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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.

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Paying for Wheels by Mileage

Several large companies are now purchasing wheels on a blanket mileage contract, which seems to have many desirable features. This question of wheels and wheel mileage is one of the timely subjects which will be taken up at the next convention of the American Railway, Mechanical and Electrical Association, according to the plans outlined by the executive committee. It might seem at first that a system of purchasing and paying for wheels according to the mileage that they run would call for a very elaborate system of bookkeeping and a cumbersome lot of records, as well as give rise to endless controversy between the companies supplying the wheels and the company using them. Just the contrary, however, is the case with the form of wheel contract which is now coming into vogue. Under this contract the electric railway company pays the company supplying the wheels a certain price per thousand wheel miles. A record is kept simply of the total car mileage of the cars of various classes. This record, as taken from the auditor's report, is supplied to the manufacturing company, and payment is made on basis of it. The manufacturing company simply agrees to keep the railway company supplied with wheels for the period of the contract at so much per thousand wheel miles. The company may or may not agree to grind down flat wheels, and the manufacturing company allows for this in making its price.

Under such a contract it is to the interest of both the railway company and the manufacturing company to get the greatest mileage possible out of every wheel. The labor cost of wheel renewals is so great that, of course, the railway company wishes to run every wheel as long as possible before renewing, and since the manufacturer is paid by the mileage his wheels make instead of by the pound, it is to his interest to supply a wheel which will give the greatest mileage per pound. There is no trouble with keeping the individual wheel mileage of various pairs of wheels, as the totals are the only figures dealt with. The arrangement is the most satisfactory one for all concerned that has yet been devised for the purchase of wheels, as by it both parties to the contract are working to the common end of getting the greatest wheel life possible. It has been a matter of common remark among wheel manufacturers that it is easy to make a good wheel with good iron, but that at prices which many roads wish to pay, they are expected to make a good wheel out of poor iron. When wheels are bought by mileage and not by pound, the manufacturer is not restricted by the matter of first cost as he is when quantity of iron and not quality is the thing paid for.

The Short Haul vs. the Long Haul

It has almost become an axiom in street railway work that it is the short-haul business that pays best. This was undoubtedly true in horse car days, when the speeds of cars and their carrying capacities were limited, and is still the case on many roads at the present day, especially in large cities where the crowded condition of the streets prevents more than a certain maximum rate of speed. Theoretically, also, the product sold by the street railway company is seat-miles, and if it can get 5 cents for a seat for half a mile it is making more money than when it sells the right to occupy the same seat two or more miles for the same price. Like a great many other theories and sayings, however, this analysis of the situation is an incomplete one. Theory will always agree with practice when the theory is correct and is carried far enough, but when the theorist stops half-way in his analysis he may reach conclusions which are unwarranted by the facts.

Let us consider then some features of the long-haul and short-haul traffic, bearing in mind that for the present the argument is confined to the conditions prevailing in the small or medium sized city and not to those of metropolitan size. In the first place, the cars must stop to receive and discharge short-haul passengers as many times per passenger as with the long-haul passenger, and stops are, of course, costly, on account of the delay caused as well as being a direct source of expense as regards power and depreciation. Again, the short-haul business is necessarily done on a small portion of the total length of the line, and is accompanied by a correspondingly crowded condition of the car, both of which circumstances tend to increase liability to accidents and missing fares. Moreover, the business is largely dependent on the weather, and with dry pavements or the arrival of hard times, the business will materially fall off.

On the other hand, a long-haul business, when once established, is practically permanent, as the patron is entirely dependent on the electric line for transportation, and as he can be carried in long cars, operated at high speeds, the average

car hours per passenger will not be very much higher than on a short-haul line in congested streets.

The subject possesses more than theoretical interest from the fact that the desirability of long suburban extensions is a serious question with many companies in our smaller cities and towns. Each case has, of course, to be judged on its merits, but there is no doubt that such extensions, when conservatively built, are profitable, as a rule, and that it is good policy to cater to the requirements of the long-haul passenger.

The Open Car

While considering some of the axioms in street railway work, as has just been done in the question of the short-haul traffic, the mind naturally reverts to another popular sentiment among street railway managers, and that is in regard to the accident proclivities of the open car. There is no doubt that there is a general tendency toward giving up the ordinary open car for the semi-convertible car, on account of the accidents caused to persons boarding or alighting from the open car. It is equally true that for suburban and city use in summer there is no car which is as generally popular with the public or which seats as many passengers as the ordinary open car. We shall not attempt to deny the fact that the open car is liable to accidents, but we should like to see any mechanical contrivance which is not. If passengers insist upon attempting to get off this car while it is in motion, by using the wrong grab-handle or by disregarding other rules for safety which should be instinctive with them, they have only themselves and their previous education to blame. The other passengers have certain rights, and if their comfort can be ensured better by providing them with a car of the ordinary open type than in any other way, their wishes should be considered. The only fair way to the railway companies by which this can be done is for the courts to recognize the fact that the open car is a material contribution to the comfort and welfare of a large part of the community, that while this car is perfectly safe to those who exercise discretion, it cannot be made fool-proof, and that, if necessary, those who ride in cars of this description should be held to a more strict accountability for carefulness than if they used a car with only a single rear exit or entrance.

Baleful Influence of the Boss

Recent disclosures in labor organizations have revealed a condition of affairs wholly unsuspected by the great mass of the people. Boss rule has been the order, and this has led to many abuses. We are all familiar with the political boss, and most of us have at least a hazy idea of the financial boss, but very few realize the influence exerted by the labor boss. Sam Parks' career and the record of his "entertainment committee," as disclosed through the prosecution of the obstreperous labor leader, was a startling revelation, and it should have suggested to every thoughtful reader of that tale of coercion and violence that the lawless element which Parks represented must have powerful protectors and influential supporters who hoped to profit by these deeds of violence, else he could not engage successfully in such wholesale intimidation. A writer in McClure's Magazine, who has made a study of these conditions, declares that while in theory there are few more magnificently democratic institutions than the trades union, it has often been degraded by the labor boss. "Croker never ruled his party with a stronger hand than Sam Parks ruled the Housesmith's Union and paralyzed the building industries of New York City," is the conclusion of this writer.

This is undoubtedly true, as all who are familiar with the proceedings in labor circles during the last year or two can testify. But Sam Parks does not stand alone. He is a type, and, unfortunately, "leaders" of this kind are appearing everywhere in labor circles. The street railway industry during the last year has had experience with them, and in many parts of the country, where the companies have refused to submit to extortion and oppression, they have been confronted with the danger and financial losses attending a strike, but in every case where they have taken a resolute stand public sentiment has been with the corporation ultimately, although it may not have been at first, and the men have been obliged to submit to reason and withdraw their unjust demands. The recent Chicago strike was an example of this kind, and the attempt to tie up the Jersey lines, earlier in the year, showed that the entire movement was dictated by the labor bosses and not by the men.

The labor boss is a logical result of conditions that not only admit of the existence but encourage the political boss and the financial boss, and Mr. Baker, the writer already quoted, declares that all these must be shorn of their power before we can hope for independence and freedom. Present conditions are attributed to the fact that most people shirk their responsibilities; the citizen by not performing his duty at the party caucus and in the election booth, the workman by not attending the meetings of his union and participating actively in the proceedings, and the investor by neglecting the meetings of the corporation in which he is interested.

How is a change for the better to be effected? It should be a simple matter, and Mr. Baker says: "It comes back, after all, to you and to me, personally, individually. If you want to be rid of the boss in your city, you have got to go to the primaries and the election booth and protest and vote and protest again. If you, as a workingman, want honest and efficient unionism, you have got to go to the union meetings and make things right, and if you, as a stockholder, want to see common business honesty in your trusts and in your corporations, you have got to look after the thing yourself." Why is this not done? Mr. Baker's explanation is at least plausible, and will be readily admitted by those who have attempted to bring about a change. "It is safe to say that a majority of the people in this country would prefer an honest free government to boss rule, but most of us are drifters—honest enough, but pulpy; we have no courage to stand up and say what we believe, or to back it up afterwards, if necessary, with hard knocks. We don't like to get our hands soiled, or to have our ease disturbed." And, consequently, the boss is tolerated and permitted and encouraged, by the apathy of the public, to work out his schemes. Once in a while a halt is called and an accounting demanded by an outraged public, as in the case of Parks and McCarthy, but these investigations are not complete, those "higher up" are shielded and the evil is not eradicated. It is only suppressed temporarily, and it lies dormant for a time until there is a favorable opportunity for further operations. Several severe rebukes have been administered of late, and we are encouraged in the hope that permanent improvement may be looked for.

Massachusetts Street Railway Policy

The Board of Railroad Commissioners of Massachusetts has defined the policy of the Commonwealth upon two very important points in the matter of granting applications for locations of street, suburban and interurban railways, embodying their views in a decision on the petition of the Suburban Street Railway Company, of Springfield. This document was published in the Street Railway Journal of Dec. 12, and con-

tains much to interest and instruct those engaged in similar projects throughout the country, as well as in enterprises of this character in Massachusetts. At the present time the position of the Commissioners is diametrically opposed to that maintained by similar bodies in other States, but it is confidently anticipated by many who favor the policy thus laid down that eventually the Massachusetts idea will prevail.

By denying the petition of the Suburban Street Railway Company for a location in Springfield, the Commissioners practically committed the entire State to the policy of regarding an existing street railway as an established monopoly, which the law will protect against any form of competition excepting under very unusual circumstances. And, at the same time, it called a halt on the growing practice of building electric railway lines over private rights of way, without securing special legislation. The Boston & Worcester, which secured a special charter enabling it to build on private land, evidently set the ball rolling, for other roads have since been attempting to follow this example without taking the precaution to acquire the special legislation which enabled the Boston & Worcester to execute its plans. There is no general law, it seems, under which electric railway companies can use private right of way. The Commissioners, therefore, announce that they will not approve any routes crossing private property unless they are warranted in doing so by special legislation, as there is nothing in the present general law which gives any street railway a right to run off the street and on private land except to avoid some difficult engineering task on the existing highway.

The result of this part of the decision, therefore, is not favorable to electric railways generally, especially those desiring to compete with steam roads for suburban and interurban patronage, as they are restricted to the highways and can only make 20 m. p. h., while there is no legal obstacle to prevent operation of trains of the steam road, on its private right of way, at a speed of 60 m. p. h. It would seem as if it were the purpose of the Commissioners to extend protection to steam roads threatened by trolley lines, similar to that they have furnished in the case of established electric railways when they come out frankly in favor of the "trust" idea in public service and support their contentions by citing the experience of cities where it has been given a fair trial.

New Policy for the New Haven

President Mellen, of the New York, New Haven & Hartford Railroad Company, made some very interesting statements at a dinner of the Chamber of Commerce in Providence recently, relating to the plans for improving the service of the system which he represented. To begin with, the speaker admitted that the service was not all that it might be; in fact, that it was not all that the patrons desired and had a right to demand, and, he might have added, that but for the fact that the entire transportation business of that section was controlled by his company, there was no doubt that the facilities would have long since been greatly improved.

