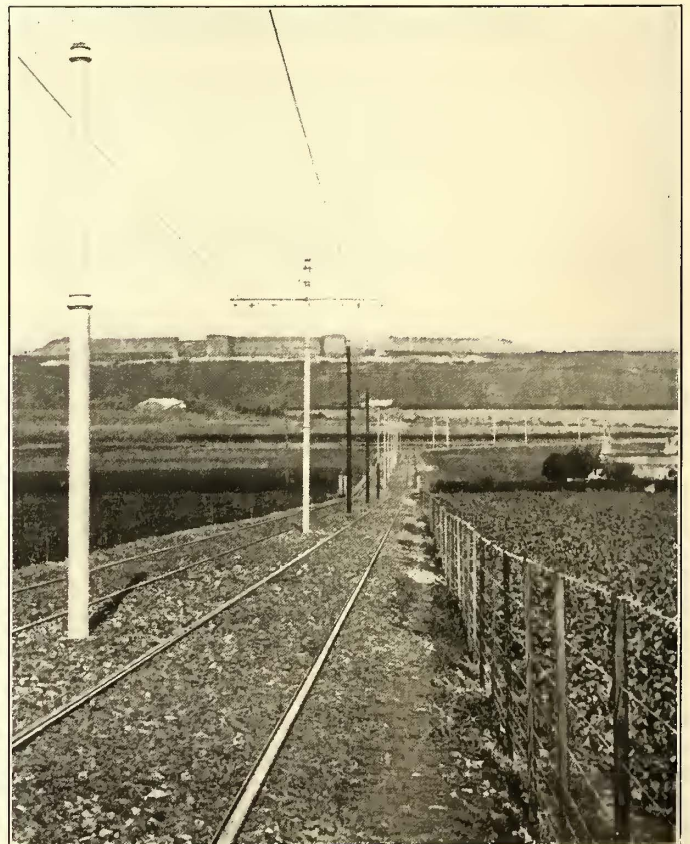


FIG. 4.—SECTION OF TRACK OVER RIGHT OF WAY

although plain in construction, are quite sightly and particularly strong. The tie-rod supporting the bracket is held by a substantial malleable iron clamp on the top of the pole, the other end being attached to a combination flexible suspension bracket, and securely turned over the outside of the pipe, thus insuring absolute rigidity for the bracket.

The poles, which are of three sizes, are built up in three sections of lap-welded steel tube. Poles used on the straight have a minimum weight of 830 lbs.; on the curves the poles weigh

970 lbs., and for dead ends and anchors 1170 lbs. These poles are made of specially strong steel, and are capable of standing a particularly heavy strain in proportion to their own weight. The No. 1 pole is capable of supporting a weight of 1200 lbs.; No. 2 pole 1500 lbs., and the No. 3 pole 2500 lbs. at a distance of 18 ins. from the top without giving more than 6 ins. temporary deflection and no permanent set.

The trolley line is as usual divided into half-mile sections, a feeder pillar being erected at each place. This pillar has in addition to the usual four-line switches a sufficient number of main switches to allow the main cables to be disconnected for making a loop test in case of breakdown.

The switches are mounted on marble panels, and the holes

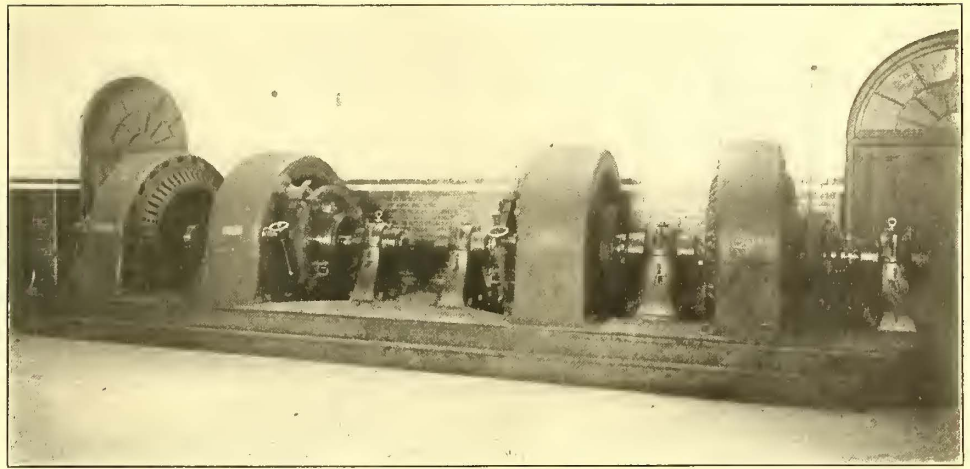


FIG. 5.—MOTOR GENERATOR SETS IN THE PORTSMOUTH POWER STATION

practice adopted by Dick, Kerr & Company in their direct-current machinery. The alternating current generator having, as already stated, a capacity of 250 kw when supplying current at 550 volts, is of the revolving field type, with external stationary armature. The stator consists of laminated segments, built up into a cast-iron frame, and special provision is made to give ample ventilation. The windings are carried in slots, and connected up in star fashion. The field magnets, consisting of laminated steel, are carried on the revolving hub, which is itself keyed to the shaft.

Exciting current is led into the field magnet coils by means of two brass slip-rings, each slip-ring being provided with copper gauze brushes. The excitation of the fields of the alternator is obtained from a direct-current shunt-wound generator, which is coupled direct to the main shaft, and carried inside one of the outer bearings. The details of the sub-station machinery are exactly in accord with the machinery at the main power house. See Fig. 6.

The switchboard at the main power house is connected to the already existing railway switchboard, and is made up of five panels, carried on wrought iron frames (Fig. 7). On the motor panels are an automatic circuit breaker, illuminated dial ammeter, the necessary switches, motor starter and field rheostat. The generator panels, of

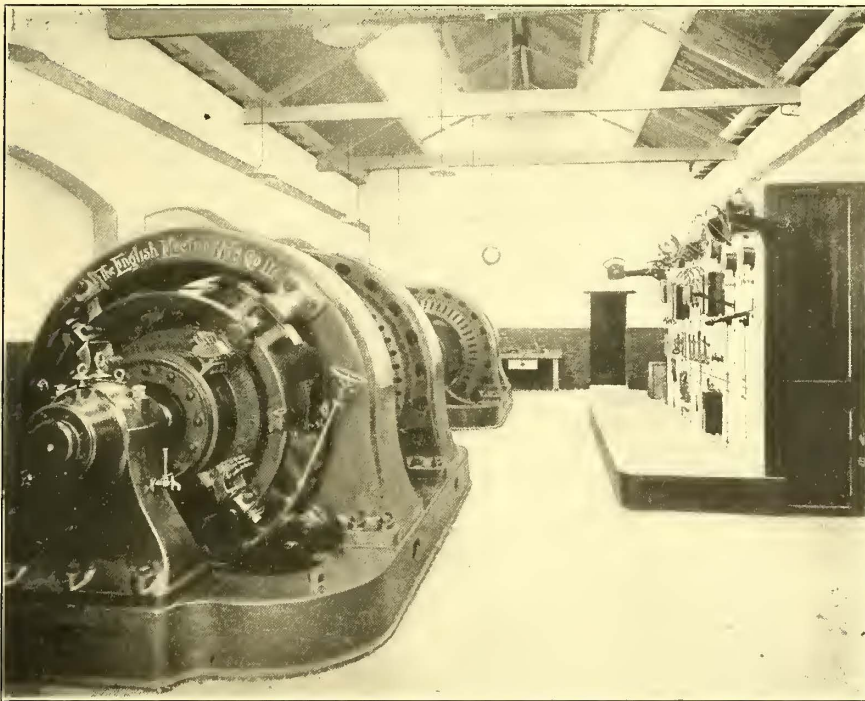


FIG. 6.—INTERIOR OF SUB-STATION

are substantially bushed with ebonite and fitted in cast-iron pillars with water-tight doors. The trolley wire is supported by gun-metal (Admiralty mixture) throughout. The insulation of the bolts supporting the wire are of specially moulded mica, and capable of standing particularly high mechanical and electrical stresses. The ears are also made of a specially tough quality of gun-metal, varying in lengths from 15 ins. to 24 ins., to suit the conditions of the work.

As the end of the line is a considerable distance from the Portsmouth power house the system necessarily called for transmission of energy at a high pressure.

The system of transmission is a three-phase one, three-phase motor generators being at the power house in Portsmouth (Fig. 5), whence current is transmitted at 6000 volts to a sub-station about midway along the line.

There are two motor generator sets which have been erected in the power station, each consisting of a four-pole direct-current shunt-wound motor, direct coupled to an eight-pole three-phase alternator, carried on the same bed-plate. The motor derives its supply from the railway bus-bars, and the output of each machine, at 375 r. p. m., is on the alternating-current side 250 kw. The motor closely follows the standard

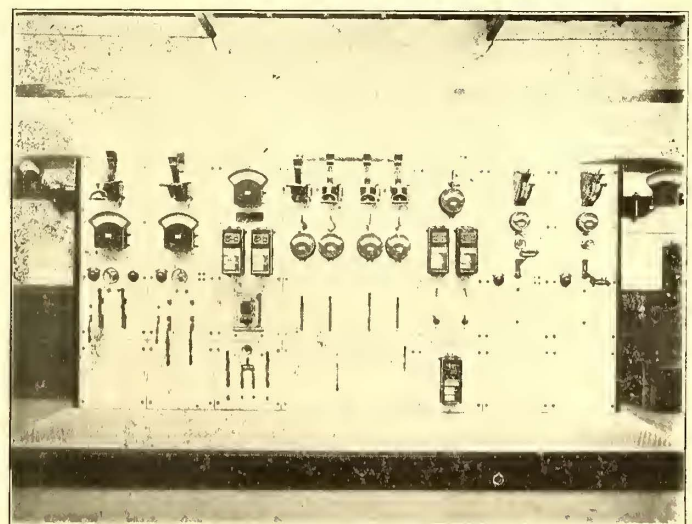


FIG. 8. STATION SWITCHBOARD

which there are two, arc provided with the necessary fuses and switches, field rheostat, field breaking switches and resistances and synchronising apparatus. The fifth panel is for the feeders, and controls the entire output of the motor generator sets, and is provided with three high-tension fuses, one high-tension switch and Kelvin ammeter.

The switchboard at the sub-station consists of eight panels, the details of construction being similar to the board at the power house, see Fig. 8. The input panel and two motor panels deal with current at 5000 volts, and are arranged so that no live connections are accessible from the front of the board. They are provided with the usual ammeters and the necessary fuses and switches. The generator panels, which deal with the current for the overhead line, are provided with the usual equipment. There are, in addition, two feeder panels and the ordinary Board of Trade panel.

The current is carried by a specially constructed three-core cable to the sub-station. The sectional area of each conductor in this cable is .05 sq. in., and has a conductivity of over 98 per cent according to Matthieson's standard. The cable is lead sheathed, and under this lead sheathing is bound a copper earthing strip. The thickness of the di-electric between the cores is .1875 in., and between the core and the cable and the cable earthing strip .1875 in.

The insulation material used on the cables is specially impregnated paper, and so high is the insulation qualities of this that these cables, which are in duplicate, have stood an alternating E. M. F. of 20,000 volts for fifteen minutes without the slightest defect becoming apparent.

From the sub-station a continuous current is taken to different parts of the line to cables, of .5-sq. in. and .25-sq. in. capacity, the whole of the cables being laid on the solid system. The track and buildings were constructed under the supervision of John Glenn, C. E., who acted as engineer for the promoters, while E. Rotter, A. M. I. C. E., has acted as consulting engineer for the electrical portion of the system.

A RATIONAL TRAIN RESISTANCE FORMULÆ*

BY JOHN BALCH BLOOD

1. In the early days of train resistance formulæ, when speeds were not high, the frictional resistance of track and journals was a considerable factor in the total resistance. Again, the head resistance was charged up to the locomotive, without a formula, and train resistance meant the pull on the engine draw-bar.

These facts, together with the fact that the criteria of industrial competition were loosely drawn, made a simple formula the desideratum, and we see as a result formulæ of many varieties containing a single variable.

These served their purpose at the time, but time and advancing knowledge showed their inadequacy both as to absolute results and functionally. The immediate needs were supplied by sets of formulæ with different coefficients and variables, each good only for a certain range.

The original single term formulæ were of two kinds, as follows:

$$R = A + BM \tag{1}$$

$$R = A + CM^2 \tag{2}$$

Where R = train resistance in lbs. per ton,

M = speed of train,

$A, B,$ and C = coefficients.

2. The development from these formulæ showed a desire for a rational formula, the elements of which would represent distinct parts of the resistance recognizable and measurable. Experiments and the gradually increasing train speeds began

to indicate the different elements of resistance, although the function and absolute value of each was not obtained.

The higher normal train speeds brought out the fact that a factor of the resistance was the air friction, and that it certainly varied as a function of the speed greater than unity, and in all probability as the square.

3. In 1885 the Eastern Railway of France made some very extensive experiments, and gave as their results a set of formulæ of a rational type, using different coefficients for different ranges of speed. Their formula was of the type

$$P = (A + BM) T + CQM^2 \tag{3}$$

Where P = total pull or horizontal effort,

M = speed,

T = weight or train,

Q = cross section of train,

$A, B,$ and C = coefficients.

This reduces for comparison with other formulæ to

$$R = A + BM + \frac{CQM^2}{T} \tag{4}$$

It will be noted that for trains with a speed of 12-32 km per hour, these engineers left off the last term having the speed factor as the square, leaving a formula of the form (1).

This formula (4) is interesting from a rational standpoint. First, it has two terms with variables; one as the first power of the velocity, and one as the second power of the velocity. Second, the second power factor has a component, the cross-section of the train. This would show that this factor was to give the air resistance, and would show that they appreciated that there was another part of the resistance that was not constant, and yet it did not vary as the square.

4. Their set of formulæ, instead of a single formula, showed that their variables were not functionally correct, and must be modified by variation of the coefficients.

This set of formulæ as given by them is as follows:

(a) For freight trains speeds 12-32 km per hour,

$$W = (1.65 + 0.05 v) Q.$$

(b) For passenger trains speeds 32-50 km. per hour.

$$W = (1.8 + 0.08v) Q + .009 Av^2.$$

(c) For passenger trains speeds 50-65 km. per hour.

$$W = (1.8 + 0.08 v) Q + .006 Av^2.$$

(d) For express trains speeds 70-80 km per hour.

$$W = (1.8 + 0.14 v) Q + .004 Av^2.$$

Where W = resistance of train in kilograms,

Q = weight of train in tonnes of 1000 kg.,

N = speed in km. per hour,

A = cross section of trains (5 qm.).

These formulæ were very accurately constructed from careful and exhaustive experiments, and the variation in the coefficients will serve to indicate the functional inadequacy of the variables.

There are four points to be observed in the variation of these coefficients. First, that the factor independent of the speed was apparently constant at all speeds. The deviation from this in case of freight trains could probably be accounted for by the construction of the car or the relative weight of load per axle. Second, it will be seen that the coefficient of the first power factor is increased as the speed increases. Third, that the coefficient of the second power term is decreased with increased velocity. And, fourth, that the second power term is eliminated from the low-speed formula.

5. From these observations we would draw the following conclusions: that there is a portion of the train resistance that is independent of the velocity; that the air friction factor has little or no influence below 32 km. These seem to be clear.

The increasing of the coefficient of the first power term and the decreasing of the coefficient of the second power term indicate an empirical attempt to adjust the coefficient to take care of improper functional value of the variables.

We find a single variable formula with first power factor gives too small results for high speeds if it is correct for low speeds. We find, also, that a single variable formula with a second power factor gives too high results at high speeds if it

* Paper presented at the meeting of the American Society of Mechanical Engineers, Saratoga, June 23, 1903.

is correct at low speeds. This would seem reasonable, as it is apparent that there are at least three forms of friction—plain sliding friction, which is independent of the speed; rolling friction, which varies directly as the speed, and fluid friction, which, in case of air, would vary theoretically as the second power of the speed.

6. It seems, then, perfectly reasonable that a rational formula should have these three terms. Experience shows that while a formula having three terms of zero, first and second power variables, respectively, will give accurate results for a wider range than either of the single variable formulæ, it is common with the second power single variable formula gives too large results at high speeds, if it is correct, at the lower speeds.

This is apparently what the engineers of the Eastern Railway of France found, and they tried to counteract this by reducing the effect of the second power at higher speeds by reducing the coefficient, and by increasing the effect of the first power term at higher speeds by increasing its coefficient. It would seem that the increase of the relative moment of the first power term at high speeds was palliative only, rather than that the rolling friction did increase in greater ratio than the first power.

The conclusion to draw from the above is, that the third term of the equation should have an exponent greater than one and less than two.

7. In March, 1899, I presented in the STREET RAILWAY JOURNAL a rational formula with a third term having an exponent of 1.8, giving reasons somewhat as above to substantiate its reliability. The formula expressed in the same terms as above was:

$$R = 4 + .15M + .3 \frac{M^{1.8}}{T} \quad (5)$$

W. J. Davis gives a formula which gives very accurate results below 40 miles or 50 miles, but it is generally acknowledged that it gives too high results at higher speeds. The formula is:

$$R = 6 + .13M + .35 \frac{M^2}{T} [1 + .1(N - 1)] \quad (6)$$

Mr. Davis gives different coefficients for different sizes of cars, but does not vary them for the speed. The large cars would naturally be used at the higher speeds, so that the coefficients, if adjusted to the higher part of the curve for the larger cars, would give a series of curves with better total results, but would not be any more functionally correct than the French formulæ.

8. There is a point in rational formulæ which is very important, namely, that the terms for head and stern resistance have in the denominator a factor proportional to the length or weight of the train. This appears in many formulæ, and is reasonable when it is considered that the head and stern resistance would be independent of the length of the train, and therefore, when expressed in pounds per ton, would be inversely proportional to the weight or length. In most formulæ the weight is used rather than the length.

This would give as a principle that the head and stern resistance, which varies as a power of the speed between one and two, should have a weight factor in the denominator.