Mr. Mellen comes back to the New Haven, as president, to find it in practically the same position and condition that it was in when he held a position not quite so prominent or important as his present office. Let us see what he will accomplish now that he is in complete control? His remarks upon former managements might be construed as uncomplimentary, but whether they were intended to be so is another question with which we have no concern. It is sufficient to know that the new president recognizes many of the shortcomings which have really hampered the development of the property to its full value, and it is earnestly to be hoped that a marked change will be made, especially in the attitude of the company toward the electric railway. Heretofore, as we have pointed out, the policy of the company has been very disappointing to its friends, and, we should judge, discouraging to those responsible for it. Instead of utilizing the electric railway for feeder lines, and equipping the suburban branches with motors, the company has opposed every suggestion of this kind until it has been compelled to adopt electricity, but, at the same time, it has tried to keep out competition, although it would not give the service demanded. The experience has not been pleasant, and, as Mr. Mellen suggested, we shall not engage in an unprofitable discussion of ancient history, but we shall hope for a change in the policy and methods adopted, especially toward the electric system, and we shall gladly give credit for any improvement that may be worked out. Certainly, the lesson should now be thoroughly learned; it has cost the company enough.

Chicago's Shame

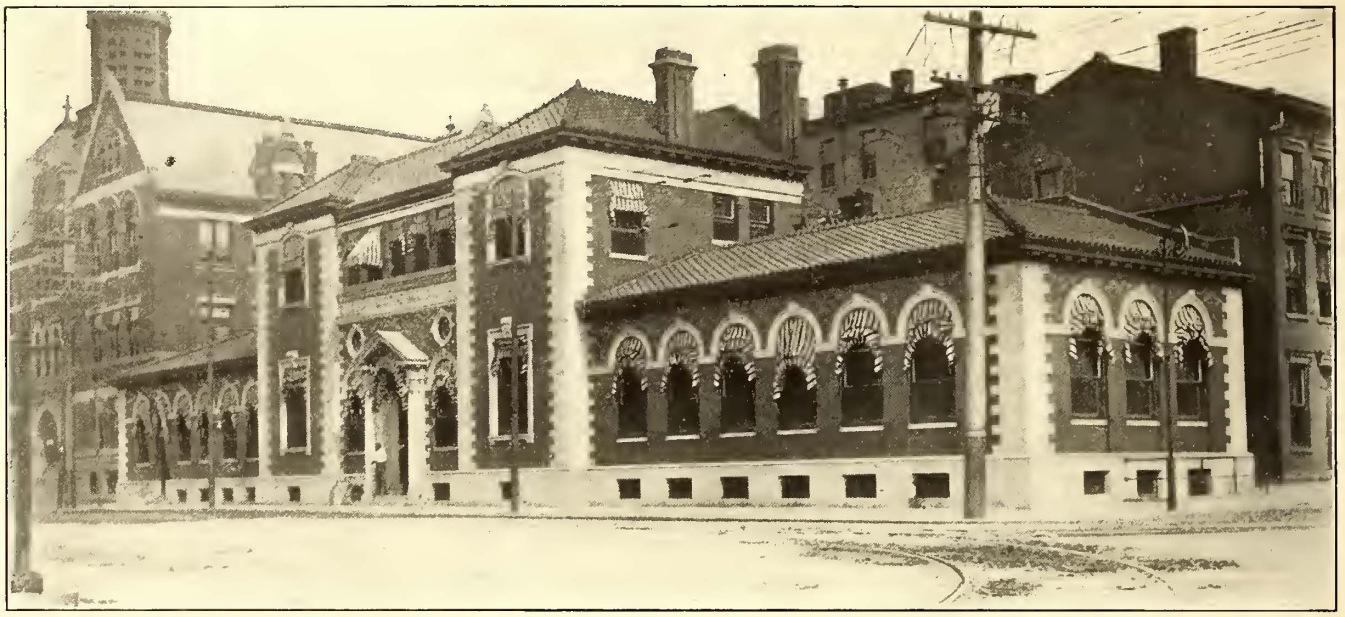
There is a "reign of terror" in Chicago, according to many well-informed residents, who are not regarded as alarmists, and this condition of affairs is not due entirely to hold-ups of the ordinary kind, house-breaking and similar outrages which have been more common than usual lately, but much of the dismay and terror, especially among women and children, is occasioned by the murderous assaults that have been made upon non-union conductors and motormen in the discharge of their duty during the day and often in much frequented places. Of course, the union repudiates these proceedings, and no wonder, for no organization or individual would dare to undertake the defense or justification of such a discreditable policy. And yet the union has accepted the terms of the company, and its members are legally and morally bound to respect them; but, unfortunately, it was demonstrated during the last strike that labor unions had little regard for the obligations of contracts, that they broke them without hesitation when it served their purpose, and that their idea of an agreement was simply an instrument to hold the other fellow to the terms he had made, recognizing no binding effect upon themselves. If any further proof were needed to show how little reliance can be placed upon them as a class, recent occurrences in the street railway controversy would furnish ample evidence. In the present instance the attitude of "organized labor" is clearly shown in the fact that at the meeting of the Chicago Federation of Labor, last Sunday, a resolution was adopted ordering all trades unionists to refuse to pay fares to conductors who have not the insignia of the street car union, namely, the union button. This refusal on the part of union men is primarily the cause of all the disturbances that have caused so much trouble.

Such a policy is bound to bring disgrace and disaster upon any organization which practices it, and while the street railway company may suffer temporarily, it is not to be expected that the union can win along these lines. Conservative and substantial business men of Chicago will not allow this blot to rest upon the fair name of that city; no matter where their sympathies may have been during the strike, they will not countenance such a disgraceful condition as has been brought about by the unions and their sympathizers. The detailed accounts that we have presented in our news pages of the rioting and intimidation practiced by the union sympathizers show the extent to which the lawless element has gained the ascendency in union organizations.

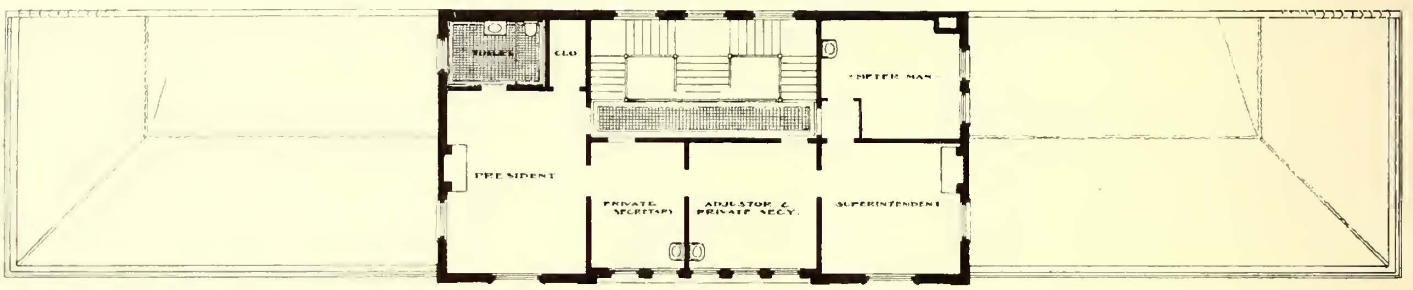
IMPROVEMENTS ON A KENTUCKY SYSTEM

The South Covington & Cincinnati Street Railway Company, which owns the Kentucky lines controlled by the Cincinnati, Newport & Covington Light & Traction Company, has been making a number of improvements in its system of late, and additions to its property.

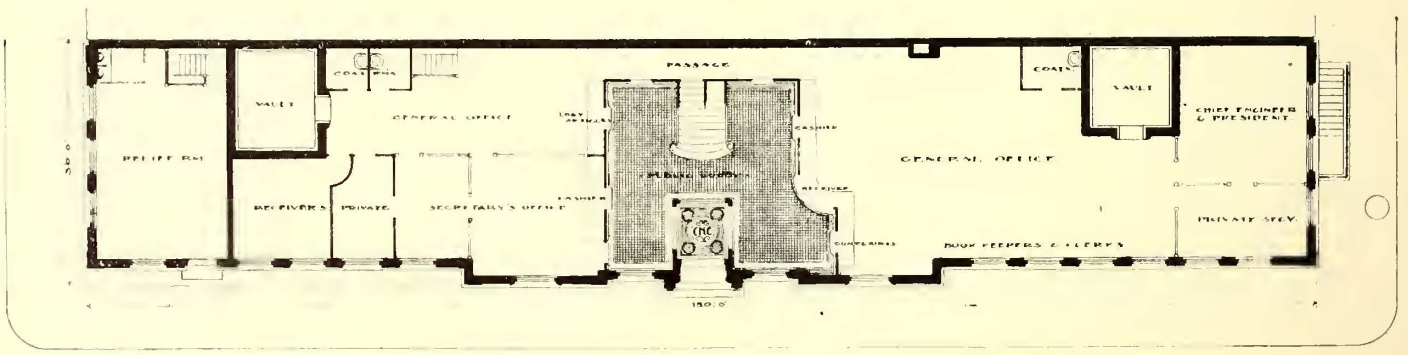
Prominent among these is the erection of the handsome and complete office building herewith illustrated, which is located on the main street in Covington, Ky., immediately adjoining the City Hall and directly opposite the postoffice. Architecturally, it is in harmony with its surroundings. The structure has 150 ft. front and is 30 ft. deep. It is constructed of Columbus fire-flashed brick laid in red mortar; trimmings of Bedford stone with copper cornice and red tile roof. It is heated by a hot-water system. The first and second floors are supported



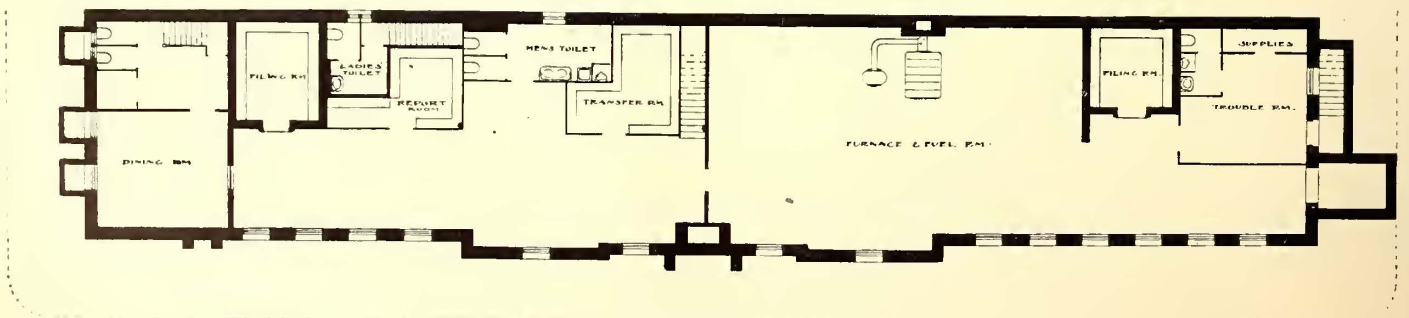
HEADQUARTERS OF CINCINNATI, NEWPORT & COVINGTON RAILWAY SYSTEM AT COVINGTON.