It has been found by experiment that the air resistance on the sides of the cars varies as power of the speed higher than the first. It is evident that this factor of total resistance should be proportional to the length or weight of the train, and, therefore, in our form of formula would have no weight factor in the denominator.

The head and stern resistance can be divided if it is desired. It is found in actual practice that the head resistance is much larger than the stern resistance. Professor Goss's experiments on models show that this head resistance is 6.5 times the stern

resistance, and that the head and stern resistance together are about 6.2 times the side resistance of one car.

From collateral evidence it would seem that the coefficient of the variable in the side resistance term should be considerably lower than that of the head resistance term. The air, in case of the side resistance, is not compressed, but is sheared off, and the fluid particles are dragged aside rather than piled up on each other.

On the basis of the above, the rational formula would be:

$$R = A + BM + CM^n + D \frac{Mp}{T} + E \frac{Mp}{T} \quad (7)$$

Where R = resistance in lbs. per ton,
 M = speed in miles per hour,
 T = weight of train in tons,
 n = exponent of side friction term,
 p = exponent of head and stern friction terms,
 A = coefficient for sliding friction,
 B = coefficient for rolling friction,
 C = coefficient for side air resistance,
 D = coefficient for head air resistance,
 E = coefficient for stern air resistance.

Now, we have not yet enough data for determining the proper exponents, nor to separate the exponents into the two forms. Again, as there are always two ends to a string, the head and stern resistance will always come together.

Until we find sufficient evidence to give us the two exponential factors, we will be better served to combine all three exponential factors into one. Again, for general work this would be simpler and sufficiently accurate. We would then have:

$$R = A + BM + \left(C + \frac{D}{T}\right) M^n \quad (8)$$

9. This is essentially the formula given by me in 1899, the only difference being in the coefficient of the exponential term separating out a factor representing the side resistance which is proportional to the train weight.

Where R = resistance in lbs. per ton,
 M = speed in miles per hour,
 T = weight of train in tons,
 n = exponent = 1.8,
 A = coefficient of sliding friction,
 B = coefficient of rolling friction,
 C = coefficient of side resistance,
 D = coefficient of head and stern resistances.

The values of these various coefficients are as follows:

$A = 3$ for heavy freight trains.
 $A = 4$ average passenger trains.
 $A = 5$ heavy large electric cars.
 $A = 6$ medium electric cars.
 $A = 7$ light electric cars.
 $B = .15$ for light track construction,
 $B = .12$ for heavy track construction.
 $C = .0016$ for ordinarily constructed cars.
 $C = .0014$ for cars with vestibules.
 $D = .25$ for small cross section cars.
 $D = .30$ for medium section electric cars.
 $D = .35$ for large electric or suburban trains.
 $D = .40$ for largest express trains.

As our experimental data is increased it will be possible to correlate these coefficients more intimately with the elements of friction they represent.

The foregoing has shown the gradual development of the train resistance formula from a rational standpoint. It, however, has been viewed all along from the start from an empirical standpoint.

10. When it was found that a formula with a single variable term was insufficient, there were those who refused to add another term to the formula, contending that such term did not give an absolute formula, and only extended its range if results were at all in advance. Again, the range of increased alleged accuracy was within the range of variation in the value of the coefficients, so that altogether the extra complication was not worth the result. These advocated an empirical formula

taking such range for each separate set of coefficients as experience would warrant.

There were others, I believe, who were led to abandon the rational formula on account of intellectual cowardice. They found that a single variable formula was hopelessly inadequate with either the first power or the second power. After having passed to the three term formula with first and second power variables, they saw that with the increase of speed and shortening of trains, too high results would be obtained at high speeds. They balked at following the natural and logical course of reducing the exponent of the second power term, arguing, perhaps, that the complication of the fractional exponent was not warranted; also, perhaps, being led by the fact that the theoretical air resistance is known to vary as the second power.

11. Let us consider the use of a train resistance formula. Originally it served more as a guide than an engineering hypothesis. As skill in design and application increased, more and more attention was paid to the fitting of machines to the work they had to do. Moreover, with steam railroads and long trains, extreme accuracy was not essential, as one or more cars could be added or taken off as conditions required.

With the advent of short suburban trains with three to five cars, short distances between stations, and a demand for increased schedule speed, it became very necessary to fit the motive power with a nicety to its work. In case of a three-car train, if the locomotive was too small, the taking off of a single car would reduce the train weight 33 per cent, and then the locomotive would be too large, besides necessitating a change in the time-tables.

This need was still further emphasized by the high speeds of such trains as the Empire State Express of the New York Central & Hudson River Railroad, and also by the high-speed interurban electric cars. In case of these electric cars the motive power of each car being on its own axles, there is no possibility of adjustment if it is not suited to its work.

It will be seen, then, that the use of train resistance formulæ has changed from that of a general guide to that of a fundamental engineering criterion. Extreme accuracy is now a desideratum, functional as well as absolute.

Again, the complication of the number of terms and the fractional exponent is not the drawback that it would appear, as the use of such formulæ now takes the intermediary of charts or curves, eliminating all complication of calculation. Moreover, the general use of the slide-rule makes a fractional power practically as easy of calculation as the integral factor.

Those who argued for the empirical formula pretty generally stuck to the single variable formula, and varied the coefficients to suit the case. There were those who, finding the two variable formulæ inadequate, apparently went on an empirical excursion to find some form which would give accurate results for a wider range than given by existing formulæ. The formula of Mr. John Lundie is of this class, and as stated by him is:

$$R = 4 + 5 \left(.2 + \frac{14}{35 + T} \right),$$

which, reduced for comparison with rational formula, becomes

$$R = 4 + .20M + \frac{14M}{35 + T} \quad (9)$$

The third term of this equation cannot be explained rationally. The depreciated reciprocal weight factor has no rational analogy in practice. This formula has all the complications of a three-term formula, without the advantage of a rational formula.

12. J. A. F. Aspinall, the general manager of the Lancashire & Yorkshire Railway, has gone into the matter of train resistance in an exhaustive manner, and presented in November, 1901, at a meeting of the British Institution of Civil Engineers,

a paper on the subject. He gave as results of his study and experiments for a five-car train:

$$R = 2.5 + \frac{V^{3/2}}{57.8} \quad (10)$$

Where R = resistance in lbs. per ton of 2240 lbs. drawn,
 V = velocity of train in miles per hour.

He found that for a greater number of cars that the length entered as a factor and gave

$$R = 2.5 + \frac{V^{3/2}}{50.8 + .0278L} \quad (11)$$

Where T = length of train in feet.

It will be noticed that the independent coefficient is small. It can generally be taken as a fact that when the independent factor is less than three the formula is empirical, and that the independent coefficient is reduced to compensate some other error introduced. In all formulæ this independent factor represents the resistance just before coming to rest, and is the minimum obtainable resistance. This is seldom less than 4 lbs., and only in exceptional cases goes below 3.5 lbs.

Mr. Aspinall has the courage to go to a fractional exponent. He, however, combines all variables into one term, thereby cutting loose from a rational formula. He has also a depreciated reciprocal length factor, which is comparable with Mr. Lundie's depreciated reciprocal weight factor. Mr. Lundie has a third term with the first power variable alone, which Mr. Aspinall does not.

Although I am a believer in a rational formula, I was pleased to see Mr. Aspinall's formula, as he is the first man to give, other than myself, a fractional exponent of the variable.

C. O. Mailloux recommends an empirical formula, and one of the form

$$R = A + BM^n \quad (12)$$

Now, mathematically, this equation can be made to very closely represent any curve with a constantly increasing function, and, therefore, can be made to represent any given test curve, probably, within the limits of accuracy. If a curve be plotted representing a given set of readings, and a curve of form of equation (12) be plotted to represent such curve, if the highest points of the two curves coincide, it will be found that the empirical curve cuts the real curve at two points, and that the values of the resistance as calculated from the empirical curve beyond the upper limit are higher than the true values. It is very important in extending curves to have all points determined as accurately as possible, for a slight variation in direction is magnified by the amount of extension. That this empirical curve would give high results on the extension is obvious when it is considered that a factor varying as the first power of the velocity is eliminated, and its place taken by an augmented coefficient of the higher power factor. At low values of the speed, the difference between the true value of the first power variable and its substituted higher power factor would probably be within the limits of accuracy of observation, but this is not so at high values, and would always lead to high results. This empirical train resistance formula is good to represent a given series of results for mathematical or functional comparison. It, however, is of little, or perhaps better stated, inferior value for predicted results of extension beyond the highest value of observation. It is very important for extending the curve that the first power factor be present and accurately determined as to its coefficient.

12. Another important point which the empirical formulæ entirely leave out is the relative value of the different portions of the resistance. In a rational formula it will be seen that the side air resistance comes within the limits of accuracy at about 30 m. p. h., and the head and stern resistances become negligible for a six-car train at about the same speed; but for a single-car train they do not become negligible till you get down towards 20 m. p. h. It would seem this is a very important function of a train resistance formula. It would seem, in conclusion, that all

arguments favor the rational form rather than the empirical form, and that the highest exponential variable should have a fractional exponent between one and two.

A DESCRIPTION AND TEST OF A 400-KW TURBO-GENERATOR

Frederick A. Waldron, superintendent of the Yale & Towne Manufacturing Company, of Stamford, Conn., read a paper at the June meeting of the American Society of Mechanical Engineers on a 400-kw Westinghouse-Parsons steam turbine which his company installed in 1901. His figures and conclusions are summed up below:

The equipment consisted of a two-phase, 240-volt alternator, of 400-kw capacity (when the turbine was running condensing, and the power factor of the alternator was from 90 per cent to 100 per cent), 7200 alternations, running at 3600 r. p. m., with a separate direct-connected exciter set. The alternator is of the revolving field type, and the surface speed of the field is 22,137 ft. per minute. The weight of the outfit is 33,200 lbs., and it occupies a floor space 19 ft. x 4½ ft. The guaranteed economy was 16½ lbs. of water per electrical horse-power at the switchboard, with 28 ins. of vacuum, 40 degs. F. superheat and 155 lbs. gage pressure. Tests for economy, under slightly different conditions, given later, show how nearly the guarantee was reached.

The condenser plant consists of a surface condenser, containing 1100 sq. ft. of cooling surface, with independent air and circulating pumps. The air-pump is of the simplex, twin beam, vertical type, making about 90 single strokes per minute. The average vacuum obtained with this outfit, with plenty of circulating water, is about 27.4 ins. This outfit is to be replaced by one of more recent design, and operated on the "dry system" and with a two-gage vacuum pump. Steam is furnished by eight Manning boilers.

The generator supplies current to sixty-four induction motors (with varying loads), ranging from ½ hp to 40 hp, which are distributed throughout the works.

The turbine end of this machine has received very little attention in the past year, and has required no renewals or repairs to any of its parts; in fact, from an operating standpoint, it has been found almost fool-proof. It was found necessary, when assembling the machine, over a year ago, to remove from the bearings, with a fine oil-stone, some burrs which had been thrown up in handling, and also a little rust which had accumulated; upon examination of the same one year later these marks had not been worn out, and there was absolutely no difference in the recorded diameters of the bearings, covering a period of one year's wear.

Occasional longitudinal adjustment, to check the clearance between the blades in the case and the revolving element, has been necessary. The wear and tear on other parts of the machine have been practically nil, and if the oil is kept in constant circulation and properly cooled, there is no need of a "hot box," and the amount of oil used is extremely small; the consumption of this particular machine is ½ gal. of cylinder oil per week, and from 3 per cent to 5 per cent of the lubricating oil on the bearings may be said to be wasted. The quality of the oil used should be perfectly free from acids which would, in any way, tend to injure the bearings. Considerable apprehension has been felt by a great many who have not come in actual contact with the turbine that the blades in the revolving element would be a source of trouble. If the machine is properly set and adjusted, with a chance for expansion between the machine and its condenser, there is (outside of defective material) absolutely no danger from these blades. It is necessary to remove the top of the case of the turbine once in three months (especially when the plant is first started), as red lead or other foreign substances in the pipes are liable to clog

the smaller blades, although a steam strainer is provided, which cares for any foreign substances which may in any way injure them.

The principal trouble with the steam end is its liability to shut down, when running from three-fourths to full load, because the vacuum is destroyed. This can be prevented if the engineer is on hand, but sometimes he isn't there, and the company had one or two shut downs in the last year from this cause. The writer states that he is informed, however, that a device for automatically preventing this is being designed by the makers, and it will be on the second machine.

It is desirable to place in the pipe for cooling water for the oil well and oil-trap with a by-pass, and, what is still better, if convenient, to have two sources of water supply. An open drip should also be provided, which can be frequently tried by the engineer, to insure proper circulation of cooling water. The electrical end of the machine has given all the trouble experienced—not from the result of electrical design and defect, but from mechanical defects, pure and simple.

The field or revolving element is made of four cylindrical forgings, 23⅜ ins. in diameter, aggregating in length about 28 ins. These sections are forced onto a shafting, with about 150 tons pressure. Owing to centrifugal force and the heat developed in the field one of these sections crept on the shaft about three-fourth of an inch, the result being that, on Aug. 21, 1902, one of the field wires was pulled apart. Repairs were quickly made and the makers agreed to furnish a new field, which was placed in position the latter part of December; when, upon starting the machine for the purpose of testing, it immediately (upon attaining full speed, and without any load upon it) flew into a large number of pieces, entirely demolishing the electrical end, and badly damaging the steam end. Investigation showed that invisible flaws in the forging were the cause of this accident. No damage was done to the building outside of the breaking of a few panes of glass, neither were any of the occupants injured, although there were eight men in the room at the time.

Some of the more important questions which could be asked of the operation would be answered as follows:

Is the windage excessive? It certainly is more than from a slow-speed generator, yet, as a whole, is not disagreeable, as noise in the engine room is a comparative quantity.

Are you satisfied with the continuity of operation? Outside of the breakdown (which was due to defective material or to causes entirely foreign to the machine) it is entirely satisfactory.

What condensing outfit is necessary? This is a question which each purchaser can best decide for himself. The writer's experience, however, is that the best is none too good, and that for continuous running and high vacuums the dry system, with a two-stage air-pump, will probably maintain higher average vacuums than any other system.

Can exhaust steam be used for heating? This turbine has supplied 25,000 sq. ft. of direct-radiating surface and 7500 sq. ft. of blower-stack surface, and maintained a temperature of from 60 degs. F. to 70 degs. F. in all buildings, when generating 520 kw and with a temperature of 220 degs. F. in the exhaust chamber of the turbine. The differential in pressure was produced by 10 ins. of vacuum on the power house end of the drips for the heating system. The writer has also found that the temperature in the exhaust chamber of the turbine varies with the different loads, and at full load and overload there is more or less superheat, whether running condensing or non-condensing.

What overload will it stand? A 50 per cent overload has been maintained at full speed for five hours without apparent injury to the machine.

Can it be changed from condensing to non-condensing, and vice versa, when running? This has been done daily during

the heating period, and without difficulty or shut-down, according to the following schedule: Non-condensing, 7 a. m. to 10 a. m.; 1 p. m. to 3 p. m. Condensing, 10 a. m. to 12 m.; 3 p. m. to 6 p. m.

Type of exciter? The exciter should be driven by an independent engine.

Cost? Upon the basis of strictly competitive prices the turbine, ready to run, costs from 10 per cent to 15 per cent less than the same sized reciprocating engine outfit. The cost of the power house per square foot per kilowatt would be about 65 per cent less for a turbogenerator outfit than for a reciprocating engine of the same power and economy. The cost of foundations is taken into account in the cost of the engine and turbine. The cost of piping is not included in either case, excepting the piping between the throttle and the condenser.

Is the vibration excessive? The author considers that, unless it is possible to balance a lead pencil on the outboard bearing and allow it to remain there for a minute, the machine is vibrating more than it should; and while there are no foundation bolts to hold the machine down there has been no tendency for it to creep on its foundations.

Some figures from tests made for economy are given below. In regard to these the author says that no special attempt was made to obtain an unusual vacuum. The condenser was tested for leakage, and all water was measured from the air-pump discharge. The power for the exciter (10.8 kw) was determined in a separate test. The exhaust from the exciter engine is used for heating purposes. Shop tests on the turbine, made eighteen months before the test of this paper, showed an economy of 14.47 lbs. of water per brake-horse-power with a load of 607 brake-horse-power and 16.43 lbs. of water per brake-horse-power, with a load of 263 brake-horse-power (200 kw). These tests were under approximately the same conditions as to pressure, vacuum and superheat as those in this paper.

The tests were made under actual running conditions; the test for each room being continued for one-half day, with regular working load, and readings of the wattmeter were taken every two minutes. The mean vibration of the pointer was taken as the true reading. The efficiency of the motors (under their different loads) was taken from the curves furnished by the builders.

ECONOMY TESTS OF 400-KW TURBO-GENERATOR

Average load in kilowatts	152	323	375	397.11	490
Steam pressure at throttle in lbs.	144.85	153.3	152	150.92	152.7
Superheat at throttle in degrees F.	None	3.44	6.46	19.66	18.2
Average vacuum in ins.	27.34	27.64	27.43	26.95	27.55
Water per kilowatt hour in lhs.	28.05	22.34	22.29	22.156	21.7

TRANSPORTATION TO SARATOGA CONVENTION

Secretary Penington, of the American Street Railway Association, has just issued a statement embodying rules governing the issue of tickets at reduced rates for the Saratoga Convention. The passenger associations have granted excursion fares from all points except in the district of the Southwestern Passenger Association. The usual rate of a fare and one-third for the round-trip will be charged. Tickets for return journey must be purchased within three days after adjournment of meeting, Sunday not being reckoned as one of the three days. No certificates will be honored if issued in connection with any ticket unless full fare shall have been paid to Saratoga. In the official chart of locations, issued last week and reproduced in the last issue of this paper, the space of the Baldwin Locomotive Works should have been given at No. 86 instead of No. 60.

There was a rear-end collision on the London Underground Railway June 17, in which the last two cars of the forward train were wrecked. Twenty passengers were taken to the hospitals more or less seriously injured.

CORRESPONDENCE

THE BERLIN-ZOSSEN TRAIN RESISTANCE TESTS

NEW YORK, June 16, 1903.

EDITORS STREET RAILWAY JOURNAL:

I have read with interest the editorial in your last issue entitled "Tailings from the Berlin-Zossen Mine," and believe I express the sentiment of surprise and disappointment generally felt by the engineering fraternity at the policy so far followed by the Studien Gesellschaft in refusing to make public the results of the train resistance tests on the Berlin-Zossen line. These trials were conducted nearly two years ago with the co-operation of the German government in generously giving the use of the Zossen military railroad, and under the auspices of a number of the leading scientific bodies and manufacturing companies of Germany. They were of world-wide interest, and all the results attained should have promptly been made available in some form or another.

Instead, the information given out has been very meager. The only extended account published in any English or American paper, so far as I have been able to discover, was printed in the STREET RAILWAY JOURNAL for June 7, 1902, and Aug. 2, 1902. None of the German papers, even, has published as much information in regard to the most important feature of the tests, viz., the factor of air resistance, as is contained in the STREET RAILWAY JOURNAL of the dates mentioned, and even the matter contained in them is practically unavailable to the American engineer. Learning that "Glaser's Annalen für Gewerbe und Bauwesen" was the only German periodical to whom any of the figures had been given, I searched for a copy of this paper at the libraries of the three engineering societies in this city and in several of the large importing houses without success. None of them exchanged with it, but I finally found a copy at the library of the Franklin Institute in Philadelphia. Even this paper did not contain several of the diagrams given by the STREET RAILWAY JOURNAL. A more unsatisfactory outcome of the long-heralded scientific investigation could hardly be imagined, a sentiment which is evidently reflected by Mr. Gerard, of Brussels, in the article referred to by you in your editorial last week.

RAILWAY ENGINEER.

[While we sympathize to a certain extent with our correspondent, we will say that our information was obtained directly from the offices of the Studien Gesellschaft in Berlin, and so have no cause to complain.—Eds.]

CALCULATION OF FEEDERS FOR INTERURBAN LINES

BOSTON, Mass., June 15, 1903.

EDITORS STREET RAILWAY JOURNAL:

I notice a slight error in the reproduction of Fig. 3 in my letter to you printed on page 884 of the issue of June 6. The ground drop line should drop from 8 volts at the 7.5-mile line to 0 volts at the 0-mile line, instead of being parallel to the base line at 8 volts as shown.

HENRY D. JACKSON.

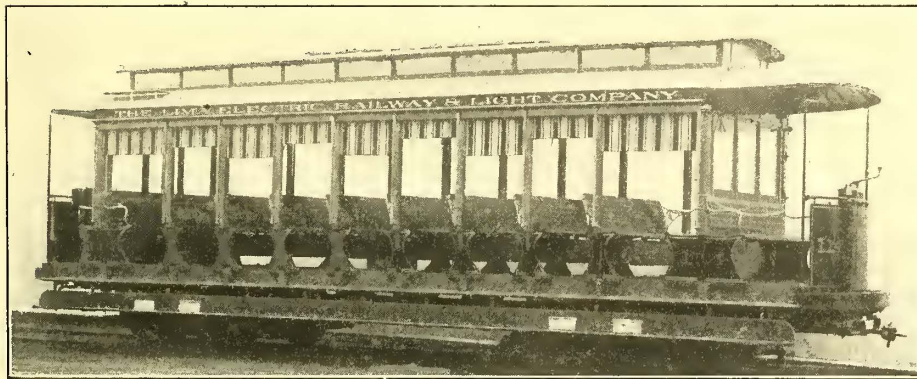
BOSTON & WORCESTER TO TRY OIL SPRINKLING

The Boston & Worcester Street Railway Company has purchased about 30,000 gals. of crude oil for sprinkling its roadbed between Southboro and Worcester. This part of the line runs almost entirely over private land, and, as the roadbed has been recently graded, more dust was expected than on the section between Chestnut Hill and Framingham, where the track runs through a grass-grown boulevard right of way. It is now expected that the road will be opened through to Worcester on June 24.

OPEN CARS FOR LIMA, OHIO.

The accompanying engraving is of one of the "Narragansett" type of twelve-bench open cars built by the J. G. Brill Company and shipped last week to the Lima Electric Railway & Light Company, of Lima, Ohio. The railway company operates a fine amusement park, which attracts large crowds and taxes the transportation facilities to the utmost, and these new cars will be of great assistance this summer in moving the crowds. The builders claim that by using a Z-bar for the sills and the foot of the Z-bar for the upper steps, they obtain a double step without exceeding the width of a single-step double-truck car. The seat ends extend over the sill somewhat, as shown in the illustration, but this, it is said, is not an objection, as it does not in any way detract from the comfort of passengers seated next the posts. The posts are stepped in brackets bolted to the sills, and enclosed by round-corner seat-end panels, which rest on the top of these brackets. The panels have metal grooves cast on their outer surface, which are extensions of the post grooves and permit the curtains to be drawn to the floor. This arrangement affords a firm support to the posts.

The cars are 34 ft. 8 ins. long, measured over the crown pieces. From the center of the corner posts over the crown pieces is 4 ft.; width over sills, 7 ft. 3 ins., and over posts at belt,



OPEN CAR FOR LIMA

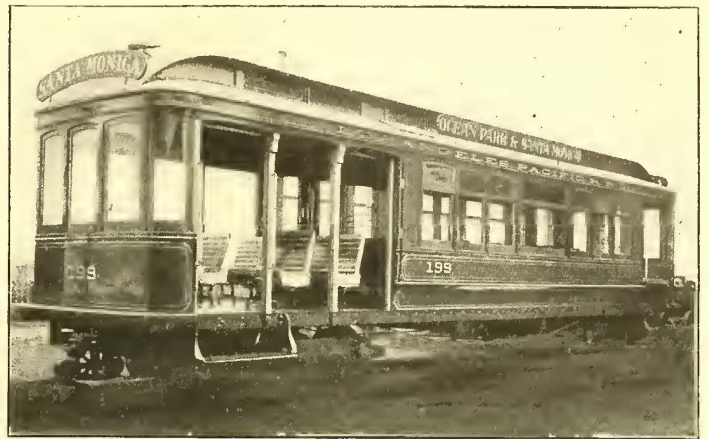
8 ft. 1 in.; from center to center of posts is 2 ft. 8 ins.; sweep of posts, 5 ins. The corner posts are 3 5/8 ins. thick, and the side posts, 2 3/4 ins. The running board is 16 ins. from the rail head, from board to sill step is 13 ins., and from sill step to car floor 7 1/2 ins. Cherry and ash in natural colors comprise the interior finish, with ceilings of decorated birch. The trim is solid bronze throughout.

The trucks are Brill No. 27-G, with 4-ft. wheel base and 33-in. wheels. Motors of 38 hp are used.

INTERESTING CARS FOR CALIFORNIA

The Los Angeles-Pacific Railroad Company has lately added ten combination open and closed cars to its equipment, built by the American Car Company, of St. Louis. The system operated by this company is one of the most extensive on the coast, having 129 miles of lines and running 138 cars. A picturesque country is traversed, attracting a large number of tourists and those who ride for pleasure from Los Angeles and other places along the route. The cars are strongly built for the fast schedules that are maintained and for the heavy loads that are carried all the year. The side sills are 4-in. x 6-in. long-leaf yellow pine, plated on the outside with 1/2-in. x 6-in. steel. Bracketed to the steel sill plates are straight posts for the open portion, 2 3/4 ins. thick, which, with the vestibule posts, make an excellent support for the roof at this end. The corner posts of the closed compartment are double, 8 ins. wide, and the side posts 2 3/4 ins. and 3 1/2 ins. It will be noticed that the central windows are double size, giving a pleasing appearance both from without and within. These windows are 4 ft. 8 7/8

ins. from center to center of posts, and the other windows 2 ft. 5 7/8 ins., measured from same points. The curved glass in the vestibule corners adds to the bright and rich appearance, and



COMBINATION CAR FOR LOS ANGELES

particularly suitable since single seats are introduced in these corners. To obtain room for the corner seats the controllers and brake shafts are placed nearer together than usual. Protection from rain or wind for the open part is had by drawing the curtains to the floor.

The closed compartment has large comfortable reversible back seats. The woodwork is plainly finished mahogany, with red brick ceilings stained to the same tone of the mahogany and neatly decorated. Large mirrors of beveled plate are placed in the corners and over the end windows to assist the light. The lower sashes of the windows are arranged to raise. The length of this compartment over end panels is 22 ft. 2 ins. The width over the posts at belt, 8 ft. 5 1/2 ins.; sweep of posts, 3 3/4 ins.

From panel over crown pieces at open part, 11 ft. 1/8 in., and at other end, 5 ft. 3 7/8 ins. Width over sills, 7 ft. 9 ins. The



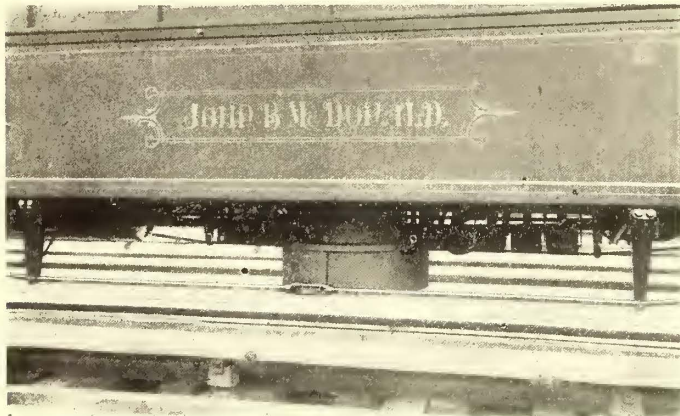
INTERIOR OF COMBINATION CAR

trucks are American Car Company's special trucks for this company. Wheel base, 5 ft. 4 ins.; 30-in. wheels; weight of a car body and trucks, 21,000 lbs.

H. H. Clough, vice-president and general manager of the Rockford, Beloit & Janesville Railroad Company, reports that on June 4, the occasion of the Woodman's picnic at Janesville, this road carried 8196 people with eight cars, making 2608 miles. The earnings were \$2,050.96, or \$257.37 per car, cars running on time all day.

TURRET-FORM MULTIPLE TRAIN CONTROL

The new Westinghouse multiple train control, which was first described in the STREET RAILWAY JOURNAL of May 16, is shown in its latest development in the accompanying illustration. Within one compact structure of turret form are ar-



TURRET FORM MULTIPLE TRAIN CONTROL

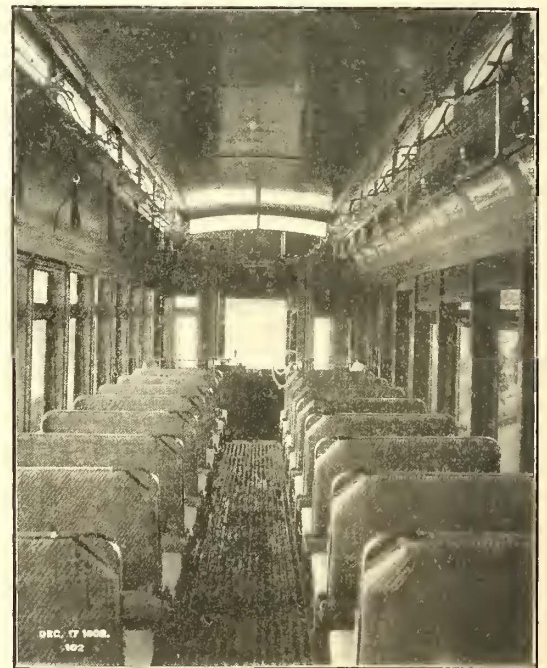
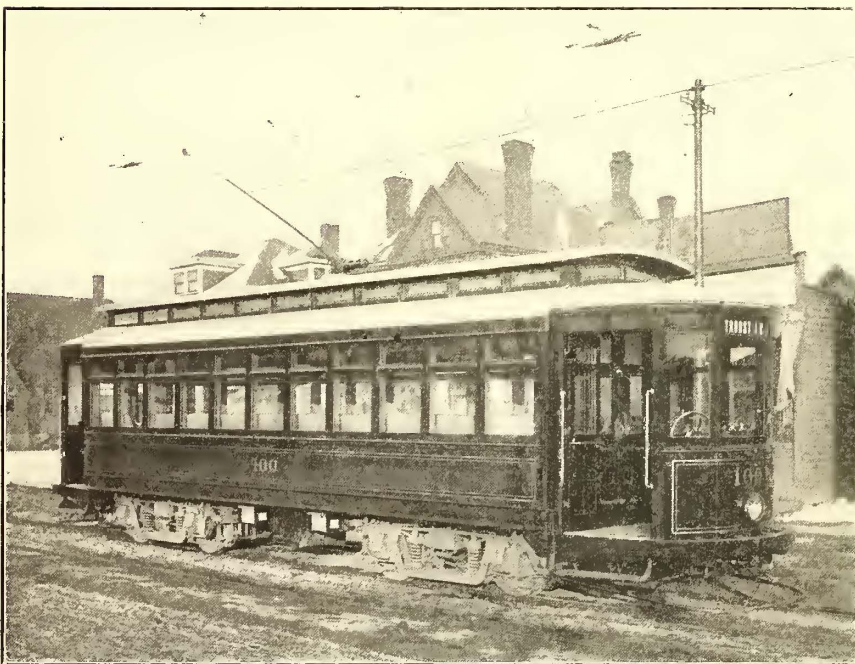
ranged the electropneumatic devices to operate a simple form of electric switch, a safety circuit breaker and automatic means for preventing the admission of excessive current to the motors, thus effecting economy, protecting the apparatus and insuring the smooth operation of trains. The new controller is located in the small turret under the car, and, it is claimed, has a circuit-breaking power fifty times greater than that of

Satterlee, assistant general manager of the Metropolitan Street Railway Company, of Kansas City. The point he makes against the plan is that when a premium is offered for conductors and motormen having no accidents it has a tendency to make the men fail to report small accidents which occur when they are on duty, as by so doing they would run the risk of forfeiting their premiums. He did not consider it feasible to adopt the premium plan and exclude the petty accidents which apparently cost the company nothing when making up the premium list, for the reason that the company has no means of knowing when suits for damages may be brought on any of the petty accidents recorded. The small accidents are frequently the ones which make the most trouble. The large accidents, for which the company is liable, are soon settled. It is the small accidents that give the opportunity for the bringing of unjust suits, and it is the unjust damage claims, rather than the just ones, that the company has to fear, as they are the most serious menace to financial prosperity of street railway companies to-day.

A NEW STANDARD CAR FOR KANSAS CITY

The Metropolitan Street Railway Company, of Kansas City, has adopted a new standard car for its electric lines, which will be substituted for the cable trains when the cable lines are abandoned in Kansas City. This change is now going on under the supervision of Ford, Bacon & Davis, engineers.

This is one of the semi-convertible cars which are becoming so popular these days. It was built by the St. Louis Car Company. The length is 43 ft. 3 ins. over all, with a body 30 ft. 7 ins. long. Both car body and trucks of the cars shown in the



EXTERIOR AND INTERIOR OF STANDARD CAR FOR KANSAS CITY

former designs. Among other advantages of this "turret system" are great blow-out capacity, uniformity of action, superior arrangement of contacts, an automatic accelerating device and marked economy of space.

ONE VIEW OF THE ACCIDENT PREMIUM PLAN

The plan of granting a premium of 1 cent per hour, or something of that kind, to motormen and conductors operating their cars for a given period without accident, has found considerable favor with some managements, and has had considerable effect in reducing the number of accidents in some places where it has been tried. The plan has both its strong points and its objections. One of the latter was recently brought up by W. A.

accompanying engraving were built by the St. Louis Car Company. Future orders, however, will have trucks with shorter wheel base, on account of some of the short curves combined with grades, and a Brill truck, with a 4½-ft. wheel has been specified on the next car. The present trucks have a 6-ft. wheel base. This car has eleven seats on each side, and so will seat forty-four persons. In some the window sashes are let down and the opening covered with a trap-door window sill. These cars are equipped with four General Electric 57 motors. The weight of the car complete is about 50,000 lbs., divided as follows: Car body, 20,000 lbs.; trucks, 13,000 lbs.; motor equipment, including two K-14 controllers, 14,000 lbs.; air-brake equipment, 1000 lbs.; auxiliary equipment, such as sand-boxes, fenders, hand brakes, etc., 2000 lbs.

LEGAL DEPARTMENT

CONDUCTED BY WILBUR LARREMORE, OF THE
NEW YORK BAR

CHARACTER OF MONEY TENDERED TO CONDUCTORS

In *Barker vs. Central Park, etc., R. R. Co.* (151 N. Y., 237), the New York Court of Appeals held that a rule of a street car company in a large city, requiring its conductors to furnish change to passengers to the amount only of two dollars, is reasonable; and that a tender, by a passenger, of a five-dollar bill to be changed for a five-cent fare is unreasonable and need not be accepted. The court, accordingly, sustained the action of the conductor in ejecting the passenger from the car because he made no other offer of payment. This decision certainly commends itself to common sense and the sentiment of justice. It is unnecessary to add anything to the following language from the opinion of the Court: "In the case at bar the reasonableness of the rule established by the defendant is obvious. In a large city like New York the round-trip of a car of any street line means a very considerable number of fares paid in, and the necessity for the conductor to carry and pay out a large amount of small change. When the defendant enacted the rule requiring its conductors to furnish change to a passenger to the amount of two dollars it did all that could reasonably be expected of it in consulting the convenience of the general public, and it would be unreasonable and burdensome to extend the amount to five dollars. It would require conductors to carry a large amount of bills and small change on their persons and greatly impede the rapid collection of fares. It is not necessary that a common carrier should bring home to each passenger a personal knowledge of any reasonable and just rule which it is seeking to enforce; to so hold would render the enforcement of the rule impracticable."

We approve of the decision of the New York Court rather than that of the Supreme Court of California, in *Barrett vs. Market Street Ry. Co.* (81 Cal., 296), in which latter case, although it was conceded that a passenger must tender a reasonable sum to be changed, it was held that five dollars constituted a reasonable sum. It is to be hoped that the New York case will be generally followed in other courts of the Union.