Second Floor



First Floor



Basement

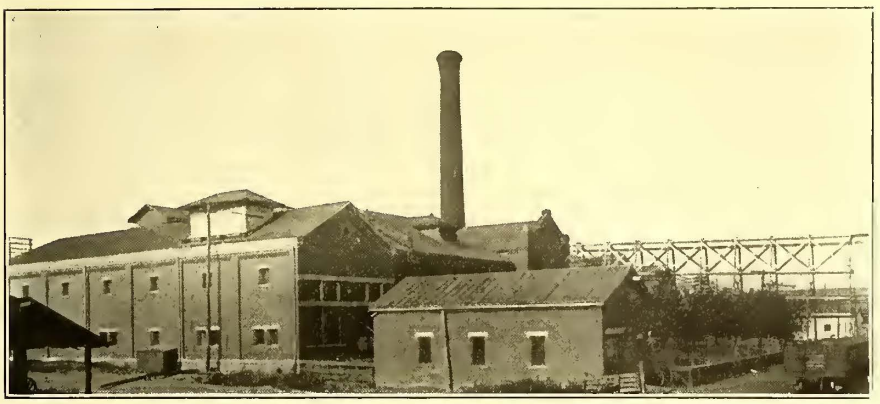
PLANS OF HEADQUARTERS BUILDING

on iron beams throughout. The finish of all woodwork and furniture is highly polished antique oak. In the center is a public lobby with marble floor and wainscoating. There are windows for the receiver, cashier, "complaints" and "lost articles." An open stairway leads to the second floor. On either side of the lobby are the general offices with private offices for the receivers, secretary, chief engineer and relief association. On the second floor are the offices of the president, claim adjuster, superintendent and treasurer. In the basement are the trouble room, transfer room, report room, filing room and a dining room for office employees.

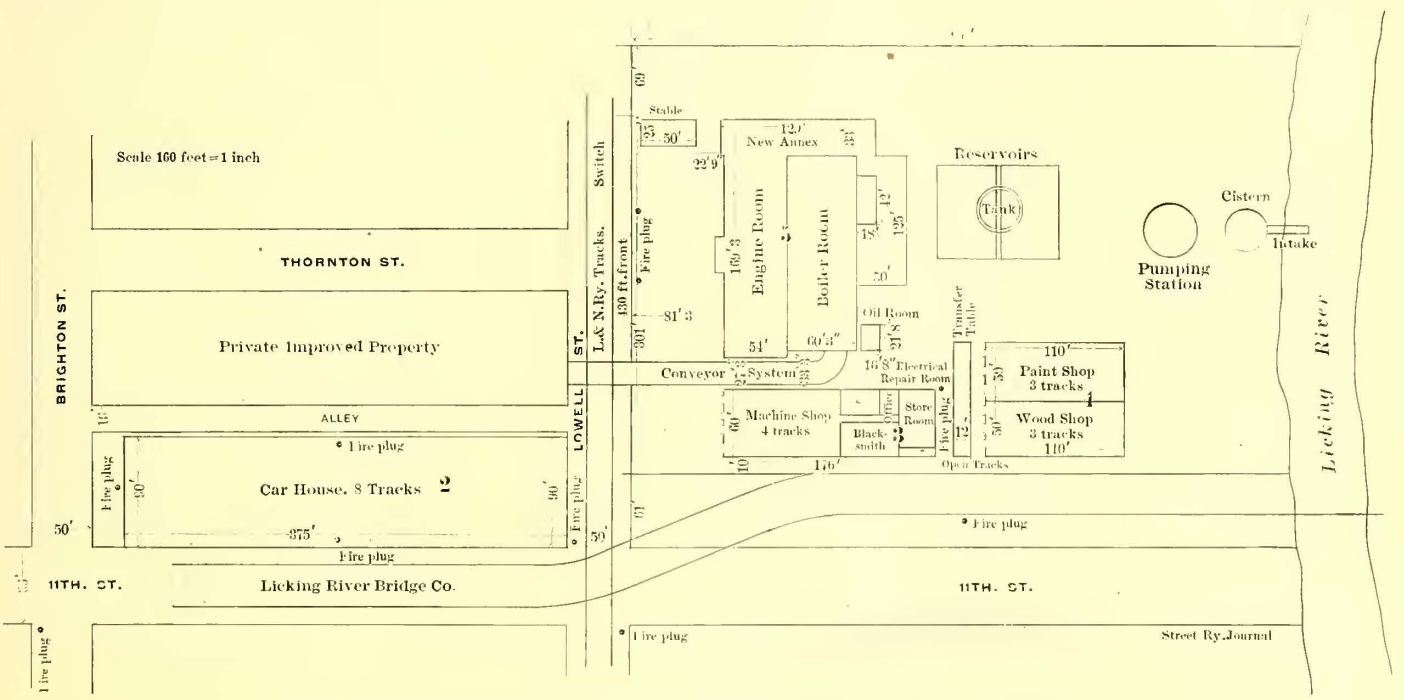
The company has grouped its repair shops and car house on a site adjoining its power house in Newport, and now has a very complete lay-out for a road of this size. The arrangement of the buildings is shown in the accompanying plan. The car house is 90 ft. x 375 ft., has eight tracks extending the entire length, and holds ninety-six cars. The floor is brick, and there are brick pits, 60 ft. long, in each track. The roof is slate and is supported on structural steel trusses with clear spans. In front between the two large doors is the office of the division superintendent. On the second floor is a waiting room, locker room with individual lockers for the men, reporting room and reading room, with tables and periodicals, supplied by the company. There is a fireproof oil room on one side of the building and a lavatory and a bath room for the men. This is supplied with hot and cold water, and there are both tubs and shower baths. All the plumbing is first class, and the place is well kept up. There is a track at the side of the building which connects with the machine shop, paint shop, woodworking shop and power house in the rear. The dimensions of the machine shop building are 60 ft. x 176 ft., and the construction is similar to that of the car house. It has four tracks, with pits the full length. The rear of the building is partitioned off for a blacksmith shop, a store room, electrical repair shop and office of the master mechanic and purchasing agent. Up-stairs is the office of the superintendent and the engineering department of the road. In the basement is a wash room for the men, with tubs and shower baths. To the rear of the machine shop are the paint and woodworking shops, which are each 50 ft. x 110 ft., divided in the center by a fire-brick wall. There are three tracks in each section, and the building is made accessible by a transfer table connecting with the tracks at the alley at the side. The machine shop has a good equipment of tools, including an engine lathe for turning axles, wheel lathe, boring mill, wheel press, lathes, etc.

The company is receiving a lot of twenty single-truck cars,

CAR HOUSE

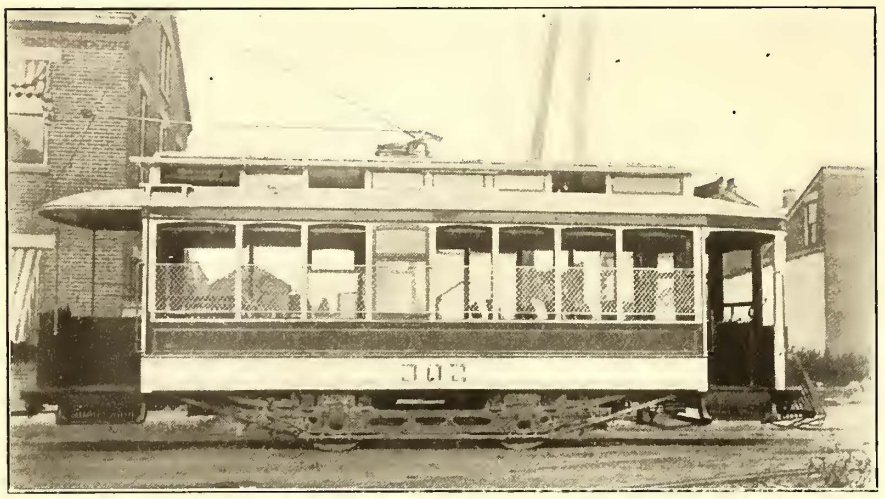


POWER HOUSE AND TRESTLE FOR COAL-CONVEYING SYSTEM



PLAN OF GROUNDS AND BUILDINGS OWNED BY RAILWAY AT NEWPORT, KY.

designed for both summer and winter service. They are the St. Louis Car Company's semi-convertible type, and are 31 ft. over all, 21-ft. body and 8 ft. wide. The bottom framing has a



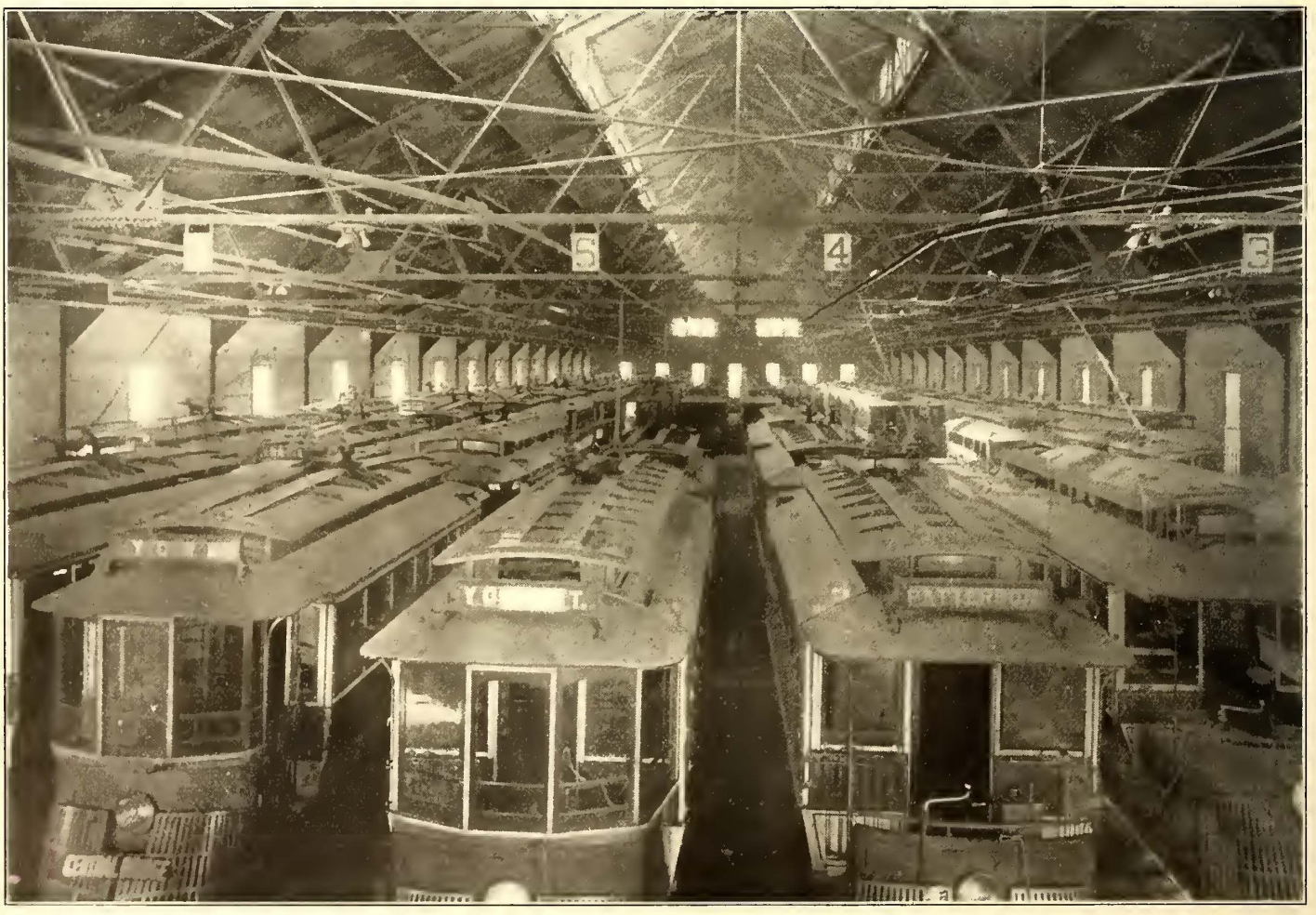
NEW CAR OF CINCINNATI, NEWPORT & COVINGTON SYSTEM

sill 7 ins. wide and 6 ins. deep, with a 7/8-in. strip of iron running through it edgewise. The sides are constructed of 7/8-in. poplar panels with no concave. The cars have front end vestibules, closed on one side and open on the other, and the rear end has an open platform. There are fourteen cross-seats, of the St. Louis Car Company's reversible enameled rattan type, and two side seats. The interior finish is extra fine cherry. Both the side sashes drop inside the car between the sills. The end sash and the end door sash also drop into pockets. The end inside sash is provided with a screen. Peckham No. 7-D trucks, two Westinghouse motors, a K-10 controller, Westinghouse electric brakes, St. Louis sand-boxes and Hunter fenders are included in the equipment.

Thomas Kelch, master mechanic of the shops, has designed several unique devices that have been adopted in the shops and on the road. One of these is a hinged trolley harp, illustrated herewith. By removing a cotter at the side, one arm of the harp may be opened, and the trolley wheel slipped off the bearing. It is claimed that the work of changing a trolley wheel can be done in one-fifth the time required with the ordinary harp. Any style of wheel may be used. The harp fits very close around the wheel, and there is no space for the wire to get between the harp and the wheel. A copper spring carries the current from the wheel to the pole.

For pit work a portable hydraulic jack, shown herewith, is used. This is mounted on four wheels, and it is light enough to be carried from one pit to another by one man. The construction is very simple; the lift portion being made of 3-in. iron pipe, 4 ft. long, while the water tank is of 3-in. pipe, 18 ins. long. The pump is of 1½-in. pipe, 6 ins. long. The table has 18-in. wood rollers, so that an armature may be rolled off easily, and the lift has a capacity of about 1000 lbs.

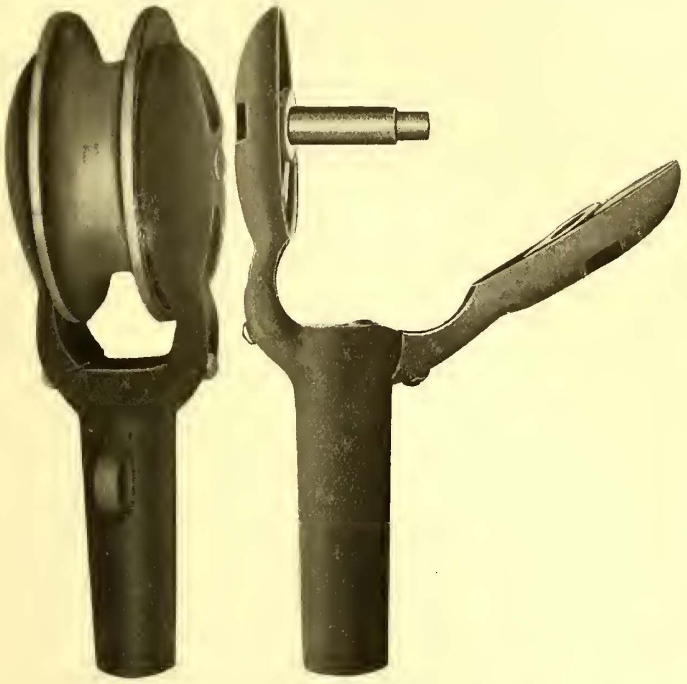
In pressing off car wheels, without removing the gear, Mr. Kelch uses a pair of cast-iron billets, having one end shaped to fit the wheel flange. The accompanying illustration shows this method in operation.



INTERIOR OF CAR HOUSE AT SOUTH COVINGTON

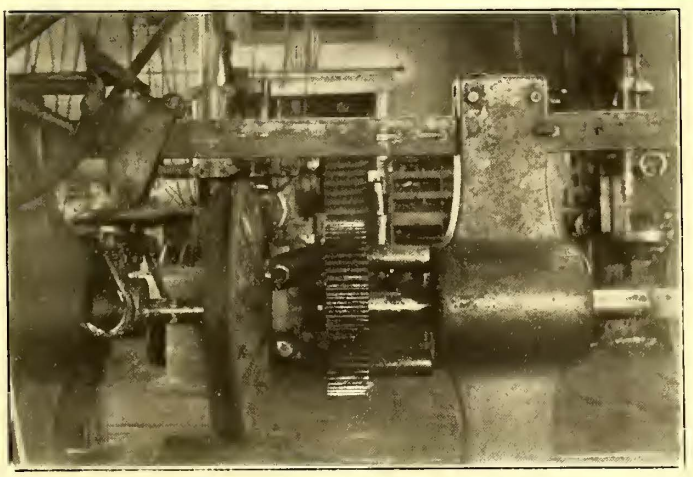
The company has about 150 cars in use, and two Westinghouse No. 49 motors have been adopted as standard equipment for each car. One man and four boys are

employed in electrical repair work, and they make all their own armature coils and field coils and do their own controller work, as well as car wiring, etc. Charles Ulrich, who is in charge of the department, has introduced several simple devices of his own invention that assist materially in the work. In winding Westinghouse No. 49 armature field coils he uses the wood form illustrated. This has four adjustable spring clamps, two having straight faces and two curved faces, which press the wire down tight and keep it in place during the winding. It is claimed that the device greatly facilitates the work. In forming Westinghouse No. 49 armature coils he uses a brass form made in two sections, having curves exactly the shape of the coil desired. The form is provided with a double hook, operated by one handle, for tightening or loosening the two sections. The hooks are tapered. By throwing the lever forward the two sections of the form are tightened, and by throwing the lever back, both sections are instantly released. In forming fuller-board for armature coil cells he uses a simple press, which saves a great deal of time. There is a flat steel plate in which there is a groove the depth of No. 11 Brown & Sharpe gage wire. A hinged arm forms a die to fit the groove, and when stamped down it forms one-half the desired cell. Another lever operates a pair of rollers, which, in passing over the fuller-board, gives it a double crease, thus forming the coil cell.



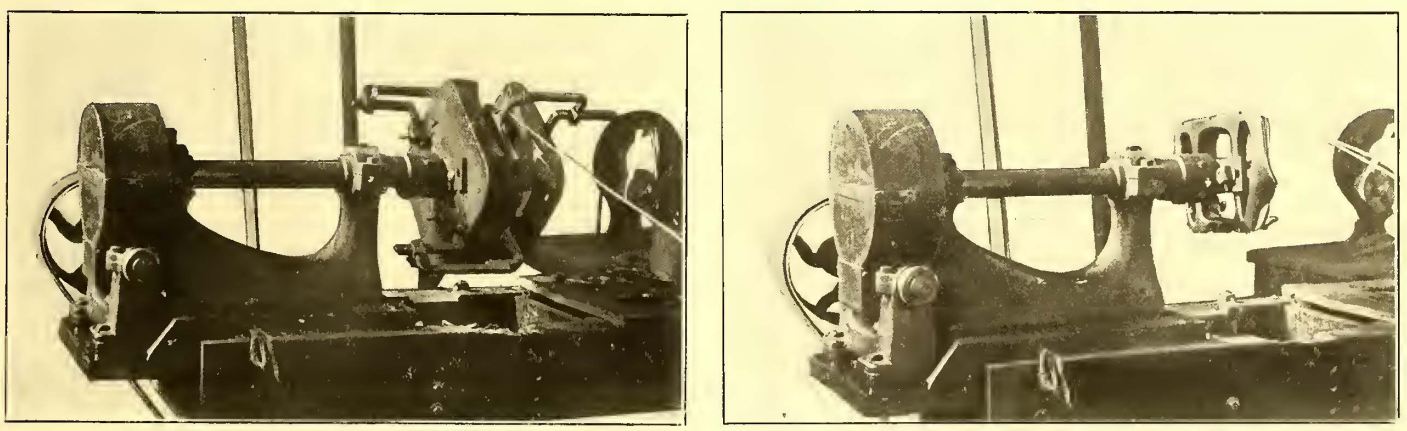
HINGED TROLLEY HARP

HOME-MADE HYDRAULIC PIT JACK



PRESSING OFF WHEELS WITHOUT REMOVING GEARS

The management is making extensive improvements in its power station (shown on page 1047), which has been growing piece-meal during the last fifteen years, and several additions have been built during that time. Railway, light and power loads are carried. Four Cleveland Shipbuilding Company's marine type vertical engines, belted to Westinghouse generators, are being taken out, and two Cooper-Corliss cross-compound condensing engines, of 2600 hp, directly connected to 1650-kw, Westinghouse, 550-volt railway generators are being installed. At present the railway side of the house is short of power, and a 400-kw Westinghouse rotary converter has been installed in the station. The rotary is of the shunt-wound type, and takes current through step-down transformers from a 500-



FORMS FOR WINDING FIELD COILS AND ARMATURE COILS

kw, 60-cycle revolving field lighting alternator at 4500 volts, and delivers 550-volt direct current to the railway bus-bar in parallel with the compound-wound generators in the station. A Chapman voltage regulator is used in connection with this arrangement, and it takes care of all variation within 2 per cent. The same alternating-current lighting generator delivers 4500 volts over high-tension lines to a sub-station on the new Erlanger suburban line. Here the current is stepped down to 360 volts, and is converted from alternating current to direct current. There are two rotaries in the sub-station, one of 400-kw and the other of 200-kw capacity. The total output of the company's station is about 1,000,000-kw hours per month. In spite of the fact that a considerable portion of the equipment is antiquated accurate records, which are taken regularly, show that the cost of current is .00666 per kilowatt-hour, including all cost of operation and maintenance, but not taking interest or insurance into consideration.

An addition to the boiler house has just been erected, in which are being installed four 500-hp Sterling boilers. Mechanical draft is used, supplied by two 14-ft. fans in connection with Sturtevant economizers for 2000 hp. Coal bunkers, having a capacity of 500 tons, have been erected on the boiler house roof, and these feed into 10-in. American stokers, which are used on all the boilers in the house. The United Telpherage Company's system of coal conveyance has been installed. A timber trestle, 45 ft. high and 180 ft. long, is used in conveying the buckets from a steel elevator bridge over a railway siding, which passes in front of the power house. The buckets have a capacity of 1 ton each.