In *Jersey City & Bergen R. R. Co. vs. Morgan* (52 N. J. Law, 60), it was held by the Supreme Court of New Jersey that a genuine silver coin, worn smooth by use but not appreciably diminished in weight and distinguishable, is a legal tender for a fare of a street car, and, if ejected for refusal to make other payment, the passenger may have an action for damages. The New Jersey court in its opinion observes:

"By the act of Jan. 9, 1879 (Sup. Rev. Stat. U. S., 488), the holder of any of the silver coins of the United States of smaller denomination than \$1 may, on presentation of the same in sums of \$20, or any multiple thereof, at the office of the Treasurer of the United States, receive therefor lawful money of the United States.

"Section 3 increases the legal tender of silver coin to the sum of \$10 instead of \$5, under the previous statute.

"In Section 3585 of the Revised Statutes the gold coins of the United States are made a legal tender in all payments at their nominal value when not below the standard weight and limit of tolerance for the single piece; and when reduced in weight below such standard and tolerance shall be a legal tender at valuation in proportion to their actual weight. The limit of tolerance for gold coin referred to is found in Sections 3505 and 3511 to be when reduced in weight by natural abrasion not more than one-half of one per centum below the standard weight prescribed by law, after a circulation of twenty years, as shown by the date of coinage, and at a ratable proportion for any period less than twenty years. This particularity in the limitation and allowance as to gold coin is not found in the case of natural abrasion in silver coins. This difference is very noticeable and important in a question of statutory construction and

legislative intention. It seems by these statutes that so long as a genuine silver coin is worn only by natural abrasion, is not appreciably diminished in weight, and retains the appearance of a coin duly issued from the mint, it is a legal tender for its original value. *United States vs. Lissner* (12 Fed. Rep., 840)."

It is to be noted that the coin actually tendered was identifiable and distinguishable. A similar question was recently raised in *Mobile Ry. Co. vs. Watters*, in the Supreme Court of Alabama (November, 1902, 33 So., 42). The action was for damages for the wrongful ejection of plaintiff from a street car, and the defense raised a question as to the actual legality of the coin tendered as fare, and, additionally, the question whether the conductor could reasonably have been expected to recognize it as a genuine coin. In support of the latter plea the conductor testified, "You could not tell but what it was cut out of a piece of tin." The Court concedes the doctrine laid down in *R. R. Co. vs. Morgan* (*supra*), and, without deciding generally whether abrasion of a coin sufficient to render it unrecognizable is sufficient to justify a conductor's refusal of it, holds that under the pleadings in the case this latter issue was actually raised, and, therefore, should have been submitted to the jury.

The Alabama decision is unsatisfactory, because it did not pass upon the general question. We should say that in cases of this kind the technical legal tender quality of a coin should not be held absolutely binding in the hurried transactions of uneducated men in collecting car fares. If a coin, although it be genuine, nevertheless be so worn as not to be recognizable as genuine upon inspection, it would be only reasonable to permit a conductor to reject it.

LEGAL NOTES

INDIANA.—Street Railroads—Injuries to Passenger—Pleading—Specification of Court—Evidence—Instructions—Exceptions—Communications to Physician—Privilege—Waiver.

1. Under Horner's Revised Statutes, 1901, section 398, providing that the court must disregard any error or defect in the pleadings or proceedings which does not affect the substantial rights of the adverse party, an objection that a complaint did not specify the court, as required by section 338, cannot avail on appeal, as such defect could not have affected the substantial rights of the defendants.

2. A complaint in an action against a street railroad and its successor, to which all its property had been transferred since the injury occurred, was not demurrable on the ground that such transfer only gave plaintiff the right to enforce a judgment against the original company against its property in the hands of its successor, as the complaint shows a cause of action against the second company, and the manner of enforcing the judgment does not arise on demurrer.

3. In an action for injuries received by a female passenger while alighting from a street car, caused by the act of the conductor in starting the car while he was standing on her dress skirt, which was still on the step of the car after she had reached the ground, evidence held to support a verdict for plaintiff.

4. Error in giving modified instructions can only be saved by a motion for a new trial.

5. In an action for injuries received by a pregnant female, carrying a child in her arms, in alighting from a street car, an instruction that "the measure of care against accident which one must take to avoid responsibility is that which a person of ordinary prudence and caution would use if his interests were to be affected and the whole risk were his own," was not objectionable as too general, where it was further charged that negligence is the failure to do what a reasonable and prudent person would ordinarily do under the circumstances, and a failure to observe the degree of care which the circumstances justly demand.

6. Under Acts 1881, page 289, providing that physicians are incompetent to testify as to matter communicated to them as such by patients in the course of their professional business, or advice given in such cases, a witness cannot be compelled to testify on cross-examination as to communications made to a physician not testified to on direct.

7. The fact that such witness testified herself in regard to her injuries, and permitted other witnesses and two other physicians, who had attended her, to do the same, was not a waiver of her privilege.—(*Citizens' St. R. Co. et al. vs. Shepherd*, 65 N. E. Rep., 765.)

NOTE.—Communications relating to this department should be addressed to Mr. Larremore, 32 Nassau Street, New York City.

MASSACHUSETTS.—Street Railroads—Negligence—Passenger Riding on Running Board—Contributory Negligence—Evidence—Admissibility.

1. While there were vacant seats in a street car at the place where plaintiff boarded it, he passed along the outside running board on the side next to another track, while the car was in motion, and was struck by a passing car. Held, that plaintiff had assumed the risk.

2. A passenger on a street car, while passing along the outside running board, was injured by being struck by a passing car. In an action for the injury, he offered to show that on previous occasions he had been on the running board next to passing cars, and not been injured. Held proper to exclude such evidence, inasmuch as it had no tendency to show that plaintiff did not assume the risk.

3. A passenger on a street car, while passing along the outside running board, was injured by being struck by a passing car. In an action for the injury, he offered to show that the car which struck him was one of several new ones, which were of greater width than the other cars. Held, that the evidence was properly excluded, because it had no tendency to show that plaintiff did not assume the risk.

4. It was proper to exclude evidence that a rail was used on the inside of new cars purchased by defendant; the fact that it was on the new cars, and not on the old ones, being no proof of negligence.—(Moody vs. Springfield St. Ry. Co., 65 N. E. Rep., 29.)

MASSACHUSETTS.—Street Railway—Maintenance of Track on Highway—Negligence—Instructions—Exceptions.

1. A request by the attorney for the plaintiffs to "save four and eight of the defendant's requests, which were given," and an assent thereto by the court, constituted a sufficient exception to the general nature of the charge given by the court covering such requests, though they were not given in the language used in the requests; but not to inconsistencies in different sentences of the charge, relating to the same subject.

2. Where plaintiffs in an action for injuries received in a street car accident have shown that the derailment was owing to the presence on the track of a stone which had rolled from an adjacent bank, and the question as to whether the stone was there by the company's fault has been treated on the trial as the decisive issue, the plaintiffs cannot complain of an instruction that negligence cannot be imputed to the company by the mere fact of the derailment.

3. A street railway company, whose track is upon a highway, but in a cut not used for travel, is bound to the same degree of care in preventing accidents from the fall of material therefrom upon the tracks as it would be if its tracks were upon its own land.

4. A street railway company is bound to the highest degree of care in the maintenance of its tracks consistent with the nature of the undertaking.

5. A charge that the degree of care required by a street railway company to prevent material falling from an embankment upon the track was different from "the highest degree of care consistent with the proper management of the road," but which describes the care required as a "reasonable degree of care * * * commensurate with * * * the danger," and a care to be "considered in connection with the business which is carried on," was not open to objection, as the degree of care specified amounts in reality to the highest degree consistent with the undertaking.—(Galligan vs. Old Colony St. Ry. Co. (two cases), 65 N. E. Rep., 48.)

MASSACHUSETTS.—Carriers—Expulsion of Passenger—Refusal to Pay Fare.

1. Where an intending passenger on a street car asked the conductor if it was a M. P. car, and he answered that it was, and the car was not going to M. P., but returning therefrom, plaintiff, on its arriving at the terminus, could not ride from there to M. P. without the tender of another fare.

2. Where a passenger on a street car refused to pay his fare when demanded, and made the conductor understand that he would resist being put off, the conductor was justified in using force in putting him off after for the third time telling him that he must pay his fare or get off.—(McGarry vs. Holyoke St. Ry. Co., 65 N. E. Rep., 45.)

MASSACHUSETTS.—Street Railways—Collisions—Mistake in Judgment.

1. A mistake of judgment in driving off a street car track in the wrong direction, in an effort to avoid collision with an approaching car, will not necessarily preclude recovery for injuries received in the collision which follows.—(Kane vs. Worcester Consolidated St. Ry., 65 N. E. Rep., 54.)

MASSACHUSETTS.—Street Railway—Injury to Passenger—Negligence—Question for Jury.

1. Whether a street railway company was negligent in running

an open car so fast around a curve that a passenger was thrown therefrom was a question for the jury.

We are of opinion that the question whether the defendant was negligent was for the jury. To run an open car so rapidly over a curve upon a railway but very recently put in operation as to throw from her seat a passenger who was sitting, as the injured plaintiff testified that she sat, might be found by a jury to be less than the degree of care in the operation of its road required of a common carrier of passengers upon an electric street railway.—(Macy vs. New Bedford, M. & B. St. Ry. Co. (two cases), 65 N. E. Rep., 397.)

MICHIGAN.—Street Railways—Injury to Traveler—Contributory Negligence.

1. Where plaintiff was injured while tempting to drive across the street on which there were two car tracks, and his attention was entirely occupied by a car coming on the westbound track, which fact could have been seen by a motorman on an eastbound car, and such eastbound car collided with plaintiff, having approached without ringing its bell, as required by the ordinance, the question of plaintiff's contributory negligence was for the jury; his hearing not being impaired, and it being probable that he would have known of the eastbound car if the customary signals had been given.—(Plant vs. Heraty et al., 92 N. W. Rep., 284.)

MICHIGAN.—Street Railway—Injury to Traveler—Negligence of Motorman.

1. In an action for the death of plaintiff's intestate, from injuries received while riding a bicycle alongside a street car track, the evidence showed that decedent, who was deaf, was signaled by his companions, and warned of the danger from an approaching car, but that he did not understand the signal. There was testimony that the motorman noticed that these signals were not observed by decedent. Held, that an instruction was justified, holding the company liable if the motorman was negligent in the management of his car, in view of the position and behavior of decedent.

2. Where one was riding a bicycle in dangerous proximity to a street railway track, and in plain view of the motorman of an electric car coming behind, apparently paid no attention to the car, and finally attempted to cross the track, in doing which he was overtaken and killed, the fact that the accident occurred while he was crossing the track will not, in view of the decedent's previous position and behavior, excuse negligence by the motorman in the management of the car.—(Bedell vs. Detroit, Y. & A. A. Ry., 92 N. W. Rep., 349.)

MICHIGAN.—Release—Rescission—Fraud—Consideration—Tender—Necessity—Evidence.

1. A settlement of an action for injuries cannot be rescinded on the ground of fraud or mistake unless plaintiff, on discovering the fraud, place defendant in statu quo.

2. Plaintiff made a settlement for injuries, and thereafter sued to recover damages therefor, alleging a repudiation of the settlement for fraud. Before the attempted rescission, plaintiff had spent the amount received, and it was thereafter arranged to obtain the amount, and plaintiff and his attorney went to defendant's office without the money, and there notified defendant's agent of plaintiff's election to rescind, and inquired if it would receive back the money, and, on receiving a negative reply, plaintiff and his attorney immediately left the office, and, though requested by the agent to show or offer him the money, neither plaintiff nor his attorney did so, but immediately withdrew. Held, that the evidence was insufficient to show a tender.—(Niederhauser vs. Detroit Citizens' St. Ry. Co., 91 N. W. Rep., 1028.)

MICHIGAN.—Street Railways—Negligence of Employee—Evidence—Sufficiency.

1. In an action against a railroad company to recover for injuries to a child on the track, where the only evidence for plaintiff was that of a little girl ten years old, whose testimony at the trial was in contradiction of that given at the inquest, when the occurrence was fresh in her mind, and was contradicted by that of several other witnesses, and was unnatural and improbable, the verdict will be set aside on appeal, though the trial court had denied a motion for new trial for insufficiency of the evidence.—(Cole vs. Detroit Electric Ry. Co. et al., 92 N. W. Rep., 935.)

MICHIGAN.—Carriers—Injury to Passenger—Acts of Trespassers—Negligence.

1. Plaintiff, a passenger on defendant's street car, while passing around the car after alighting was injured by catching her foot in a rope attached to the rear of the car by a trespasser. The rope had been on the car for some minutes, while the car was traveling about a mile and a half, but, on account of the darkness, was not discovered. Held, that the company was not guilty of negligence in failing by inspection to ascertain the presence of and remove the rope.—(La Fond vs. Detroit Citizens' St. Ry. Co., 92 N. W. Rep., 99.)

MICHIGAN.—Trial—Curing Error—Waiver—Instructions.

1. Error in the admission of testimony was cured by the court instructing jury to disregard it.

2. That omission to instruct that there was no evidence that the plaintiff's injuries were permanent was inadvertent was immaterial, as affecting the prejudice to defendant.—(Butler vs. Detroit, Y. & A. A. Ry. Co., 92 N. W. Rep., 101.)

MINNESOTA.—Street Railways—Negligence—Accident at Crossing—Evidence—Sufficiency—City Ordinance—Construction.

1. Where street railway tracks occupy a street at the foot of an incline which, in conjunction with other streets, forms a system of crossings in a populous part of the city, it is the duty of the motorman in charge of a car coming down the grade to keep a lookout for young children approaching the crossings or standing near the tracks, and to take reasonable precaution to prevent injury to them, by sounding the gong, checking the speed of the train, and holding it under control.

2. A certain ordinance reads as follows: "No person having the control of the speed of a street railway car passing in a street shall, on the appearance of any obstruction to his car, fail to stop the car in the shortest time and space possible." Held, this ordinance is not unreasonable, in that it requires the stopping of the car without regard to the safety of the train and the persons therein. It is no more than a declaration of the law, and only requires the person in charge of the car, upon the appearance of an obstruction, to stop the car as soon as possible under the circumstances, with due regard for the safety of the passengers.

3. Other assignments of error considered, and held to be not well taken.—(Gray vs. St. Paul City Ry. Co., 91 N. W. Rep., 1106.)

MINNESOTA.—Street Railroads—Injury to Person on Track—Contributory Negligence.

1. Evidence considered, and held that the negligence of a pedestrian who was struck and injured by an electric car at a street railway crossing while passing in front thereof, as disclosed by the facts in this case, was so plain, as a matter of law, that the trial court was justified in directing a verdict for the street car company in an action for damages.—(Metz vs. St. Paul City Ry. Co., 92 N. W. Rep., 502.)

MINNESOTA.—Negligence—Failure to Repair Street—Liability of Railroad Company.

1. In a personal injury action, held, that the verdict was not manifestly and palpably against the evidence, that there was evidence reasonably tending to establish appellant's negligence in respect to keeping the paving in repair at a cross-walk, and that the question of respondent's contributory negligence was one for the jury.—(Williams vs. Minneapolis St. Ry. Co. et al., 92 N. W. Rep., 479.)

MISSOURI.—Mechanics' Liens—Waiver—Account—Sufficiency.

1. A party contracting to construct an electric railway did not waive his lien for labor and material by his mere agreement to take bonds, stock, etc., in payment therefor, but only lost it in, so far as payment was actually made to him in accordance with the contract.

2. An account filed by a mechanic's lien claimant contained an itemized statement of the work done, materials furnished, and prices charged, aggregating \$280,000, which was the lump sum claimant was to receive under his contract, with the further statement that a trust company, "under the terms of the contract, delivered to the claimant \$250,000 of its first mortgage bonds, which bonds so delivered the railroad company (the other party to the contract) claims was illegal." Held, that the account was sufficiently itemized, and while its grammatical construction was open to criticism, and a balance was not formally struck, it was perfectly apparent that the amount claimed as due was \$30,000.

3. An account filed by a mechanic's lien claimant which claimed as the balance due \$30,000 was not objectionable, as not being a just and true account, though the sum claimed could, under the terms of the contract, have been paid with \$25,000 worth of stock and \$5,000 in cash out of certain moneys raised by subscription.

4. The fact that the money due a mechanic's lien claimant was in the hands of a trust company, and that claimant had a right of action against it therefor, did not preclude claimant from enforcing his lien, where the money was not paid to him by the trust company because the other party instructed it not to pay it.—(Baumhoff vs. St. Louis & K. R. Co. et al., 71 S. W. Rep., 156.)

MISSOURI.—Street Railroads—Negligence—Alighting Passenger—Injury by Approaching Car—Evidence—Contributory Negligence—Instructions.

1. Where plaintiff alighted from a street car, and, just as he passed around behind it, was struck by another car going in the opposite direction on the next track, negligence of the street car company could not be inferred from the mere happening of the injury.

2. Failure of the motorman to ring the gong as his car ap-

proaches another car on the next track going in the opposite direction, and stopping to allow passengers to alight, was negligence.

3. In an action against a street car company for injuries to a passenger, who, immediately after alighting and starting to cross the street behind the car, was struck by another car going in the opposite direction, evidence held to justify submission to the jury of the issue as to whether or not the motorman of the latter car rang the gong when approaching.

4. In an action against a street car company for injuries to a passenger, who, immediately after alighting and starting to cross the street behind the car, was struck by another car going in the opposite direction, evidence held to require submission to the jury of the issue of plaintiff's contributory negligence.

5. In an action against a street railway company, where there was evidence of contributory negligence sufficient to take that question to the jury, an instruction that if the injury was caused by the concurring negligence of plaintiff and defendants' agents, and the negligence of neither, without the concurrence of the negligence of the other, would have caused said injury, plaintiff is not entitled to recover, was proper.—(Hornstein vs. United Rys. Co. of St. Louis et al., 70 S. W. Rep., 1105.)