The station uses about 2,500,000 gals. of water per day for feed-water and condensing purposes, and the water supply system has recently been improved. Three Lawrence Machine Company's centrifugal pumps, operated by 50-hp vertical motors, are set in a well, 78 ft. deep, near the bank of the river, which adjoins the property. These take water from a well 24 ft. in diameter and 22 ft. deep, which is connected with the river by a 36-in. intake. Water is discharged into a 12-in. header connected with a 16-in. header, supplying the feed-water and condenser pumps. In the yard there is a reservoir, 50 ft. x 90 ft. and 12 ft. deep, and suspended 15 ft. above this is an emergency tank, 10 ft. in diameter and 15 ft. high.

The new Erlanger suburban line is 7 miles long, and is double track and built entirely on private right of way across country. Track is laid with 60-lb. T-rail with rock ballast. Joints are 6-bolt fish-plates. The Harold P. Brown plastic bond is used at joints. The trolley wire is 00 grooved, and the high-tension lines are 0. The sub-station on the Erlanger line has a dwelling for the attendant attached. All buildings were designed and supervised by J. R. Ledyard, superintendent, and the improvements in the steam and electrical equipments were designed by E. E. Darrow, chief engineer.

HIGH TRANSMISSION EFFICIENCY

The results of some recent tests on the efficiency of transmission on one of the large interurban railway systems in the Middle West are given below.

The system, which comprises about 100 miles of track, built for the most part over a private right of way, is supplied with power at 26,000 volts from a single power station. The maximum distance from the station to which power is delivered is about 60 miles. The alternating-current output, measured at the generator terminals at 2300 volts, for a period of six weeks covered by the test, was 970,000 kw-hours. The output of the rotaries at the five sub-stations during the same period was 803,000 kw-hours, showing a loss of 17 per cent. This included the loss in the step-up transformers, the transmission line, the step-down transformers in each sub-station and the rotary converters. It is estimated by the engineers of the road that the apparatus losses were 121,000 kw-hours, or 11.9 per cent, and that the losses in the transmission line were 46,000 kw-hours, or 5.1 per cent.

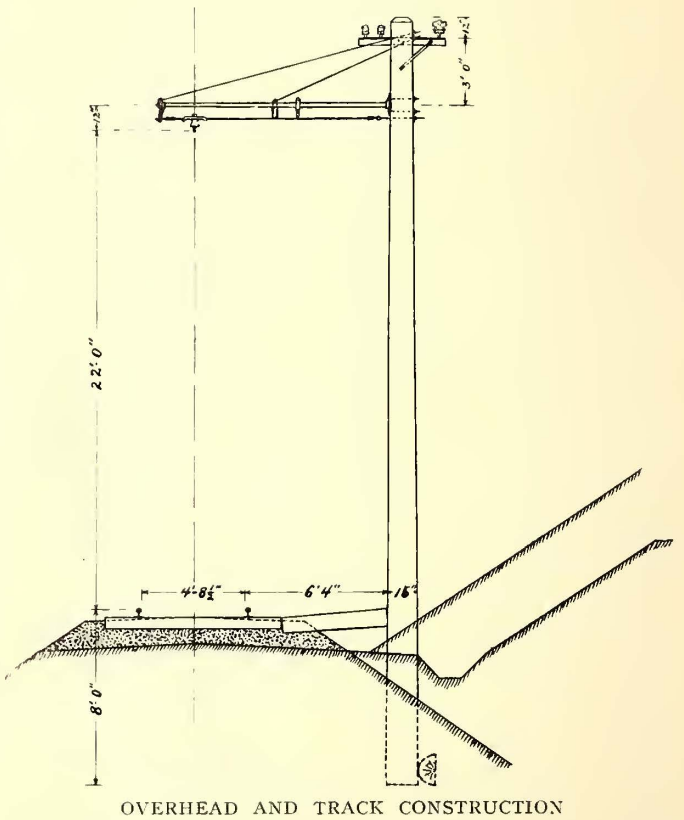
The load on the station and line is steadied by means of a storage battery and carefully adjusted booster at the farthest sub-station.

NEW INTERURBAN ROAD AT EVERETT, WASHINGTON

A new interurban line was placed in operation, Nov. 20, between Everett and Snohomish, Wash. The distance is only 9 miles and the population of the two cities is 26,000, yet the opening and operation of the new line had an important bearing upon electric railway development in that section.

The Everett Railway & Electric Company owns and operates the street railway system in Everett, consisting of about 10 miles of single track and 1 mile of double track. Through the efforts of its president, J. T. McChesney, the company has, within the last two years, rebuilt and re-equipped its entire system. It has recently constructed and equipped an entirely new power house of 1300-kw capacity for the electric railway, the city lighting and water-works system of Everett.

Last spring the company decided to build an interurban road to Snohomish, a distance of 9 miles. The route between the



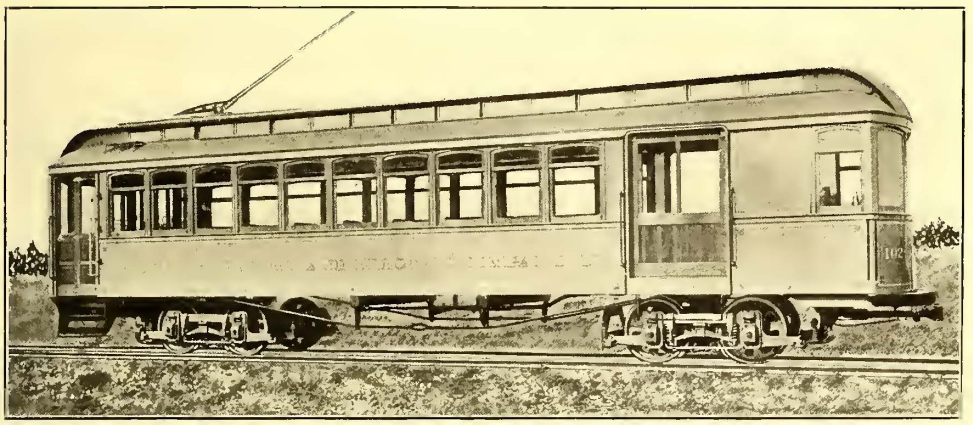
OVERHEAD AND TRACK CONSTRUCTION

two cities along the county roads was decidedly rugged to say the least, and the cost of a road so located would have been large. It was, moreover, difficult to obtain the necessary franchises from the City Council and County Commissioners.

The company recognized that the Northern Pacific Railway Company's branch line from Everett to Snohomish, on the Seattle-Vancouver-Division, was not only a direct route, but it also had the advantage of avoiding the bad grades. The steam railway passenger service, which was furnished by the Northern Pacific, was over its own private right of way and was rapid, but, with only two trains each way per day and the usual coal dust annoyance, it was concluded that a heavy traffic could not be secured. The expense of operating the passenger service with steam locomotives practically absorbed the passenger earnings.

Following several conferences last June, Charles S. Mellin, then president of the Northern Pacific Railway Company, and now president of the New York, New Haven & Hartford Railroad Company, leased this short single-track branch road to the Everett Railway & Electric Company. The lease included the use of the single track, good bridges, two railway depots, telegraph lines, and so much of the freight house, sidings, etc., as were needed by the electric railway to handle its passenger, mail and express business. The through freight, however, will be handled by the Northern Pacific Railway over the same tracks.

The Everett Railway & Electric Company, in its overhauling of the old lines, connected each rail joint with 0000 "all-wire," 12-in. protected rail-bonds, using 7/8-in. terminals, and erected a special bracket pole construction, with the pole 6 ft. 4 ins. from the gage line of the rail. This feature was designed by Edward P. Burch, consulting engineer, and the chief engineer of the Northern Pacific Railway Company approved the proposed overhead construction illustrated herewith. A 350,000-circ. mil copper feeder, and a 0000 figure 8 trolley wire were installed. The complete brackets were furnished by the Ohio Brass Company, and were of extra heavy construction.



INTERURBAN CAR ON WASHINGTON LINE

Two types of cars were furnished by the American Car Company, of St. Louis. These cars are about 46 ft. over all, one type being a passenger coach, the other a combination. Three cars will furnish all passenger and express service, including provision for theatrical scenery, of which there will be several cars per week to be carried. The cars are of heavy construction, approaching steam railway coaches in design and appearance. They have rattan cross-seats, electric heaters, are well lighted and look clean and comfortable. They are mounted on two Brill 27-E-1 trucks. A 6-ft wheel base could be used since there are no short curves. The truck centers vary from 22 ft to 25 ft. The trucks are equipped with standard Westinghouse air brakes and Westinghouse motor-driven air compressors.

Master Car Builders' wheel and other standards were adopted as far as possible. Each truck is equipped with two Westinghouse No. 68 40-hp motors—the grades being light. Cradle suspension was adopted. The complete car equipment weighs 23 tons.

No additional power house equipment was required. Power will ordinarily be furnished by a 300-kw rotary converter. Tracks between the local system and the steam road have been built, so that the electric cars use the street railway tracks in Everett. Hourly service has been installed. It is estimated that the passenger receipts will reach $2,200 per annum per mile, the fare being about 1½ cents net per mile in place of nearly 3 cents per mile by the steam road. The cars will be despatched by telegraph by the men who act as agents and operators for the steam road, and the branch will be operated by the rules of the Northern Pacific Railway Company.

The two interests are working in harmony, and there will be no wasteful competition. The schedule time will be fast. This would not be possible on a country road with its grades and curves and other speed limits. There will be but little paving to maintain on city streets. Very little anxiety is felt regarding future development or competition by other electric interurbans not on private right of way. The convenient waiting stations at the ends of the line, near the heart of each city, will cater to the comfort of passengers, which will be another strong point in favor of the present system.

The work of transforming this part of the system and equipping it electrically was done under the supervision of Edward P. Burch, consulting engineer, of Minneapolis.

THE COMMERCIAL ASPECT OF HIGH SPEEDS

The mechanical and electrical success of the high-speed experiments on the Berlin-Zossen line in Germany, are generally admitted in that country. Nevertheless, there has been a sentiment among German engineers who have followed the experiments closely that while speeds of 100 m. p. h. to 125 m. p. h. are practicable they will not be profitable. So little has been made public in regard to the results attained on the Zossen line that it is impossible to judge whether these criticisms are well founded or not. Still it is of interest to learn the basis upon which they are made.

The following, which is an extract from a recent issue of a Berlin daily, but which is said to represent the opinions of the sceptics referred to above, sums up some of the objections:

> The only positive result which the Berlin-Zossen tests have shown is the certainty that our present track construction and roadbeds are, to say the least, far from satisfactory for speeds above 150-km to 160-km per hour. There has never been any doubt that speeds up to and above 200-km could be attained; the question was whether such speeds could be used in practice. As shown by the rapid deterioration of the roadbed and track construction under high speeds, this point has been settled negatively, at least for the present.
>
> In questioning the propriety of this decision it might be claimed that a track of the requisite strength for high speed railways could be built. The reply to this is that it is useless to think of operating high-speed cars except upon an entirely new and distinct set of tracks, as high-speed service cannot be run in connection with any other. It is also doubtful whether it is even then feasible, with safety, without being accompanied with almost impossible conditions. For instance, such roads could not use a dirt sub-construction with wooden ties, and gravel ballast. They must be built massively throughout, therefore, of brick and cement, and of great width, for to insure safety against damage from windage the two tracks of a double-track road should be at least 10 meters (33 ft.) apart. A road of this construction and width between Berlin and Hamburg, for instance, would cost so much that its construction is out of the question for years to come. To make it even fairly profitable at least 60,000 passengers would have to be transported daily. It is evident that there is no such possible traffic between even the largest German cities. While, therefore, the recent high-speed tests have a theoretical and scientific value, the results do not encourage the hope of the early practical application of high-speed cars to commercial work.