MISSOURI.—Pleading—Waiver of Objections—Carriers—Duty of Employees—Issues Submitted—Damages—Evidence.

1. It is bad pleading to blend two causes of action in a single count of a petition, and the fault should be corrected if timely objection is made; but the objection is not timely if made by motion to elect after an answer has been filed, and a jury sworn to try the issues.

2. It is the duty of a street railway company's employees in charge of a car to treat passengers with respect, and not subject them to insult and violence; and that rule was applicable to this case, under the testimony adduced by the plaintiff, and was properly given in charge to the jury.

3. When the trial court, at the instance of defendant, instructed the jury at the close of plaintiff's case that the plaintiff cannot recover on one cause of action stated in his petition, the defendant cannot complain on appeal that the court afterwards submitted the cause to the jury solely on the other cause of action stated in the petition.

4. The petition prayed for \$5,000 damages. The instruction on the measure of damages is complained of because it did not limit the amount the jury might award to that prayed in the petition. Held that, as the jury only awarded \$500 damages, this point is without merit.

5. It is not reversible error that the trial court, in an instruction on the measure of damages, directed the jury to award damages for plaintiff's injuries "caused by the wrongful conduct of the defendant as set out in other instructions," when the jury were told in other instructions that they must find the defendant's conduct was wrongful in the respects charged before they could find a verdict against it.

6. The defense in this case was that whatever injuries plaintiff received were inflicted by the servants of the company in defending themselves against an assault by the plaintiff. An instruction was given by the court which told the jury that, if plaintiff began the assault he could not recover. Held, that it was not error to refuse an instruction submitting the issue of whether the plaintiff was a trespasser on the car or not, because that was immaterial, as he had no higher right to commit an assault if he was a passenger than he would have had if he was a trespasser.—(Murphy vs. St. Louis Transit Co., 70 S. W. Rep., 159.)

MISSOURI.—Street Railways—Injuries to Passenger—Negligence—Evidence—Sufficiency—Instructions.

1. A petition alleged that a passenger on a street car, as it approached a regular stopping place, notified the conductor of his wish to alight; that, in sight of the conductor, he stepped upon the lower step of the platform; that the car slackened speed, but did not stop, and immediately after passing the crossing the employees "carelessly and negligently suddenly increased its speed without giving plaintiff warning;" and that thereby plaintiff was thrown to the ground, etc. Held, that the petition sufficiently pleaded the negligence of the company.

2. Where a verdict was based on substantial evidence that the ribs of a man sixty-nine years of age had sustained "green-stick fractures" (that is, fractures in which only one side of the ribs were broken), the verdict would be sustained, though there might be strong expert testimony as to the impossibility of the ribs of a man of that age sustaining such a fracture.

3. The insertion of the word "voluntarily" in instructions requested by defendant, so as to make them read that if plaintiff's injuries "were caused by his voluntarily stepping from a car," etc., and that if "plaintiff did voluntarily step from said car," did not

alter their meaning, and was no cause for complaint.—(Gorman vs. St. Louis Transit Co., 70 S. W. Rep., 731.)

NEW JERSEY.—Street Railways—Injury to Passenger—Issues for Jury—Withdrawal.

1. Shortly after plaintiff alighted from one of defendant's street cars she fell in the street and was hurt. The immediate occasion of her fall was a defect in the street pavement between the rails of defendant's track. She charged the defendant with negligence in three particulars: (a) That the car was brought to a stop at an unsafe and improper place; (b) that the conductor negligently directed her towards her destination, and (c) that the defendant had neglected to repair the street pavement as required by the terms of a municipal ordinance. The trial judge withdrew from the jury's consideration the first and second grounds of complaint, because of want of evidence to support them, and submitted the case to the jury solely upon the third ground. A verdict having thereupon gone against the defendant, held, that the judgment cannot be sustained on the theory that the evidence would have justified a finding against the defendant on either of the first two grounds.

2. A city ordinance in terms requires all street railway companies to pave, repave, and keep in repair, under the direction and to the satisfaction of the proper municipal authorities, the space between the rails of their tracks, and between the tracks, and the space for one foot outside of each outer track, at the same time providing that, if any company fail so to pave or repave or to keep the pavement in repair, the city authorities may cause the work to be done, and the company shall, on demand, pay the cost thereof. Held, as a matter of construction, that the ordinance does not confer a right of action upon any member of the traveling public who may sustain damage through the non-repair of the street.

3. Held, further, that the ordinance in question is an assumption of the power of taxation, and cannot be supported under the police powers conferred upon the municipality by the Legislature.

4. The case of North Hudson Co. Ry. Co. vs. City of Hoboken, 41 N. J. Law, 71, commented on and explained.—(Fielders vs. North Jersey St. Ry. Co., 53 Atlantic Rep., 404.)

NEW JERSEY.—Courts—Jurisdiction—Grade Crossing.

1. When two railways cross each other at grade, and, being unable to agree upon proper provisions for protection against collision, submit that question to the determination of this court, it has jurisdiction to determine it.

2. Principle upon which the court will act in making such determination discussed.—(Jersey City H. & P. St. Ry. Co. vs. New York, S. & W. Ry. Co., 53 Atlantic Rep., 709.)

NEW JERSEY.—Death—Excessive Damages.

1. In an action for the death of a man fifty years of age, whose earning capacity did not exceed \$10 per week, and who left a widow and four children, one of whom was self-supporting and the others aged, respectively, thirteen, six and five years, a verdict for more than \$3,600 was excessive, and should be reduced to that amount.—(Garbaccio vs. Jersey City, H. & P. St. Ry. Co., 53 Atlantic Rep., 707.)

NEW YORK.—Street Railways—Street Intersections—Control of Car—Question for Jury—Negligence—Evidence—Damages.

1. At street intersections it is the duty of a street railway company to have its cars under control, so as to protect the rights of pedestrians.

2. The question whether a street car was at a certain time under control is for the jury.

3. In an action against a street railway, the plaintiff's evidence was that he was struck at one side of a street, and carried or pushed by the car to the other side of the street before the car came to a standstill, and that this distance was 25 ft. or 30 ft.; that there was no bell sounded, or other warning given. Held sufficient evidence for the jury to consider upon the question of the defendant's negligence.

4. In an action for injuries from being run into by a street car, evidence considered, and held that the question of plaintiff's contributory negligence was for the jury.

5. In an action against a street railway company for injuries, it appeared that plaintiff was forty-five years of age, and a mason, who had earned from \$3 to \$5 per day; that one of his hands was practically ruined for the purposes of his trade; that he had suffered much pain and had paid or was liable to pay considerable in doctor's bills. Held, that a verdict for \$10,885.62 was not excessive.—(Sesselmann vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 482.)

NEW YORK.—Street Railroads—Assault on Passenger by Conductor—Pleading—Negligence—Liability.

1. A complaint in an action for injuries to a passenger against a street railway company, alleging that while plaintiff was attempting to board a car the conductor negligently and recklessly

interfered, so that he was thrown from the car and injured, is supported by proof that while plaintiff was standing on the car steps the conductor willfully knocked him from the car; the assault being in law a negligent act on the part of defendant.

2. A complaint in an action for injuries to a passenger, alleging that the conductor in charge of a street car was unfit, and that defendant knew or should have known it, and that the accident happened solely through defendant's negligence, is supported by proof that while plaintiff was standing on the car step the conductor willfully knocked him from the car.

3. A street railway company is liable for the willful assault of its conductor on a passenger.—(Willis vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 478.)

NEW YORK.—Railroads—Street Railway Crossings—Consent—Temporary Injunction.

1. Where, on an application for a temporary injunction to restrain defendant railway company from crossing plaintiff's street car tracks, defendant contended that plaintiff had consented to such crossing, but the only proof of such consent was a verbal agreement with plaintiff's vice-president and a paper, signed by the vice-president, but not signed by the secretary nor sealed with the seal of the corporation, it was not sufficient to show consent by the corporation, and a temporary injunction was therefore properly granted.—(Ballston Terminal R. Co. vs. Hudson Val. Ry. Co., 78 N. Y. Supp., 399.)

NEW YORK.—Street Railways—Accident on Tracks—Negligence—Instructions.

1. While a boy was crossing a street on a clear evening his hat was blown off, and, in pursuing it, he ran on a car track and was struck by a car coming from the rear. When he started for his hat the car was from 100 ft. to 125 ft. away and going at a rapid rate of speed. The motorman gave no warning. Held, that the questions of negligence were for the jury.

2. Where there was evidence that the motorman could not have stopped the car in time to avoid the accident, and that he was not bound to anticipate what the boy would do, it was error to modify a requested charge that defendant was not liable if the boy either stepped on the track or tried to pick up his hat from the track when the car was so near that it could not be stopped by charging "unless there was sufficient in the evidence to have given a reasonable notice to the motorman as to the probable conduct of the boy."—(Davidson vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 352.)

NEW YORK.—Street Car—Collision with Vehicle—Negligence—Question for Jury—Contributory Negligence—Instructions—Invading Province of Jury.

1. Evidence examined in an action for injuries received while riding on the rear of a truck passing along defendant's street car tracks by reason of a car overtaking the truck and colliding with it, and held sufficient to take to the jury the question of defendant's negligence.

2. Whether plaintiff, who was injured while riding on the rear of a truck passing along defendant's car tracks by reason of a car overtaking the truck and colliding with it, was guilty of contributory negligence, held, under the evidence, to be for the jury.

3. In an action for injuries received while riding on the rear of a truck passing northward along defendant's car tracks by reason of a car overtaking the truck and colliding with it, an instruction that, if the northbound motorman, by the exercise of reasonable care, could have seen that there was danger of a collision between a southbound car and the truck, and still kept his car up to within a few feet of the truck, so that the truck was driven back into his car, then he was negligent, was reversible error, because charging, as matter of law, that, if the jury found the facts, then the motorman was negligent, which was a question for the jury in view of all the circumstances.—(Conor vs. Metropolitan St. Ry. Co., 79 N. Y. Supp., 294.)

NEW YORK.—Street Railways—Negligence—Instructions.

1. Defendant being entitled to have the question of contributory negligence submitted, plaintiff's requested instruction that if defendant was negligent in running the car after plaintiff had fallen, and while he was being dragged, is properly refused, as eliminating the question.—(Schwartz vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 886.)

NEW YORK.—Street Railway—Collision with Team—Negligence.

1. A prima facie case of negligence is made out, and no contributory negligence shown, by testimony that about daylight the driver of a team, on which there was a light, turned his horses across street car tracks at a street crossing, seeing a street car about a block away, and had got the horses and about half the wagon across the tracks, when the car, coming with great speed

and no warning, struck it.—(Sophian vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 837.)

NEW YORK.—Change of Attorneys—Securing Fees.

1. A client has the right at any time during the pendency of a suit to arbitrarily change his attorneys, on securing to them their fees, providing there has been no misconduct on their part.—(O'Sullivan vs. Metropolitan St. Ry. Co., 79 N. Y. Supp., 481.)

NEW YORK.—Cyclist—Collision with Horse—Contributory Negligence—Question for Jury—Witnesses—Impeachment—Party Calling—Trial—Striking Out Evidence—Harmless Error.

1. Whether plaintiff, who was injured by colliding with a horse while riding his bicycle, was guilty of contributory negligence, held, under the evidence, to be a question for the jury.

2. Where, in an action for personal injuries, a witness called by plaintiff testified on cross-examination as to a matter of defense not touched on in his direct examination, plaintiff, on a recross-examination, was entitled to discredit his testimony as to such defensive matter by the introduction of evidence given by him on a former trial.

3. Competent evidence introduced by plaintiff cannot be stricken out on his motion if the evidence could, in any view, be of benefit to defendant.

4. It is not prejudicial error to strike out, on plaintiff's motion, competent evidence, which has been introduced by him, if the evidence does not appear to have in any way inured to the benefit of defendant.—(Hubner vs. Metropolitan St. Ry. Co., 79 N. Y. Supp., 153.)

NEW YORK.—Street Railway—Pedestrian—Injury—Modification of Instruction—Error—Appeal—Sufficiency of Exception.

1. Plaintiff testified that as he left the sidewalk he saw a truck on the street car track nearest him and above the intersection of the streets; that he could see through the truck, and there was no car behind it; that as the truck turned into the cross-street, and plaintiff was near the track, a car rushed upon him; that he attempted to turn back, but it was too late. One witness testified that, as plaintiff approached the track he looked straight ahead; and another swore that when he first saw plaintiff the latter was four or five feet from the track, with his head slightly bowed, and that he continued to walk forward in this manner until he was struck by the car. Held, that defendant's requested instruction that, if plaintiff failed to look for an approaching car, he was guilty of contributory negligence, was improperly modified by substituting "Of course, if plaintiff was reckless—failed to look up and down, heedless of the consequences—and this car was in sight, * * * clearly he was guilty of negligence."

2. At the conclusion of a colloquy between court and counsel with reference to instructions, defendant's counsel addressed the court with respect to exceptions, and the court said: "You may take them after the jury have retired. Either side may do that. The jury retired, and defendant's counsel said: "Your honor will allow me an exception, in due form, to each request which is refused, and to each request which is modified?" The court responded "Yes." Held, in view of the special permission given, the exception was sufficient to warrant the review of the modification of a certain requested instruction, notwithstanding its generality.—(McKinley vs. Metropolitan St. Ry. Co., 79 N. Y. Supp., 213.)

NEW YORK.—Master—Violation of Rules by Servants—Constructive Notice—Servant—Dangerous Place for Work—Care Required of Master.

1. The rules of an elevated railroad company required its trains to slow up when a green flag was exposed, and it appeared that it was usual to put up such flags for the protection of workmen. In an action for the wrongful death of a track repairer by reason of an engineer's failure to slow up in response to a green flag, a co-employee of the decedent, in answer to the questions as to whether the speed of the cars would decrease any when a green flag was exposed, stated "They didn't seem to mind the flag at all," and also testified that this was an everyday occurrence prior to the accident. Held not to show such a general violation of the rule as to charge the company with constructive notice thereof.

2. Where, in an action for the death of an employee, the court submitted only the question as to the negligence of the defendant railroad company in failing to enforce its rules after notice of their general violation, and the evidence was insufficient to prove such notice, the judgment for plaintiff cannot be supported on the theory of other negligence on the part of the defendant railroad company, where such theory was not submitted to the jury nor was defendant heard thereon.—(Clark vs. Manhattan Ry. Co., 79 N. Y. Supp., 220.)

NEW YORK.—Death of Infant—Contributory Negligence—Instruction—Exception to Charge—Negligence of Infant—Curing Error.

1. An instruction in an action for the negligent killing of a boy of tender years that it was his duty to exercise such care and pru-

dence to avoid an accident as a boy of his age and of good intelligence would exercise under the circumstances, "and deem adequate thereto," is erroneous, as making the degree of care he exercised sufficient if he deemed it adequate.

2. In an action for the negligent killing of a boy of tender years, an exception "to the language of the court with regard to the degree of care imposed on the boy" sufficiently points out the error in the charge stating the degree of care required of him.

3. Error in a charge in an action for the negligent killing of a boy of tender years, which made the degree of care he exercised sufficient if he deemed it adequate, is not cured by subsequent language defining "reasonable care," and saying that it required a vigilant use of the senses, and that if there was an omission of this care or duty by deceased, and it contributed to the accident, there could be no recovery.—(McDonald vs. Metropolitan St. Ry. Co., 78 N. Y. Supp., 284.)

NORTH CAROLINA.—Street Railways—Motorman—Scope of Authority—Assault—Provocation—Effect.

1. In an action for assault by a motorman on plaintiff, who had been a passenger on a street car, the fact that plaintiff provoked the assault was not a defense, but was relevant only to mitigate damages.

2. Where a passenger on a street car got into an altercation with the motorman, and after alighting from the car and depositing certain bundles which he carried on the sidewalk, returned to the car, whereupon the motorman left the car and assaulted plaintiff in the street, plaintiff was not entitled to recover, as against the company, for such assault; it not being committed by the motorman while he was acting within the scope of his employment on the car.—(Palmer vs. Winston-Salem Ry. & Electric Co., 42 S. E. Rep., 604.)

PENNSYLVANIA.—Street Railways—Personal Injuries—Witnesses—Credibility—Appeal.

1. Where two physicians and other witnesses testified in an action for personal injuries that prior to the accident plaintiff was a healthy, able-bodied woman, and thereafter she aged considerably, had a nervous tremor, lost in weight, had heart failure, and that her sufferings would be permanent, it sustained a finding that the injuries resulted from the accident.

2. Where, in an action against a street railway company for personal injuries, a physician testifies that he had visited plaintiff, and admits that he had been sent by the company, but denies that he was its physician, plaintiff can show by cross-examination that the witness had, as a representative of the company, frequently visited and examined persons hurt in accidents on its line.

3. The Supreme Court cannot consider objectionable remarks by counsel, where they are not brought on the record by affidavit and exception.—(Guckavan et al. vs. Lehigh Traction Co., 53 Atlantic Rep., 351.)

TENNESSEE.—Street Railways—Persons on Track—Injuries—Contributory Negligence—Sudden Peril.

1. Where plaintiff's decedent was killed by the negligence of the motorman of a street car while he was attempting to escape from an approaching automobile, he was not disbarred from claiming immunity from contributory negligence on the ground that he was placed in a sudden peril, and, losing his self-possession, made a mistake of judgment, by reason of the fact that the peril producing the confusion of judgment and the consequent false effort to escape was not the negligent act of defendant.

2. Where, in an action for death, it was claimed that deceased was not guilty of contributory negligence by reason of his being placed in a sudden peril, it was error to refuse to charge that, to entitle deceased to immunity from the charge of contributory negligence under such rule, he must have been without fault in putting himself in the place of peril or danger.—(Chattanooga Electric Ry. Co. vs. Cooper, 70 S. W. Rep., 72.)

WASHINGTON.—Street Railways—Collision with Team—Negligence—Evidence—Instructions.

1. In an action for injury from the negligent running of a street car, evidence that the customary rate of speed of cars on the line was greater than allowed by ordinance, and a high and dangerous rate, is inadmissible.