There were two accidents on the Metropolitan Electric Underground, of Paris, on Monday morning, Nov. 30, somewhat similar to the catastrophe of Aug. 10, but there was no loss of life.

DAILY REPORTS, STORE ROOM ACCOUNTING AND OPERATING RECORDS OF THE CAMDEN & SUBURBAN RAILWAY

The theory of the system of daily reports followed by the Camden & Suburban Railway Company is based upon the submission to the general manager by the head of each department of a digest of the work done during the preceding day and the condition of the department. It will be impossible, of course, to reproduce all the blanks used in making these reports, but the most interesting are presented herewith.

DAILY SHOP REPORT

Camden & Suburban Railway Repair Shop.

Approved ____ M M Date ____ 190

CAR No	No. Order.	No. Job	DATE Started.	DATE Finished.	No. Labor Reports to Date.	COST OF LABOR Net, This Day	COST OF LABOR Prev. Reported	COST OF LABOR Total	Cost of Material	Total Cost	REMARKS
						$ Cts.	$ Cts.	$ Cts.	$ Cts.	$ Cts.	

FORM 123

SUMMARY OF

Daily Shop Report

Date ____ 190

	$	cts
Repairs Cars		
" Motors		
Construction Cars		
" Motors		
Sundry Accounts		
Bonus "		
Total Cost of Labor	$	

FORM 126

SHOP REPORT

The shop report is contained on Form 123, and indicates what cars (by numbers) are in the shop, date started, date when expected to be finished, number of labor repairs up to date, cost of labor and material up to date, etc. The headings, "Number of Order" and "Job," are filled out in the office. The company makes a distinction between the "order number," which is for work of some magnitude, and "job number," which is that covering a small repair only. This daily shop report is accompanied by a summary on Form 126, showing the total cost of labor for the repairs. In addition, early each morning the main office is called up on the telephone by the repair shop foreman, and notified of the cars detained in the shop for various reasons, and the time at which they will be released. This information is received by the stenographer, and is immediately typewritten out in the following form:

TYPICAL DAILY TYPEWRITTEN REPORT

Sept. 3, 1903.

Car No.	Trouble	Date finished
141	Wheels and armature	To-morrow
139	Wheels	To-morrow
132	Overhauling	To-morrow
121	Flat wheel	No stock
143	Seat casting	No stock
81	Field	To-morrow
140	Field and armature	To-morrow
129	Air brake	To-day
128	Air motor and overhauling	Sept. 20
127	Armature band	To-day
123	Broken flange and seat	Sept. 5
154	Wheels, journals and brake rigging	To-day
53	Dasher accident	To-day
155	Seat and curtain	To-day
92	Trolley base	To-day
102	Journal box	To-day

Sept. 20	1
Sept. 5	1
To-morrow	5
To-day	7
No stock	2
	16

108	Overhauling	Sept. 5
109	Overhauling	Sept. 5
110	Overhauling	Sept. 5

This statement is written out in duplicate. The original is immediately sent to the chief despatcher who requires the information in making up his time-table. He afterwards transfers the information to a special sheet containing thirty-two vertical columns. In the first column is the number of each car, while the other columns are for each day in the month. A code letter is used to indicate whether each car is in condition for service, and if not, the reason why it is not available. At the bottom of each column the despatcher totalizes daily the number of cars in the car house and those available for service. At the end of each month the total number of cars in the repair shop for each class of repairs, and the average per day is made up. From this a communication is sent monthly by the main office to the master mechanic, with a statement of how much the actual condition of affairs differs from the condition which the repair shop ought to maintain. The standard on the road is that the number of cars in the repair house shall not exceed an average of 1.11 cars per 1000 miles run during the month. The agreement with the master mechanic also provides that the cost of repairs and the maintenance of the cars in the shop will not exceed 1.4 cents per car mile, including all labor and material.

The carbon duplicate of the statement reproduced above is for the personal use of the general manager, and is laid on his desk as soon as it has been written out. He usually puts it in his pocket and finds it of convenience when he calls at the repair shop on his tour of inspection.

The Camden and Suburban Railway Co.

Date ____ DAILY TIME REPORT—TRACK DEPARTMENT ____ Foreman

No.	NAME	HOURS Total Hours	HOURS Rate	Job No.	DESCRIPTION AND LOCATION OF WORK

FORM 62

Operation No. ____

DAILY LINE LABOR REPORT

C. & S. RY. CO.

Started ____ GEN. LINE REPAIR

Finished ____ CONS. LINE

Date ____ FOR OFFICE OR DUPLICATE EX. LINE REPAIR

Sheet No. ____

Location:

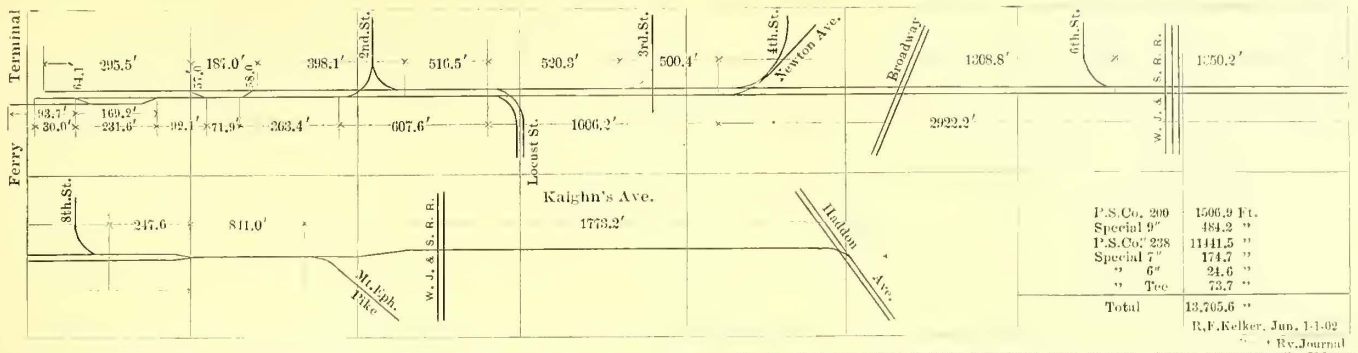
Nature of Work:

Workman's No	NAME	CLASS	HOURS	RATE	COST

FORM 121

DAILY REPORTS FROM OTHER DEPARTMENTS

Every morning the general manager also receives a report from the track foreman showing the number of men, carts and teams engaged on track work, also the date at which the track foreman expects any particular job on which he is engaged



SAMPLE SHEET FROM TRACK DEPARTMENT FILE, SHOWING METHOD OF RECORDING TYPES OF RAIL AND SPECIAL WORK

to be finished. These are filed and the manager is thus apprised of any unexpected delay in the construction of the work. The same plan is followed in the line department.

CAMDEN AND SUBURBAN RAILWAY COMPANY

DAILY REPORT OF LABOR ON TRACK

Job No. 103A

Sheet No. 127

LOCATION HADDON HEIGHTS EXTENSION

ACC. CONST. TRACK

Date SEPT 16 1903

	TRACK LAYING				CONSTRUCTION				GRADING				BONDING			
	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost
Total this date																
Previously reported				1170 45				1356 33				141 76				277 02
Total to date																
Unit Cost																

	PAVING				HAULING A				HANDLING MATERIAL				BRIDGES AND CULVERTS			
	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost
					2	3½	17	60								
					1	1	183	19								
					5	2½	15	38								
Total this date								1 17								
Previously reported				65 38				360 22				141 59				190 43
Total to date								361 39								
Unit Cost																

	DITCHING				DRAIN 2nd & HAULING B WOODLYNNE AV.				WATCHMAN				CLEANING STREET			
	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost	Men	Hours	Rate	Cost
Total this date																
Previously reported				851 86				71 42				31 94				30
Total to date																
Unit Cost																

Timekeeper

Engineer

FORM 103

The daily time report of the track department is shown in Form 62. In addition, daily reports are kept in the main office of the material used and the labor on each important piece of track work upon which the company may be engaged. These forms are shown respectively in 89 and 103, and do not call for any special comment except that, as will be seen, the total cost up to date is recorded daily, both for materials used and of labor on track. A complete graphical record is kept, as on many systems, of all track and special work. This record is kept on a series of tracings, and new ones are added or corrections made as the work is changed. A small reproduction of one of the tracings is given on this page.

The line department makes its two daily reports on Form 121 and Form 122. These correspond to the two forms used in the track department, except that the headings are different. The line superintendent does not keep his time book, but the time book is made up in the office from Form 121. Both line and track departments use Form 54 for notices to the treasurer to pay for men who have been discharged. The power station department submits a copy of its daily log, reproduced on page 1054. The form of this requires no explanation, except to say that separate voltage and ampere readings, during the summer, are taken of the lighting circuit to Wood-Lynne Park, and these appear in the voltmeter and ammeter column, and also the time the booster was in service in the booster column. Once a month the output in kilowatt-hours and consumption in tons of coal are tabulated. The following is a copy of this record for the last fiscal year:

POWER-STATION RECORD

	Kilowatt-hours	Tons of coal per month
April, 1902	313,030	701.34
May, 1902	361,170	767.75
June, 1902	332,545	779.34
July, 1902	355,061	850.70
August, 1902 .	315,035	839.42
September, 1902	301,755	803.03
October	415,405	867.42
November, 1902	410,810	952.14
December, 1902	424,805	1,080.00
January, 1903	413,757	1,096.00
February, 1903	467,895	803.07
March, 1903 ...	421,955	838.59
Total	4,533,223	10,378.80

Average, 5.15 lbs. of coal per kilowatt-hour.

DAILY TRAFFIC RECORDS

Every morning a record showing the receipts of each line for the day and for the corresponding day of the previous year,

TRACK

Started JULY 1ST 03

Finished

CAMDEN AND SUBURBAN RAILWAY COMPANY

REPORT OF MATERIAL USED on HADDON HEIGHTS EXTENSION

Charged to CONST. TRACK

Sec B.