2. A street railway company is not necessarily free from negligence though a car, at the time of a collision with a team, was running within the limit of 9 miles an hour, fixed by ordinance, and the bell was being rung.

3. An instruction in an action for personal injury that "any negligence" of plaintiff is not excused is erroneous, only ordinary care being required of him.

4. An instruction should not assume, as matter of law, from the collision of a street car with a team, that there was negligence of some one.—(Atherton vs. Tacoma Ry. & Power Co. et al., 71 Pacific Rep., 39.)

FINANCIAL INTELLIGENCE

WALL STREET, JUNE 24, 1903.

The Money Market

The money outlook still continues to be rather doubtful, between the approach of the period for remitting crop-moving money on the one hand, and the prospect of further gold exports to Europe on the other hand. If bank reserves were at all normal, neither of these matters would occasion concern. But reserves are still exceptionally low for this season of the year. Last Saturday, when a considerable addition had been expected, the published figures recorded an increase in surplus of less than \$1,000,000. The explanations for this comparatively poor showing were far from clear. The best opinion seemed to be, however, that the trust companies, preparatory to making their semi-annual reports to the State Comptroller, were withdrawing money from the banks in order to make their exhibit as strong as possible. If this proves to be the case the banks ought to show within the next fortnight a gain large enough to equalize the disappointingly small increase of the last week or two. Irrespective of this factor, which is not of the first importance, the question is, how local reserves can be built up sufficiently in face of heavy exports of gold to a position where they can withstand, without undue strain the demands of the autumn. Two requisites of this situation are very clear—the first that bank loans be kept down by absence of speculation and syndicate borrowings, the second that money rates remain continuously, at least, as high as they are now. That the market is not concerned over the immediate conditions is evidenced by the fact that money rates have not gone up in spite of the European drafts upon our gold supply. Sterling exchange has declined from its high point, but sterling at Paris and Berlin have dropped enough to offset our decline. Consequently, the exchange market remains at the gold-shipping point, and the chances at the moment certainly favor a further outgo of some magnitude before the movement is over. The problem is not a pressing one for the immediate future, but bankers would feel easier if they could see a clearer way toward a substantial increase in money market resources in the course of the next ten weeks. Call money is quoted daily at 2 to 2¼ per cent, sixty-day loans at 4 per cent, and six-month loans at 5.

The Stock Market

There has been very little change in the position of the general stock market during the last week. An interval of dullness, such as usually occurs at the culmination of a severe decline, is what Wall Street is now prepared for. The week's trading has been scant, with narrow and irregular fluctuations in prices. Such business as there is has been contributed chiefly by the professional traders who have taken first one side and then the other, without showing preference for one more than the other. Commission houses are doing next to nothing, and while investors and the large financial interests seem willing enough to take stocks at concessions, they do not care to lend their support to any operations for a rise. What the market is now awaiting particularly is definite news from the corn crop, the first authentic information in regard to which will not arrive until the tenth of next month, when the government issues its first corn estimates. Many shrewd judges of the situation are inclined to think that this is the true explanation of the present situation. If the condition is shown to be an average one, it may encourage a more ready and substantial interest in a campaign for higher prices. If the corn crop is less favorably situated than this the market is pretty certain to be left to itself. But in all events nothing more than a moderate advance would be warranted so near the time of possible difficulties in the money market.

No one had seriously expected that the attempt to break the Interurban-Metropolitan lease would be successful, and the announcement on Monday that the suit had been dismissed occasioned no particular surprise. Metropolitan shares, which had been marked down several points on the preceding days, promptly recovered their loss, and Metropolitan Securities, which had reached their new low record, also rallied sharply. In the latter instance the buying orders were pretty clearly traceable to the house which is behind the underwriting. Influential buying has also been discern-

ible in Manhattan Elevated, but the purchases have been of an investment character, not intended to advance the price. Brooklyn Rapid Transit at one time during the week came in for some attention from the bear clique, which has been operating so successfully of late in the railroad shares, but the attack, after meeting with only moderate success, was apparently abandoned in evidence that the supply of the stock at the lower level was exceedingly limited.

Philadelphia

The week in Philadelphia has been extremely dull and uneventful so far as the local traction market is concerned. Prices, with one or two exceptions, have varied scarcely any. Philadelphia Rapid Transit dropped suddenly 1¾ points to 11, apparently on liquidation from speculative holders who did not care to pay the \$5 a share assessment recently called. Union Traction, which went as low as 44½ a week ago, recovered to 45½, Philadelphia Traction was unchanged at 96½, American Railways unchanged at 45, and Railways General down seven-eighths from the last previous sale, to 3½. Shares of the Philadelphia Company were more active than anything else on the list. The common sold down from 42 to 41½, while the preferred held firm at 47. There is no news in connection with any of these properties. The market for their stocks is simply waiting on developments in the general market.

Chicago

The market for street railway issues in Chicago is still unsettled by the uncertainty as to the outcome of the agitation for extension of the franchises. Union Traction common rose rather sharply at one time during the week, to 5, dropped back to 3½, then advanced again to 4½. The preferred gained a point to 35. The recovery in these stocks reflected the speculative impression that the chances are better than they were, for the company securing the sort of franchise it wants. City Railway moved forward even more strikingly. It rose altogether 10 points, from 190 to 200. The particular reason for this doubtless lies in the assurance from official quarters, that whatever arrangement is made with the city over the franchise, the dividend on the stock will not be reduced. West Chicago shares lost two points from 62 to 60. Elevated shares were steady, but dull during the week. Lake Street sold at 5 and 5¼, South Side at 100 and 98 ex-dividend, Metropolitan common at 24 to 24½, and Metropolitan preferred at 68.

Other Traction Securities

No change of consequence has taken place among the Boston traction stocks during the last week. Boston Elevated, after selling down to 141½ a week ago, rallied to 144. Then it dropped off again, and an odd lot sold on Monday at 141—the lowest point of the season. Massachusetts Electric issues were comparatively steady, the common rising from 26¾ to 28, while the preferred ranged between 84 and 82½. Trading in them was very light. West End preferred lost a point to 109, and the common a point to 89. In Baltimore, United Railways stock was rather heavy, declining from 11¾ to 11½. The income bonds changed hands in small quantity at 64¾, and the 4 per cent Generals between 92½ and 92¾. Other sales on the Baltimore Exchange included Newport News & Old Point Comfort 5s at 100, City & Suburban (Baltimore) 5s at 112, Baltimore Traction 5s at 114¾, and City & Suburban (Washington) 5s at 97½. Sales of traction specialties on the New York curb for the week comprise the following: American Light & Traction common at 75½ and 75¼, the preferred at 95, United Electric Companies, of New Jersey, at 16½ to 16¾, New Orleans 4½ per cents at 85¼ to 84¾, Interborough Rapid Transit at 100¼ to 100. New Orleans Railway preferred at 42¾ to 42½, Brooklyn Rapid Transit new 4s at 83, and Brooklyn City Railroad at 238. On the New York Stock Exchange North American stock rose sharply on the publication of the company's annual report, which, besides disclosing undivided profits of \$1,330,000, showed that investments in the embarrassed Shipbuilding Trust amounted to only \$164,000. This disproved the rumors under which North American stock has recently suffered.

Tractions were comparatively inactive at Cincinnati last week. Detroit United was again the leading issue, and about 700 shares sold; opening at 76, declining to 72 and then strengthening to 73½

at the close. Cincinnati Street Railway was somewhat weaker, and several lots sold at 130, but it advanced later to 132; sales, 380 shares. Several lots of Miami & Erie Canal sold at 20, and Toledo Railways & Light declined from 28 to 26 on small sales.

Cleveland City Railway and Northern Ohio Traction were the only active issues in Cleveland. The former sold to the extent of 186 shares at 95¾ and 97, the first lot being ex-dividend. Northern Ohio Traction was firm at 21¼ and 21½; sales, 260 shares. Aurora, Elgin & Chicago common was offered at 24, but only 17½ was bid. Sixteen thousand dollars worth of Cleveland City 6 per cent bonds sold at 93, which is half a point lower than the last sale.

At Columbus, Columbus Railway common advanced from 103½ to 105. Small lots of the preferred sold at 104¾. East St. Louis Railway sold at 63, and Rochester Railway at 82½. The new Columbus Railway & Light advanced to 36½.

Security Quotations

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

	Closing Bid	
	June 16	June 23
American Railways	45	45
Aurora, Elgin & Chicago	a25	a24½
Boston Elevated	144	a142
Brooklyn Rapid Transit	56½	55¾
Chicago City	190	195
Chicago Union Traction (common)	4¼	3½
Chicago Union Traction (preferred)	30	30
Cleveland Electric	75	*70
Columbus (common)	102	102
Columbus (preferred)	105	105
Consolidated Traction of New Jersey.....	67	67
Consolidated Traction of New Jersey 5s.....	104½	105
Detroit United	72½	72½
Electric People's Traction (Philadelphia) 4s.....	99	99
Elgin, Aurora & Southern	a49	a49
Lake Shore Electric	a14½	10
Lake Street Elevated	4¾	5
Manhattan Railway	*135¾	136
Massachusetts Electric Cos. (common)	26¾	26
Massachusetts Elec. Cos. (preferred)	84	82
Metropolitan Elevated, Chicago (common)	23	23
Metropolitan Elevated, Chicago (preferred)	67	66
Metropolitan Street	124½	124
New Orleans Railways (common)	11¾	11½
New Orleans Railways (preferred)	42½	42
North American	85½	85
Northern Ohio Traction & Light.....	21	a22
Northwestern Elevated, Chicago (common).....	20½	21
Philadelphia Rapid Transit	12½	11
Philadelphia Traction	96½	96
St. Louis Transit (common)	24¼	24¼
South Side Elevated (Chicago)	99	*98
Syracuse Rapid Transit	a32	26
Syracuse Rapid Transit (preferred)	70	70
Third Avenue	114	113
Toledo Railway & Light	25	25½
Twin City, Minneapolis (common)	95	95½
Union Traction (Philadelphia)	44¾	45
United Railways, St. Louis (preferred)	72¾	72¾

a Asked. * Ex-dividend.

Iron and Steel

The action of the Steel Corporation in fixing prices for its finished products on the same basis for 1904 as for 1903, has imparted a rather more confident tone to the iron market. Shading of prices continues in foundry iron, and the best opinion is that inasmuch as buyers are still holding off, further concessions will be necessary before the downward movement is finally checked. But there are no indications as yet of an actual falling off in consumptive requirements, and leading trade interests are by no means uneasy over the outlook. It is felt that since the course of the Steel Corporation has been eminently conservative in the past, the management would not now have decided to continue the existing prices schedules, had they not thought the market position secure. Quotations are as follows: Bessemer pig iron \$19.85 and \$20.35, Bessemer steel \$29 to \$30, steel rails \$28.

Metals

Quotations for the leading metals are as follows: Copper 14½ cents, tin 28 and 28¾ cents, lead 4¼ cents, and spelter 6 and 6¼ cents.

IMPORTANT RAILROAD DECISION IN NEW YORK STATE

On June 23, 1903, the Court of Appeals of New York State handed down a decision affirming an order of the Third Department of the Appellate Division of the Supreme Court, at Albany, which, on March 11, 1903, in a unanimous decision and opinion affirmed the action of the New York Board of Railroad Commissioners in granting to the New York & Port Chester Railroad its charter, or, as it is technically known, the certificate of public convenience and necessity required under Section 59 of the Railroad Law. The decision of the Court of Appeals was unanimous, and is, of course, the decision of the court of last resort.

This is probably the most important case in the history of railroad litigation in the State of New York which has come up for many years, and settles once and for all a long mooted point in the railroad laws of this State; that is, the contention that Chapter 10 of the Laws of 1860, which was invoked by the New York, New Haven & Hartford Railroad Company in an attempt to have the decision of the Railroad Commission reversed and set aside, was declared to have no effect.

Chapter 10 of the laws of 1860 reads as follows:

"It shall not be lawful to lay, construct or operate any railroad in, or upon, or along any or either of the streets or avenues of the city (city of New York), except under the authority and subject to the regulations and restrictions which the Legislature may have granted since the 13th day of January, 1860, or may hereafter grant or provide."

This act is known as the act of 1860, and has served as an effectual prohibition against the construction of any important railroad within the limits of New York City since 1860. This law was upheld by the Court of Appeals as late as December, 1890, in the case of the People's Rapid Transit Company vs. Dash, 125 N. Y., 93. This was the celebrated case in which a number of men had secured from the State a charter permitting the construction of a railroad running through city blocks of New York City from the Battery to Spuyten Duyvil. This charter provided for a double deck electric railroad. The description of the route was as follows:

The construction shall be a two-story viaduct, the first flat having a width of 50 ft., with an elevation of about 60 ft. above the street level. The second story with the same axis or center line as the one on which it rests, shall be 25 ft. wide at the top and 75 ft. above the street.

This railroad was to have been wholly within the City of New York, and its construction was prohibited by the decision of the Court of Appeals in the Dash case here referred to, which maintained that the act of 1860 was operative, and served as a final and effectual prohibition against the construction of any railroad of this kind within the City of New York.

The line of the New York & Port Chester Railroad runs through 10 miles of New York City, and its construction has been violently fought by opposing interests for the last three years. The first contest was before the Board of Railroad Commissioners, when the company made its application for a charter, and the contestants were the New York, New Haven & Hartford Railroad Company, the Union Railway Company, the New York Central Railroad Company, the New York & Stamford Railroad Company, and two or three other corporations. At this time the ground was taken by those who opposed the charter that electrically and from a financial standpoint the scheme was impracticable. The testimony given before the Commissioners was of the greatest interest from an engineering standpoint, and much of it was published in the STREET RAILWAY JOURNAL for Dec. 7, 1901, and Jan. 4, 1902. During this hearing all of the opponents dropped out except the New Haven Road, which, after being defeated before the Railroad Commissioners on the practicability of the plans, carried the case to the Court of Appeals, founding its objections to the construction of the road upon the act of 1860.

In these legal proceedings the New York & Port Chester Railroad Company was represented by William C. Trull, as chief counsel; ex-Judge Judson S. Landon, and ex-Chief Justice Charles Andrews, of the Court of Appeals, as associate counsel, together with Judge William Rumsey, recently deceased, of the Appellate Division, and Frank Sullivan Smith, as associate counsel.

The decision just rendered is also a striking personal victory for W. C. Gotshall, the president of the Port Chester company, who has expended in his legal struggle several hundred thousand dollars. Mr. Gotshall conceived this project in 1898, and has worked on it almost continuously ever since, having developed it and carried it through, not only from an engineering point of view, but from a legal standpoint, through every court of this State to the final consummation and to its final and complete victory. The victory is all the more remarkable on account of the magnitude and vehemence of the opposition which Mr. Gotshall has encountered for the last five years. When this scheme was first conceived, it was undoubtedly in advance of the art. As

late as two years ago, when this matter was heard before the Railroad Commission, several railroad companies in this State were loud in their assertions that electrical operation of existing high-speed suburban roads was not commercially feasible or practicable. The testimony and demonstrations which the Railroad Commission received from the Port Chester Road set at rest these contentions and established the fact that some engineers had been quietly, but studiously solving the problem.

The New York & Port Chester Railroad Company by this decision of the Court of Appeals now has a clean legal bill of health. In addition, it has secured from the cities of New Rochelle and Mt. Vernon the right to cross over or under all the streets of those cities which will be crossed by the line of its road. It has also secured from the Supreme Court the right to cross over or under about sixty highways in Westchester County not in the cities of New Rochelle and Mt. Vernon which will be crossed by the line of its road. The company now has pending before the Board of Aldermen in this city its petition and ordinance for the normal assent of the Board of Aldermen for the crossing of such streets within the City of New York as will be crossed by the line of its road. This application was introduced into the Board of Aldermen on May 7, 1903, and referred to the railroad committee. The road, as planned, will be upon its own right of way, except in such cases where public highways, streets or avenues are crossed where it will be over or under such public highways. All of the crossings will be concrete viaducts.

CHICAGO TRACTION MATTERS

On June 23 a conference was held between the Chicago City Railway officials and the Council committee, at which compensation for franchise privileges and a system of universal transfers were discussed.

The company will expend from \$15,000,000 to \$18,000,000 on improvements and extensions, placing the underground trolley on its trunk lines down town and as far south as Eighteenth Street and adopting grooved rails and other changes that the city asks.

Efforts will be made to reduce congestion within the loop district by placing a number of transfer stations there.

The Council committee is particularly anxious to determine on a universal transfer plan to which the Union Traction Company is expected to give its approval when its financial troubles are straightened out.

The Chicago City Railway Company insists that consideration be given possible damage claims, cost of operation, the additional investment for rehabilitating the service, and other problems of outlay.

RICHMOND TROLLEY STRIKE

As reported in the STREET RAILWAY JOURNAL for June 13, the motormen and conductors of the Virginia Passenger & Power Company, of Richmond, Va., submitted an agreement to that company involving the recognition of the Amalgamated Association of Street Railway Employees, an increase in wages, a nine-hour day, free transportation over the company's lines at all times. Upon the refusal of the company to submit to arbitration the men held a meeting, and of 650 only seven refused to vote to strike. All the men, however, failed to appear for duty on the morning of June 17, and no cars were taken out.

The following notice has been posted by the company on all the barns:

NOTICE TO MOTORMEN AND CONDUCTORS

Motormen and conductors of the Virginia Passenger & Power Company failing to report for duty by the morning of Thursday, June 18 1903, can call at the general office, Seventh and Main Streets, turn in their badge, buttons, rule book and other property of the company, and receive their deposit and pay, as those failing to report for duty by the time specified will not be regarded longer as employees of the company, and men employed after that time will be assigned to regular runs in accordance with the date of their employment.

S. W. HUFF, General Manager,

Richmond, Va., June 17, 1903.

Up to date none of the employees has made settlement.

In anticipation of the strike the company had secured a number of men from other cities, but in spite of this fact it was almost impossible to run any cars, as riots were begun as soon as a few cars were started on June 18. The rioting grew worse from day to day, the special policemen were unable to cope with the situation, and on Sunday Governor Montague called out the militia, consisting of the Seventieth Regiment, the Richmond Blues and the Richmond Howitzers, the latter an artillery company. The arrival of the militia, it was thought, would enable the company to

resume its service, as it has enough men to run the cars. Only a few newcomers have deserted, although the strikers are offering to each man free transportation home and \$7 in cash.

On Wednesday, June 24, rioting was resumed with renewed vigor as the company sent out several cars under armed protection. There were 800 troops on duty, and five additional companies were called into requisition. Six rioters were shot just across the line in Henrico County, and it required the united efforts of the Richmond Howitzers armed with a Gatling gun to get one car through the West End. Obstructions of all kinds have been placed on the tracks, including torpedoes, and ropes festooned with tin cans and rags were thrown over the trolley wire to impede the progress of the cars. The Mayor has warned women and children to keep off the streets, and forbidden the gathering of crowds along the lines of the railway.

ANNUAL REPORT OF THE ALLIS-CHALMERS COMPANY

The second annual meeting of the stockholders of the Allis-Chalmers Company was held in Jersey City on June 18. The report of the president, Charles Allis, on the business of the year, was very satisfactory. The profits for the twelve months ending April 30, after carrying very liberal amounts to reserves as well as deducting an extraordinarily large amount for depreciation, maintenance and repairs amounted to \$1,653,576. From this amount 7 per cent was paid on the preferred stock, amounting to \$1,175,000, leaving a net surplus for the business of the second fiscal year amounting to \$516,076. This, added to the surplus at the commencement of the second year leave a net surplus at the commencement of the third fiscal year amounting to \$820,886. Referring to the new works at West Allis, near Milwaukee, Wis., Mr. Allis states that they are rapidly approaching completion, there now being employed at this plant nearly 1200 men, which force will be increased to about 2000 within the next few months. These works are said to be as near perfect for economy and facilities of production as anything in the world and when the present plans of the company are completed it is thought there will be added from five to six million dollars annually to the volume of the business of the company. All the officials, committees and superintendents were re-elected with the addition of James Stillman, of the National City Bank, New York, and Charles Allis as members of finance committee.

IMPORTANT CHANGES IN PERSONNEL OF MONTREAL STREET RAILWAY COMPANY

After the last meeting of the Montreal Street Railway Company's directors the announcement was made that James Ross had resigned the vice-presidency of the company, and had also resigned from the directorate. It was also announced that F. L. Wanklyn had been elected to fill the positions vacated by Mr. Ross.

For the last few years Mr. Ross, owing to pressure of other business, has been unable to give much attention to the Montreal Street Railway. It is stated that he also contemplates resigning from the directorate of the Toronto Street Railway.

The general management of all lines will be under the direction of Duncan McDonald, who returns to the company from Paris, France, where he held the office of general manager of one of the important street railway companies in that city for the last three or four years. Mr. McDonald will relieve Mr. Wanklyn of much of the detail which now comes to him.

The new board of directors consists of the following gentlemen: President, L. J. Forget; vice-president, F. L. Wanklyn; H. Montagu Allen, F. Henshaw and K. W. Blackwell.

SLEEPING CARS FOR THE COLUMBUS, LONDON & SPRINGFIELD

As stated in this paper for May 16, the Columbus, London & Springfield Railway Company, of Columbus, Ohio, has decided to instate a sleeping car service between Columbus and Cincinnati. These cars are being manufactured by the Holland Palace Car Company, of Indianapolis, and will be owned by the same company, just as sleeping cars on most of the steam railroads are owned by the manufacturers. Each car will contain ten compartments, 6 ft. 10 ins. long x 3 ft. 6 ins. wide, each compartment having an upper and lower berth. For day use the berths will close up, giving an open parlor car, with twenty revolving parlor car chairs. The cars will be 56 ft. 4 ins. long, and will be equipped with four 150 hp motors.

ANOTHER HUNTINGTON PROJECT IN CALIFORNIA

On June 6 articles of incorporation were filed with the County Clerk for the Los Angeles Interurban Railway Company, another Huntington-Hellman corporation, with a capital stock of \$10,000,000. Its purposes and operations will be similar to those of its million-dollar counterpart, the Pacific Electric Railway Company, which is soon to operate altogether about 100 miles of road. Although the new company is to be absolutely independent of the Pacific Electric Railway, it is organized to build a system that will simply be an extension of the interurban lines now controlled by the latter company. Nothing like a consolidation or amalgamation of present systems has taken place, but, on the other hand, there has begun an expansion that will mean millions to Southern California and eventually give Mr. Huntington a network of powerful electric railways throughout the entire southern part of the State.

The Los Angeles Interurban Railway Company proposes to construct a system having 350 miles of track. The routes to be covered run from Whittier through the La Habra Valley; also to Redlands and Riverside, with a branch to Colton, San Bernardino and by Highland to Redlands; also a branch from Los Angeles to Randolph and Santa Ana, thence to Newport Beach, thence northwest to a junction with the Pacific Electric line, and thus to Los Angeles again; also a line from this branch to Alamitos and Artesia, and thence to Los Angeles; also a branch through San Fernando to Santa Barbara; another branch running through Glendale to Burbank, and another line to Ontario by way of Covina. Many of the above routes are already surveyed.

Epes Randolph, vice-president and general manager of the Pacific Electric Railway Company, has been elected president of the Los Angeles Interurban Railway Company, and, besides himself, the directors are George E. Pillsbury, George S. Patton, J. A. Muir, S. C. Baxter, John D. Bicknell and Howard E. Huntington. Howard E. Huntington represents his father on the board of directors. I. W. Hellman is treasurer.

The Pacific Electric Land Company is another Huntington corporation newly organized, with a capital stock of \$4,000,000; it is affiliated with the Los Angeles Interurban Railway Company. Mr. Randolph is also president of this company.

ANNUAL OUTING OF THE NEW ENGLAND STREET RAILWAY CLUB

The annual outing of the New England Street Railway Club at Narragansett Bay and Bristol Harbor was scheduled for June 26, rain or shine. As usual the committees in charge made arrangements for all details, and announced the following programme: Members are permitted to bring friends. A special train to leave Boston at 9 a. m., arriving at Providence at 10.05 a. m. The steamer to leave Providence at 10.30 a. m. for the trip down Narragansett Bay and Bristol Harbor to Crescent Park. A light collation to be served on the boat. On arrival at Crescent Park at 1 p. m. dinner to be served. Returning, the party to start from Crescent Park at 5 p. m., and leave Providence at 5.55 p. m.

LEGALITY OF RAILWAY BOND ISSUES

Attorney-General Cunneen has given an opinion to the State Board of Railroad Commissioners affecting the legality of bond issues of railroad companies. Under the law a railroad may mortgage its property and issue bonds if the consent of the State Board of Railroad Commissioners has first been obtained to such mortgage, but recently the Buffalo, Aurora & Hamburg Electric Railroad Company proceeded to mortgage its property and issue bonds without first having complied with this requirement. After the bonds had been issued application for approval of the issue was made to the Board of Railroad Commissioners. The board asked the Attorney-General as to its powers in the case, and the opinion given is that the Commissioners cannot now give consent the same as if the railroad company had filed its application before it had made its mortgage and issued its bonds.

The Attorney-General says that the power of the railroad company to make a mortgage is granted by the State on condition that consent be first obtained, that the application for the consent necessitates the exercise of discretion and of judgment on the facts and that it is contemplated that this take place before the mortgage is made. It cannot, therefore, consistently take place afterward.

JUDGE GROSSCUP HEARS ARGUMENTS ON THE NINETY-NINE-YEAR ACT IN CHICAGO

Judge Grosscup, under whom the receivers for the Chicago Union Traction Company are acting, announced some time ago that on June 18 he would like to hear informally arguments as to the probable rights of the Union Traction Company under the ninety-nine-year act of 1865. This hearing was not a formal proceeding of court, but was to enlighten the court on the points for and against the validity of the ninety-nine-year act, in order that he might act properly and intelligently in his instructions to the receivers in connection with the improvement of the property and negotiations leading to renewal of franchises. It was expected at one time that attorneys for the city of Chicago would appear before Judge Grosscup at this time, but no one appeared in behalf of the city, and the arguments presented were only those offered by the attorneys for the Chicago Union Traction Company. The arguments of these attorneys were mainly directed to a refutation of the arguments which have been advanced at various times against the present validity of the ninety-nine-year act.

It has been charged that the act was originally secured by bribery of the Illinois legislators, and was, therefore, invalid. Against this the attorneys pointed out that the courts have held that legislative acts of former generations, even when passed under such conditions, cannot affect innocent holders of securities to-day, provided the legislative acts involved were constitutional. The case of the Broadway franchise in New York was cited in support of this.

It was denied by the attorneys that the act of 1865 was unconstitutional, as the General Assembly of Illinois had, under the constitution of 1848, unlimited power to deal with the property rights and franchises of municipal corporations, and, therefore, to make regulations regarding the street railways of Chicago.

The long silent acquiescence by the city as to the validity of the act of 1865 was held to constitute such laches as to prevent the city from urging any legal objections at this late day to the constitutionality of the act on the ground that its title was defective.

The acceptance by the companies of the ordinance of 1883 did not constitute a waiver by the companies of their rights under their original charters, as amended by the act of 1865. The ordinances of 1883 merely put off the settlements of the validity of the act for twenty years. It was pointed out that the elder Mayor Harrison in 1883 recognized the validity of the ninety-nine-year act, and for that reason wished to defer the controversy regarding it. The Mayor, however, in his message to the Council in that year, wrote as follows:

No one can be more impressed than I by the enormity of the injustice attempted to be perpetrated upon this city by the General Assembly of the State by the act of 1865, extending the franchises of the several railroad lines affected by it nearly three-quarters of a century. I have always entered upon the discussion of that act with all of my prejudices arrayed against it. But I am forced to yield to the opinions of lawyers far abler than myself that the act of 1865 is valid.

There has been, however, a tendency in our higher courts during the past few years to lean somewhat to the people, and to recognize that they have some rights which the Legislatures of the day cannot barter off forever to powerful corporations. Perhaps in twenty years from now the courts may be so free, that the city may be able to get a hearing which to-day would be denied it.

After hearing the arguments Judge Grosscup said that he did not know when or how he should announce his conclusions upon the validity of this act, or whether he should make any announcement at all. The hearing, he said, was not a litigation, not a case, but simply a method adopted to obtain in an open and public way such information and argument as might be needed by him properly to conserve the property entrusted to his care, while at the same time taking heed of the just interests of the city. As administrator of the property, he said, he could have informed himself privately; but it seemed to him that an open hearing was preferable. He was unwilling, however, to close the inquiry if parties thinking the act of 1865 invalid wished either by personal conference, letter or brief to bring to his attention omitted information. He trusted that it would not be forgotten that upon correct information would depend what he would do in requiring considerable sums to be expended upon improvements, as well as in determining what steps he would take when July 30 of this year arrives. At the opening of the proceedings Judge Grosscup expressed regret that Mayor Harrison and other city officials had not seen fit to be present at the hearing. There is apparently a little disposition on the part of some of the city officials to let the matter go to a trial in court, although there are others who realize that if the matter can be settled quickly and out of court, it will be better both for the companies and for the public, than if it is allowed to drag through the courts. The people of Chicago are suf-

fering for better transportation facilities, and the longer the matter is delayed the greater will be the loss to both companies and public.

CURTIS TURBINES AT SCHENECTADY

At the invitation of the General Electric Company, the editors of a number of the technical papers in New York visited the works of the General Electric Company on June 19. The object of the visit was to afford the newspaper men an opportunity of inspecting the Curtis steam turbines and the preparations made at the works for their manufacture. The turbine department occupies the greater part of one of the large buildings at the Schenectady works, covering an area of 800 ft. x 90 ft., and about 400 men are employed. Even these facilities are cramped for the large number of orders on hand, which aggregate 185,000 kw, and the department is to be moved to a new building now being erected, and which will occupy an area of 240,000 square feet.

Some of the processes used in the manufacture of the Curtis turbine are extremely interesting, especially the method of cutting the buckets in the solid steel discs and in balancing the discs. Several different types of slotting machinery are used for cutting the buckets, but in all of them the tool is so guided that its cutting edge travels at each stroke over the exact curve to be reproduced. After the buckets are cut, a steel band is riveted around the periphery of the wheel. Each disc is balanced separately on the shaft, and in the position in which it will be permanently mounted. Any unbalancing effect is determined by the flexure of the shaft when revolving rapidly, and weight is taken from the proper part of the wheel until a perfect balance is secured.

The description of the Curtis turbine published in the STREET RAILWAY JOURNAL for April 11 leaves little to be described, except a short reference to the governing device and step bearings. As explained in the previous article referred to, steam flows into the primary stage through a number of nozzles, which are covered by poppet valves, there being one valve to each pair of nozzles. These valves are seated or opened by the action of steam on a piston, the steam being admitted or exhausted by a small pilot valve actuated by a magnet. Current is supplied to the magnets from the exciter bus-bars of the generator operated, and the number of magnet circuits closed, and, consequently, the number of valves opened is controlled by a centrifugal governor at the head of the shaft, which moves an arm over a controller in series with the magnet valve circuits. In order to obviate rapid alternate opening and closing of the magnetically operated valves, as would otherwise occur in keeping the speed constant, the governor mechanism is connected with a balanced throttle valve in the steam path of the first pair of nozzles, and this throttle valve must be fully opened before the governor can move the controller to admit steam to another pair of nozzles.

The step bearing to which reference was made is, of course, an important feature of the machine, as the shaft being vertical, the entire weight of the revolving parts, including those of the generator, are supported on this bearing. It consists of a cast-iron shoe, secured on the foot of the vertical shaft over a similar stationary shoe. Oil, where a pressure of 250 sq. ins. or more is needed, is forced through a hole in the center of the lower shoe, and then passes radially to the periphery of the shaft shoe. It is then forced through a babbitt guide bearing, and finally back to the pump. In this way the entire weight of the revolving parts is carried on oil, and in case of a failure of the oil supply the turbine is arranged so that it will be automatically shut down.

NEW USE FOR CORK INSERTS IN FRICTION SURFACES

Cork inserts in brake-shoes have proved a great success, and the National Brake-Shoe Company has built up a large business not only in New England but in other parts of the country, particularly in street railway service. The remarkable success of cork inserts has led W. W. Whitcomb, the inventor, to apply them to many other mechanical uses. He has been identified several years as president and manager of the National Brake-Shoe Company and its predecessors, but in addition to building up the brake-shoe business he has been quietly exploiting the application and use of cork inserts in machinery to secure increased power transmission and absorption, and has successfully applied it to clutches, pulleys and power machines requiring braking. In order to give his whole attention to this important branch of the business Mr. Whitcomb has retired from the presidency, but remains on the board of directors, the executive committee, and as consulting expert of the brake-shoe company. He is president and general manager of the new business, under the name of the Composite Pulley & Clutch Company. His office, as heretofore, will be at

620 Atlantic Avenue, Boston. It is interesting to note that in other industrial lines the cork inserts have produced quite as remarkable results as they do in brake-shoes when applied to the braking of car wheels.

E. L. Gifford, formerly treasurer, has been elected president, and George W. Nock is elected treasurer and general manager of the National Brake-Shoe Company.

UNION ENGINEERING BUILDING

A formal organization of the joint committee representing the several bodies which have taken action with respect to the gift of \$1,000,000 of Andrew Carnegie for a Union Engineering Building, was effected on June 18, by the election of the following officers:

Chairman, Charles F. Scott; secretary F. R. Hutton. The chairman was directed to indicate to Mr. Carnegie the acceptance of his gift by the joint committee representing the several organizations. The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Engineers' Club have appointed representatives upon a joint committee for accepting the gift. The American Institute of Mining Engineers has likewise taken action in so far as its rules permit. Its council has appointed representatives, subject to changes in the rules of the organization, which have been proposed by the council, for adoption at the next general meeting. Following is a list of representatives of the several bodies upon the joint committee:

American Institute of Mechanical Engineers, James M. Dodge, F. R. Hutton, Charles Wallace Hunt.

American Institute of Electrical Engineers: Charles F. Scott, B. J. Arnold, S. S. Wheeler.

American Institute of Mining Engineers: A. R. Ledoux, Charles Kirchoff, Timothy Dwight.

Engineers' Club: John C. Kafer, W. H. Fletcher, W. A. Redding.

The American Society of Civil Engineers, at its recent meeting in Asheville, referred the matter to its board of directors for recommendation, and directed that the matter be then presented to the members of the society for letter ballot. Representatives of the society have been invited to meet with the joint committee, and take part in deliberations with regard to the plans to be adopted. The representatives who have served upon the conference committee are Alfred Noble, W. J. Wilgus, George H. Pegram.

The joint committee placed the immediate work of developing plans upon an executive committee of five, consisting of one member from each of the five organizations named in Mr. Carnegie's letter, as follows:

American Society of Civil Engineers: Alfred Noble.

American Society of Mechanical Engineers: F. R. Hutton.

American Institute of Mining Engineers: A. R. Ledoux.

American Institute of Electrical Engineers: Charles F. Scott.

Engineers' Club: W. H. Fletcher.

The executive committee met on May 19, and organized by the election of Charles F. Scott, chairman, and F. R. Hutton, secretary.

STREET RAILWAY PATENTS.

UNITED STATES PATENTS ISSUED JUNE 23, 1903

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]
730,869. Electric Railway; William M. Brown, Johnstown, Pa. App. filed July 29, 1902. The car magnet in a surface-contact system sometimes picks up pieces of iron and carries them against the rails of branch tracks, thereby causing a short circuit which may open the circuit breaker at the power station. To avoid this, portions of the branch track are connected with special feeders carrying a low current, enough to propel the cars, but not sufficient to cause a disturbance of the system.

730,913. Fender for Cars or Other Vehicles; George Hipwood, Laconia, N. H. App. filed Sept. 25, 1902. Details of construction are given.

731,000. Controlling Electric Boosters; Merle J. Wightman, West New Brighton, N. Y. App. filed June 5, 1901. When the driving motor ceases to operate the field of the booster is demagnetized; this prevents it from running away under the current of the feeder circuit.