Operation No. 103

Sheet No. 20

SEPT 8 1903

	Motor Grease	Black Paint	Forms #93	Ties 6"x8"-7' Union Rwy Supply Co	T. Rail Sec 237 A.S.C.E. To Be Used
Total to date	40 lbs	½ Gal	150	11286	22993.5
Previously reported			100	10086	
Net this date			50	1200	

	Churchill Joints	Spikes 9/16" x 5½"	Y. Pine Lumber 2"x12"-16'	20d Nails	4/0 Sd. Copper Wire (Bare)
Total to date	1020	145 Kegs	175 Pcs	165 Lbs.	245 Lb
Previously reported		140			
Net this date		5			

	Copper Bond #3 Plates (C&S.)	Iron Bond #3 Plates (C&S)	Machine Bolts 1"x3½"	Lock Washers 1"	Plastic Alloy
Total to date	910	910	910	910	11 Lbs
Previously reported					
Net this date					

	Plastic Solder	Emery Wheels	Ajax Bonds Complete	Ties 6"x8"x7' (Old Stock)	Special Work
Total to date	29 Lbs	9	1300	500	3 Complete Crossovers
Previously reported	26 "	8			4 " Curves
Net this date	3 "	1			300 ft Reversible Guard Rail
					2 Complete Crossovers

REMARKS

FORM 89

Form No. 150

Receipts of The Camden & Suburban Railway Co., for ____________

Weather, A. M. ________ P. M. ________
Thermometer, A. M. ________ P. M. ________

ROUTE.	Cars.	Trips.	Hours.	Miles.	PASSENGERS.							RECEIPTS.				
					Trans.	Free.	Iden.	Com.	T'ks.	Cash.	Total.	Cash.	Total.	Per Hour.	Per Mile.	Per Pass.

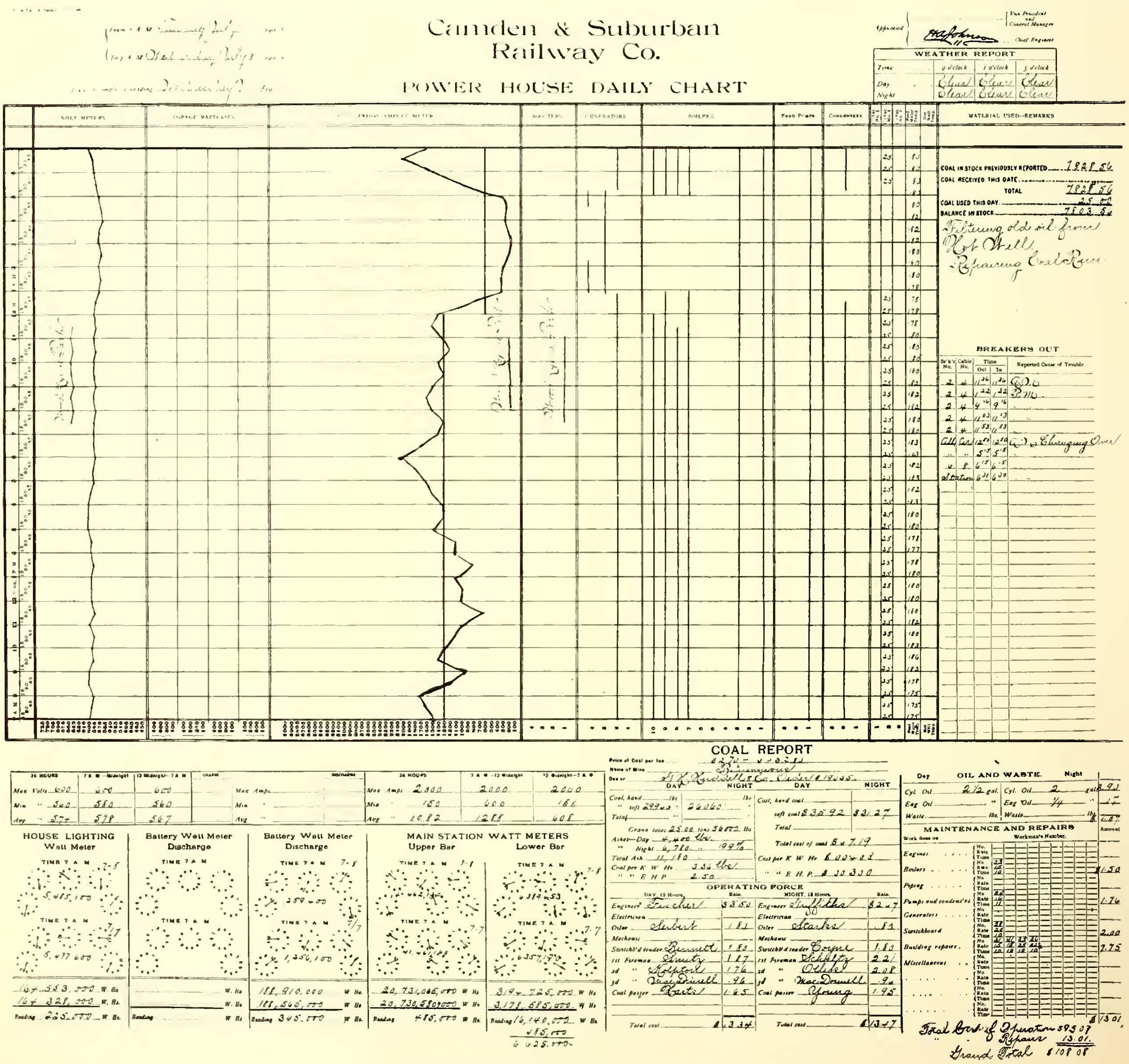
FORM 150, SHOWING DAILY REPORT

is laid on the desk of the general manager. This is followed a few days later by a summary on Form 150. From this latter form a graphical record of the daily receipts per car mile and per mile of track is made up. For some three or four years back the company has followed the practice of plotting these statistics out graphically by days and also the daily receipts per car mile and per car hour. A reproduction of a record extending from April 1, 1900, to March 31, 1901, inclusive, is shown on page 1056. This chart has been found very valuable for quickly determining whether the car service is adequate or not and making other calculations. It shows the following for each day during the year—car receipts, car miles run, car hours, receipts per car mile and receipts per car hour.

THE VALUE OF CAR-HOUR RECORDS

It might be stated in this connection that for the last five years the company has used the car-hour unit in connection with the car mile, and all statistics are worked out on both bases. The former is useful, as it is the only basis on which the labor factor can be calculated, while the latter is the only practical unit for figuring wear of parts and depreciation.

An illustration of the value of using both bases can, perhaps, best be illustrated by a comparison between one of the city and one of the suburban lines. The city line (the Kaighn's Avenue line) has receipts of 21.46 cents per car mile and $1.24 per car hour, while the suburban line has receipts of 14.69 cents per car mile and $1.90 per car hour; in other words,



FORM 115, SHOWING DAILY LOG OF POWER STATION

the suburban line has receipts 46 per cent less per car mile and 53 per cent more per car hour than the city line. If the car mile basis alone was taken the suburban line would, perhaps, be considered unprofitable compared with the usual standard as to receipts per car mile, whereas the car-hour basis shows that the line is quite a profitable one

Another valuable use of the car-hour basis, as found in analyzing expenses in Camden, is that, being a guide to the labor cost, it calls attention to the lay-over expenses. A short or a long lay-over does not affect the wear and tear of the car or power cost, both of which in Camden are worked out on a car-mile basis, but does enter directly into the labor cost which, on lines operating at different speeds, can best be figured

Form No. 54.

The Camden and Suburban Railway Co.

Camden, N. J., ____________

Pay ____________ *No.* ______

______ *dollars and* ______ *cents, for*

______ *hours work, at* ______ *cents per hour.*

$ ______

______________ *Foreman.*

FORM 54

Form 122—6-14-'03—1000-C 15,978

LINE ______________

Started ______ CAMDEN AND SUBURBAN RAILWAY COMPANY *Operation No.*

Finished ______ REPORT OF MATERIAL USED on ______________ *Sheet No.* ______

Charged to ______________ ______ 190

	ST. LINE CLIPS	PULL-OFF CLIPS	EYE BOLTS 12" x ⅝"	EYE BOLTS 18" x ⅝"	BELL HANGERS
Total to date					
Previously reported					
Net this date					

	BRASS FEED IN BELLS	GLOBE STRAINS CLEVIS	GLOBE STRAINS, PLAIN	RIGHT H. SWITCHES No. 977	LEFT H. SWITCHES No. 976
Total to date					
Previously reported					
Net this date					

	LOCUST PINS 1½"	IRON PINS 1½"	SOLDER, AJAX	SOLDERING SALTS	TAPE
Total to date					
Previously reported					
Net this date					

	ANCHOR CLIPS, No. 106	ANCHOR CLIPS 15", No. 645	SINGLE PULL-OFFS	DOUBLE PULL-OFFS	GIANT STRAINS, No. 825
Total to date					
Previously reported					
Net this date					

	FEEDER WIRE 4-0"	SPAN WIRE 5-16"	SPAN WIRE ¼"	FEEDER SPAN WIRE, INSUL.	GIANT STRAINS, No 834
Total to date					
Previously reported					
Net this date					

REMARKS:

Line Foreman.

FORM 122

on the car-hour basis. In other words, the company believes that in its comparisons and records of operating expenses, it is impossible to use either unit exclusively, but that both have to be employed in connection with each other.

Another instance of the value of the use of the car hour is shown in estimating the value of suburban extensions. This can best, perhaps, be shown by an example. The Moorestown line formerly terminated at Merchantville, and when the line was extended to Moorestown, a distance of 5 miles, it became a question as to whether this extension paid. The population

Form No. 86. Order No. 17827-2m-12-15-'03

CAMDEN & SUBURBAN RAILWAY COMPANY.

DAILY MILEAGE MEMORANDUM.

Date ______________ ______________ MASTER MACHINIST.

CAR NO.	MOTOR NO.	TRUCK NO.	PART	MAKE	REMARKS

FORM 86

of Moorestown, or rather of the section on which the additional fare of 5 cents is charged, is 5000. The extension of the service these 5 miles required an addition of 1360 car hours a month to the service. Upon starting the service, an inspection was made to determine what proportion of the increased travel was carried into the original section. These reports indicated that 80 per cent of the traffic to and from Moorestown was through traffic, or that the 5000 population was carried an average of 120 times per capita per year, making the receipts per month about $5,000. This sum, divided by the additional car hours per month required for the service, or 1360, gives the receipts for the extension, $3.60 per car hour.

It might be said in passing that the per capita rides given above have also been found to be about the average on the Haddonfield and Haddon Heights and other interurban extensions of the company.

MILEAGE RECORDS

The mileage records of all cars and parts are very carefully kept by means of three forms, 86, 116 and 64. The basis used is the truck number, rather than the car number, as the same truck is frequently used under several car bodies. The first blank used is No. 86, which is made out daily, in duplicate, by the master mechanic, who keeps the carbon and turns over the original to the storekeeper. From this form the mileage record of the different parts are made up and kept on Form 64, each truck having its own sheet. From Form 64 a record can be

Form No. 116. Order No. 17827-2m-12-15-'03 No. ______

CAMDEN & SUBURBAN RAILWAY COMPANY.

Daily Memorandum, Shipment of Wheels.