731,149. Railway Car; Casper Zimmerman, Chicago, Ill. App. filed April 3, 1903. A fireproof car whose body portion is of general cylindrical outline with flattened sides, and having cast conical-shaped shells forming the ends of the car.

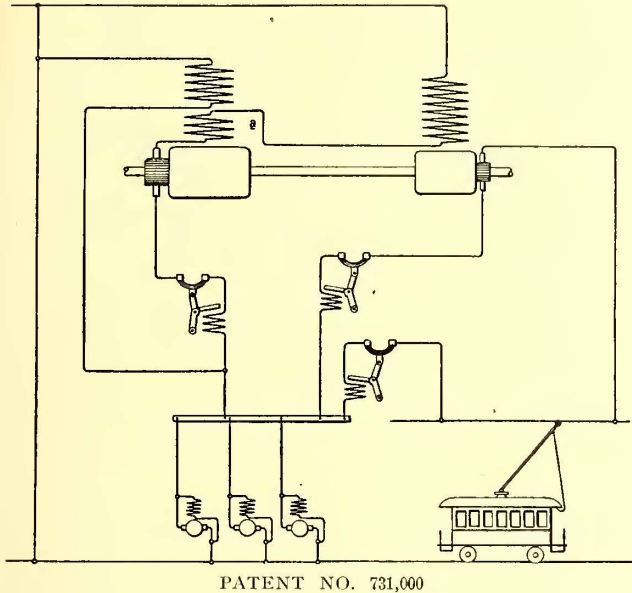
731,204. Car Seat Movement; Eddy T. McKaig, Chicago, Ill. App. filed March 3, 1902. Details of construction of a reversible car seat.

731,205. Car Seat Movement; Eddy T. McKaig, Chicago, Ill. App. filed June 18, 1902. Details of construction.

731,253. Railroad Rail; James G. Wentzel, Wellsburg, W. Va. App. filed March 3, 1903. A ball race is provided in the side of the tread of the rail in which balls are inserted, thereby providing a ball-bearing for the flange of the car wheel.

731,284. Trolley Arm; Judson T. Cousins, Norwich, Conn. App. filed May 12, 1902. The trolley harp is readily removable from the trolley pole in order to readily change wheels.

731,292. Railway Construction; Peter Dunwald, Rio, N. Y.



App. filed April 6, 1903. A moving platform having a plurality of platforms moving at graduated speeds running on an endless track and applicable to the streets of cities, one side running up the street and the other side down the street.

731,361. Car Seat; Gardner C. Hawkins, Boston, Mass. App. filed May 20, 1902. A pair of chairs mounted to rotate on a swinging support and automatic means for unlocking the swinging support from its base by the rotation of the chairs.

731,364. Electromagnetic Traction Increasing Apparatus; Albert A. Honey, Tacoma, Wash. App. filed Dec. 28, 1901. In order to increase the electromagnetic traction each drive-wheel is provided with magnets on its inner side.

731,365. Electromagnetic Traction Increasing Apparatus; Albert A. Honey, Tacoma, Wash. App. filed Dec. 28, 1901. A railway car supported on wheels and axles, an idler axle, wheels on the idler axle in line with the supporting wheels, other wheels on the axles, helices surrounding the idler axle and means for energizing the helices.

731,387. Car Replacer; Thomas N. Renfroe, Woodlawn, Ala. App. filed April 22, 1903. Consists of a base having an inclined top and vertical side, a roller mounted for rotation within said base and extending through said inclined top and a laterally inclined guide rib terminating at one side of the center of said roller.

PERSONAL MENTION

MR. LEWIS A. ARMISTEAD, chief clerk of the Boston Elevated Railway Company's elevated division at Sullivan Square Terminal, will shortly sail for Europe on a vacation trip.

MR. H. H. PATTERSON has resigned as superintendent of the Scranton Railway Company, of Scranton, Pa., because of ill health. He will go to California for the summer.

MR. EDWARD K. OWEN has resigned as superintendent of the Sandusky Division of the Lake Shore Electric Railway. He will be succeeded by Mr. L. K. Burge, formerly with the Toledo & Monroe Railway.

MR. HARRY D. STONE, of the engineering department of Messrs. Stone & Webster, has returned to Boston after several months' work in Jacksonville, Fla., in connection with the power station and car house construction of the Jacksonville Electric Company.

MR. JOHN B. PARSONS, president of the Philadelphia Rapid Transit Company, sailed from New York June 19 on the steamer Cedric, for a European pleasure trip. Mr. Parsons, before his

return, will visit England, Germany, Norway, Russia and France, and will probably inspect a number of the principal tramway systems in those countries.

MR. JACOB HAYS, a prominent financier of New York, is dead. During his active life Mr. Hays was president of the Eighth and Ninth Avenue Railroads, a director of the Tenth and Twenty-Third Street Ferry Company, of the Brooklyn Ferry Company, the Knickerbocker Trust Company, and the Knickerbocker Safe Deposit Company.

MR. R. A. LEUSSLER has recently been elected secretary of the Omaha & Council Bluffs Street Railway Company, the new consolidated company, of Omaha, Neb., and Council Bluffs, Ia. Mr. Leussler was formerly chief clerk to the secretary and treasurer of the St. Louis Transit Company, and, previous to the consolidation in St. Louis, was connected with one of the subsidiary companies there.

MR. STEPHEN W. BALDWIN, who, for over twenty years, has so ably represented the Pennsylvania Steel Company in New York as sales agent, will retire from active service on July 1, 1903, although he will retain his connection with the company in an advisory capacity. Mr. A. E. Aeby, who has long been connected with the New York office, will succeed Mr. Baldwin, and on and after July 1 will be the New York sales agent of the Pennsylvania Steel Company.

MR. A. M. MARTIN, recently appointed superintendent of the Worcester & Connecticut Eastern Street Railway Company, has been appointed assistant general superintendent of the New York, New Haven & Hartford Railroad. Previous to his appointment on the Worcester & Connecticut Eastern Street Railway Mr. Martin was private secretary to General Manager W. E. Chamberlain, of the New York, New Haven & Hartford Railroad.

MR. JOHN H. TUFEL, superintendent of construction for the Cleveland Construction Company, of Cleveland, in the construction work on the Miami & Erie Canal, has gone to New York for the Cleveland Company to take charge of the construction of the extensions of the New York & Long Island Traction Company, of Mineola. Before leaving Cincinnati Mr. Tufel was tendered a farewell dinner by the officials of the canal company.

COLONEL MYRON T. HERRICK, a prominent Cleveland banker, who has been nominated for Governor of Ohio by the Republican party, was a member of the banker's committee which had charge of the affairs of the Everett-Moore syndicate, and is a prominent stockholder and director in several electric roads, among which are the Cleveland Electric Railway and the Pennsylvania & Mahoning Valley.

MR. E. C. FOSTER, of Boston, retiring general manager of the Boston & Northern Street Railway Company, and president-elect of the New Orleans Street Railway system, was presented with a gold watch on the evening of June 18 by employees from Lynn, Gloucester, Chelsea, Salem, Woburn, Wakefield and Reading. Superintendent Henry Grover, of the Chelsea Division, was master of ceremonies, and the presentation speech was made by Mr. W. P. Walton, a conductor.

AT A DINNER GIVEN IN THE SAVOY HOTEL on June 22, the officers and employees of the Interurban Street Railway Company, of New York, presented to President H. H. Vreeland a silver loving cup 27 ins. high. Two hundred men were chosen by the 8000 employees to represent every department of the railway. As stated in the STREET RAILWAY JOURNAL for June 20, Mr. Vreeland sails for Europe to testify before the Royal Commission on London traffic as an expert in urban railroading.

MR. OTTO E. OSTHOFF, who has been for some time engineer of the Chicago office of the Electric Storage Battery Company, will, on July 1, become associated with Mr. H. M. Byllesby, consulting engineer of Chicago. Mr. Byllesby has been conducting a consulting business in Chicago for about a year past. His work has been principally in the reconstructing, operating and improving of electric railway and light properties. His business is tending largely toward situations in which Mr. Osthoff's long experience will be of great value.

MR. WILLIAM BURLINGHAM has accepted an appointment as chief engine designer with the B. F. Sturtevant Company, of Hyde Park, Mass., resigning a position in the United States Inspection Office with the William R. Trigg Company, of Richmond, Va. Mr. Burlingham has previously been associated with the Bath Iron Works, the General Electric Company, the Southwerk Machine & Foundry Company, and the Newport News Shipbuilding & Dry-Dock Company. He has also served on Mr. Edison's staff at the East Orange Laboratory, and is a graduate of the Worcester Polytechnic Institute.

NEWS OF THE WEEK

CONSTRUCTION NOTES

MONTGOMERY, ALA.—The Haynesville Railway Company has filed articles of incorporation, with a capital stock of \$75,000. The purpose of the corporation is to build a railway from Haynesville to Morganville.

SHEFFIELD, ALA.—The survey of the lines connecting Florence, Tusculumbia and Sheffield has been made and routes agreed upon. Work is being pushed on the power house in Sheffield.

COVINA, CAL.—Press reports state that E. Randolph, general manager of the Pacific Electric Railway, has applied for a franchise to construct a single or double-track railway on Badillo Street, and that bids for said franchise will be received by the board of trustees until July 21.

LOS ANGELES, CAL.—Henry E. Huntington is reported to be behind an enterprise which has for its aim an electric railway into the Yosemite Valley. Under the name of the Intermountain Railway a line is to be built from Sunnyside, near Fresno, to the Yosemite Valley via Clovis to Milltown. The road will pass through an immense timber reservation belonging to the Michigan Lumber Company, which is reported to have promised to supply fifty carloads of lumber per day for fifty years. Considerable grading has already been done. It is said that the proposed road's grade will average about 2 per cent.

LOS ANGELES, CAL.—The City Council has sold to Clark & Bryan for \$2,500 a franchise to extend the West Ninth Street line of the Los Angeles Railway Company $\frac{1}{4}$ mile, beginning at Ninth Street and Grand View Street and running over Ninth, Park View and Hoover Streets to Tenth Street and along Tenth Street for several blocks.

LOS ANGELES, CAL.—The fight for a blanket franchise that has promised the city 3-cent fares still wages, but not with the fury of a few weeks ago. It is believed by many that Senator Clark and his associates have about decided to withdraw and permit the steam roads of Southern California to do the best they can against the electrical onslaughts of the Huntington-Hellman syndicate.

LOS ANGELES, CAL.—The Los Angeles & Redondo Railway Company is moving its car shops at Redondo and making many improvements in its shops, car houses and power plant. One building 120 ft. x 180 ft. is being moved several blocks in its entirety.

SANTA ANA, CAL.—Surveys are being completed for an electric railway to be built between Santa Ana and Newport Beach by the Pacific Electric Railway Company. Mr. Huntington, president, has recently purchased a large interest in the Newport Beach Company, recently capitalized for \$1,000,000.

SANTA CRUZ, CAL.—C. H. Cassin has been granted an electric railway franchise for Pacific Avenue to be run to Seabright. The new line will soon be in operation, and will shortly be extended to Capitola. Cost, \$7,000.

WHITTIER, CAL.—A franchise for an electric railway on Hadley Street has been sold to the Pacific Electric Railway Company for \$100. This franchise will be used as a part of the Whittier terminus of the interurban road now under construction to Whittier from Los Angeles.

DENVER, COL.—The City Council has passed an ordinance granting a franchise to the Denver & Northwestern Railway Company for an electric railway over certain streets in Denver. All that now remains before commencing active work is to secure some minor rights of way.

VICTOR, COL.—A franchise has been granted to the Colorado Springs & Cripple Creek District Railway to build tracks and run cars through certain thoroughfares of this city. This means that the High line and Low line will be connected and the electric cars will probably make the circuit from Cripple Creek to Victor over the High line by way of Bull Hill and return to Cripple Creek by the Low line.

DANBURY, CONN.—The Danbury & Harlem Traction Company, which has partially built an inter-state trolley line from Danbury to Golden's Bridge, N. Y., has been authorized by the New York Railroad Commissioners to issue a mortgage for \$500,000 to pay for construction work. It is unofficially stated that the work will now be pushed to completion. The General Assembly of Connecticut has recently passed a resolution granting various additional franchises to the company to occupy streets in the towns of Danbury and Bethel.

HARTFORD, CONN.—The Legislature has passed a resolution changing from Enfield to Hartford the corporate headquarters of the Hartford & Springfield Street Railway Company, and granting additional franchises to the corporation.

NEW HAVEN, CONN.—The Eastern Connecticut Electric Power Company, organized with a capital stock of \$100,000, which is to be increased to \$800,000, and which will take up the development of several large water-powers in the eastern part of the State, with a view to supplying from 5000 hp to 7000 hp to electric light and street railway companies and industrial plants, has elected the following officers: President, F. A. Jacobs; vice-president, R. L. Warner; secretary and treasurer, Thos. C. Perkins; directors, Senator F. A. Jacobs, president of the Worcester & Connecticut Eastern Street Railway Company, Danielson; R. L. Warner, of the Westinghouse Electric Manufacturing Company, Boston; Edwin F. Green, of Lockwood, Greene & Company, Boston; H. B. Freeman, Jr., and Thomas C. Perkins, of Hartford.

WALLACE, IDAHO.—The City Council has granted to Herman J. Rossi and associates a thirty-year franchise to construct and operate an electric railway system.

CHAMPAIGN, ILL.—The Danville, Urbana & Champaign Railway Company is to build a 14-mile extension of its present lines at once.

MOLINE, ILL.—The Tri-City Railway Company has begun work on its westward extension to the site of the old town of Rockingham. It is the expectation to have the line completed within a month.

MARSHALL, ILL.—The County Board of Supervisors has granted a franchise to the St. Louis, Vandalia & Terre Haute Electric Railway Company. It is reported that work on the line will begin within sixty days.

QUINCY, ILL.—The locations are about completed for the Quincy & Southeastern Electric Railway Company, and the right of way is well under way. The company plans to begin construction work at once.

AURORA, IND.—The officials of the Cincinnati, Lawrenceburg & Aurora Electric Railway Company announce that the survey of a right of way for the extension between Aurora and Rising Sun has been completed, and that 9 miles will be built at once.

BOONEVILLE, IND.—The Town Board has granted a franchise to the Evansville, Booneville & Rockport Traction Company. The franchise is similar to the Evansville franchise. The company is required to file a \$10,000 bond with the city within three months, and at the expiration of nine months the sum of \$2,000 in cash must be paid to the Town Treasurer as a guarantee that work on the road will commence within a year and will be completed within thirty months. Edward Henning and William Threlkeld, representatives of the company, say franchises will next be secured through Warrick County, Rockport and Spencer. The survey will be begun at once.

BURLINGTON, IND.—A subsidy of \$15,000 has been voted to the Logansport-Frankfort Traction Company in Burlington Township. The line will connect Logansport with Darwin, Burlington, Michigantown and Frankfort.

INDIANAPOLIS, IND.—The Board of Commissioners of Marion County has granted a franchise to Charles L. Henry, president of the Cincinnati & Indianapolis Traction Company, to enter the county. The road is to be built upon a private right of way except a strip of about 575 feet along Railroad Street, in Julietta. The right is given by the franchise to cross all intervening highways along the private right of way. The company has made a deposit in the sum of \$1,000 to secure performance of its part of the contract in compliance with the conditions made by the Board of Commissioners. Acceptance was immediately filed, and the work is to begin as soon as possible.

INDIANAPOLIS, IND.—The County Commissioners have granted a franchise to the Indianapolis-Northern Traction Company to enter the county and city over the new College Avenue Fall Creek Bridge. In consideration, the company will make the filled approaches to the bridge, to cost \$15,000.

JEFFERSONVILLE, IND.—Trobridge, Nivers & Company, of Chicago, have underwritten the securities of the Louisville & Southern Indiana Traction Company. The company announces that it will build an electric railway from this city along the river, to Madison, and another line will be built to New Albany. The company stands ready to take up the contracts of the company building to French Lick and West Baden and push the work. The new corporation has secured entrance to Louisville over the Big Four Bridge.

MUNCIE, IND.—The construction forces on the Ohio & Indiana Traction Company road, which is being built between Muncie, Union City, Greenville, Dayton and Hamilton to Cincinnati, have reached a point within 2 miles of Muncie. Bridges and culverts are being built and the grading work between Muncie and Union City, in Indiana, is being hurried along. There will not be a curve in the track between Muncie and Winchester.

MUNCIE, IND.—The Muncie, Hartford & Fort Wayne Railway Company is grading for a 15-mile extension from Montpelier to Bluffton. E. P. Roberts & Company, of Cleveland, are the engineers.

NEW ALBANY, IND.—Monroe Township, Jefferson County, has voted a 2 per cent subsidy for the Greensburg & Indianapolis Traction Company.

NOBLESVILLE, IND.—The work of completing the line of the Indianapolis & Northern from Indianapolis to Noblesville is well along. The rails have been laid between Noblesville and Carmel, and the poles are up, the temporary bridge across Whittee River completed, and the grade made to Kokomo. The power house in this city is receiving its finishing touches and the machinery is in place.

RUSHVILLE, IND.—A \$10,000 lease has been taken on the old Carmichael mill and mill race to get an adequate source of water-power for the power house of the Indianapolis-Cincinnati Traction Company's line.

SOUTH BEND, IND.—The Council has passed the franchise of the Chicago & Indiana Air Line Railway over the Mayor's veto. The franchise will be contested for alleged illegality.

WARSAW, IND.—The electric railway between Warsaw and Winona Lake Park has been placed in operation. The line was built by the Winona Assembly. The power house is located in the Assembly grants, and is also a lighting plant.

ALBIA, IA.—M. E. Springer, of Des Moines, Ia., is promoting the construction of an electric railway from Albia to Buxton, Hiteman, Hocking, Hilton and Hynes, all mining towns in Monroe County. The combined population of the towns is about 12,000 people, and only one of the five has any passenger facilities whatever, the others being reached by a coal road which does not carry passengers. The proposition outlined by Mr. Springer contemplates the purchase of the present electric light plant and the building of the city gas plant, city heating plant and waterworks in Albia and the con-