Date ______________ 190

ORDER NO.	MARK	DATE REMOVED	NO. CAR	NO. MOTOR	NO. TRUCK	END	MAKE	SIZE AXLE	SIZE WHEEL	DATE PLACED	MILEAGE

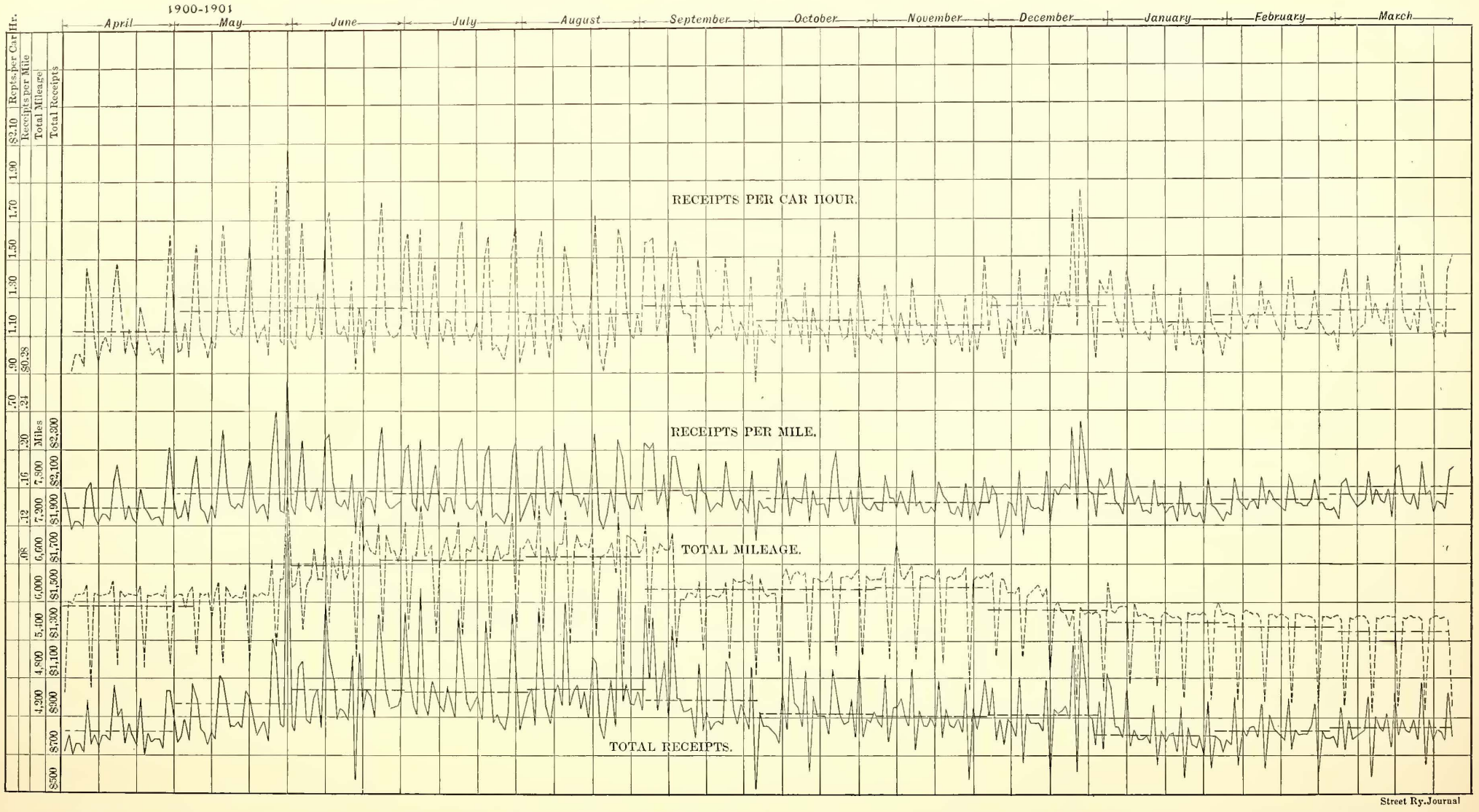
FORM 116

and is made up from time to time of the life of different parts. The following figures are reproduced from this record:

LIFE OF DIFFERENT CAR-EQUIPMENT PARTS

Part	Type of Motors (all Westinghouse).	Type of Car	Average Mileage	Remarks
Carbon brushes	Four-49	St. Louis 28 in. body Stephenson 26½' body	14,909	Double truck cars
"	Two-38b	St. Louis 28' body	10,896	" "
"	Two-49	Brill 21' body	13,117	Single "
"	Two No. 3	" 18' "	11,846	" "
Arm. bearings	Four-49	Stephenson	8,480	Double "
"	Two-38b	St. Louis	7,312	" "
"	Two-49	Brill	9,532	Single "
"	Two No.3	"	10,297	" "
Brake-shoes	--------	St. Louis & Stephenson	17,726	Double "
"	--------	Brill	11,648	Single "
Car wheel	--------	St. Louis & Stephenson	23,668	Double "
"	--------	Brill	19,963	Single "
Gears	--------	Stephenson	96,238	Double "
Gears	--------	St. Louis	84,912	Single "
Pinions	--------	Brill	20,983	Double "
"	--------	"	24,636	Single "

Form 116 is used as a daily memorandum for the shipment of wheels.



REPRODUCTION OF DIAGRAM TABULATING THE DAILY RECORD OF CAR-MILES, TOTAL RECEIPTS, RECEIPTS PER CAR-MILE AND RECEIPTS PER CAR-HOUR, FROM APRIL 1, 1900, TO MARCH 31, 1901

C. & S. RAILWAY CO. MILEAGE RECORD.

EQUIPMENT.

TRUCK No.....
BODY:—Make.....
CAR No. { Box..... Open.....
TRUCK { Make..... No. on Car.....
MOTOR { M. No..... No. on Car.....
CONTROLLER:—Make.....
BEGINNING.....
ENDING.....

DATE	BRUSHES										ARMATURE BEARINGS				BRAKE SHOES				MOTOR AXLE BEARINGS								WHEELS				GEARS				PINIONS				REMARKS
	Motor No. 1				Motor No. 2				Motor No. 3				Motor No. 4																										
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Motor No. 1	Motor No. 2	Motor No. 3	Motor No. 4	Truck No. 1		Truck No. 2		Motor No. 1		Motor No. 2		Motor No. 3		Motor No. 4		Motor No. 1	Motor No. 2	Motor No. 3	Motor No. 4	
																	Motor No. 1	Motor No. 2	Motor No. 3	Motor No. 4	Pair Outside	Pair Inside	Pair Inside	Pair Outside	Gear Side	Com. Side	Gear Side	Com. Side	Gear Side	Com. Side	Gear Side	Com. Side	Motor No. 1	Motor No. 2	Motor No. 3	Motor No. 4	
																	Pair Outside	Pair Inside	Pair Outside	Pair Inside	Motor No. 1		Motor No. 2		Motor No. 3		Motor No. 4										
																	Truck No. 1		Truck No. 2																		

FORM 64, FOR KEEPING MILEAGE RECORDS UNDER TRUCK NUMBER

MOTORMEN'S CAR REPORT

Each motorman when he leaves his car is obliged to turn in a card, No. 56, giving the condition of the car when turned in. This is used by the master mechanic in looking up trouble. After the trouble has been investigated and the necessary repairs are made, this card is filed by the master mechanic.

SHOP ORDERS

A record is kept of the minor repairs on orders No. 25 and No. 27. No. 27 is kept by the timekeeper at the repair shop as a time-sheet, and indicates the time expended in doing the work. Each sheet is numbered consecutively, and the word "job" or "order" is scratched out, as the conditions may require. If more than one man is working on the same operation a separate sheet is used for each man. The cost of the labor at different rates per hour is indicated by checking off the proper total in the table on the report. Form No. 25 is used for orders only, and is made out after the order has been finished. It is made up from different forms, 27 and 92. A separate form is used for repairing registers.

RECORDING THE CARS IN SHOP

The master mechanic keeps a graphical record of the condition of all cars by the arrangement shown in the sketch on page 1058. This consists of a long box of just the right size for holding wooden blocks about 3 ins. square. The blocks are used to represent every car on the system. They are made of hard wood with a bottom slotted to hold a white card for memoranda. On the edge of the block is pasted the number of the car, so that by the position of these blocks in the box the master mechanic can tell what cars are in the repair shop. After a car leaves the repair shop the position of its block in the box is changed and a note is put on the card as to the date at which the repairs were completed and the amount of work done. As all overhauling is done by contract, and as each essential kind of overhauling is given a distinctive letter, this letter only is put on the card.

TRANSFERS

The transfers are printed by the Globe Ticket Company, and require only three punches, the month, the hour and the route.

Form 56—15M—4-21-'03-18775

Motorman's Car Report.

Car No.....Date.....Car House.....
Line.....Time.....
Condition of Car when turned in.....
.....
.....
.....
Blowed Fuse.....
.....
Motorman

FORM 56

The day of the month is printed in red on the face of each ticket, and the month can be punched any time before the tickets are required, so that really two punches only are needed. The transfers are given out by the car-house despatcher, who keeps a record of all thus given out, used, destroyed, etc., on blank No. 68, which is sent daily to the office by the despatcher. The despatcher also sends out at the same time a statement on another form, showing the number of each car and the reading of its register.

STOREROOM ACCOUNTS

The storeroom of the Camden & Suburban Railway Company, as indicated in the first article on the system, is directly next to the car house, and the practice followed has a number of novel features. When a requisition has been approved by the general manager for an article which can be supplied by several manufacturies, a printed form of letter is used, which is addressed to the manufacturer asking him to quote "lowest prices for the articles specified below," giving list price, discount, net, place f. o. b. A space is provided at the bottom in which he agrees to guarantee to furnish the articles mentioned for the price specified opposite each item within a certain number of days (left blank) on receipt of the order. This form for the convenience of the manufacturer is printed with

Form No. 25-4-5-'02—M. 15000

C. & S. RWY. CO.

SHOP ORDER

Order No.....Date Started.....
Dept.....Date Finished.....
Workman's No.....
Class { Repairs..... Construction..... No. of Repairs { Labor..... Material.....
Part.....
Operations.....
.....
Remarks.....
.....
.....
.....
Foreman.....
Contract Price.....Total Cost of Labor.....
Paid on Account.....Total Cost Material.....
Bonus.....Total.....
ENTER ON EACH SHEET ITEMS CHARGEABLE TO ONE OPERATION ONLY.

FORM 25

an ink which will copy, and the words, "this is not an order," are distinctly printed upon it. This form is filled out from the requisition by the stenographer in the office of the purchasing agent, and is sent to the manufacturers whose names are

Form No. 27—5m, 18998 5-8 '03 C. & S. RWY. CO.

Shop Report

Order / Job... No..... Date.....

Dept..... From..... A. M. P. M. To..... A. M. P. M.

Workman's No..... Job Finished.....

Part.....

Operation.....

.....Foreman.....

X	Reg. Rate	¼	½	¾	1	2	3	4	5	6	7	8	9	10	11	12
	.08⅓	.02	.03	.04	.06	.08	.17	.25	.33	.42	.50	.58	.67	.75	.83	.92	1.00
	10	.02	.06	.05	.08	.10	.20	.30	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20
	12½	.03	.04	.06	.09	.13	.25	.38	.50	.63	.75	.88	1.00	1.13	1.25	1.38	1.50
	15	.04	.05	.08	.11	.15	.30	.45	.60	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80
	16	.04	.05	.08	.12	.16	.32	.48	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92
	.16⅔	.04	.06	.08	.13	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00
	17½	.05	.06	.09	.13	.18	.35	.53	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10
	.20	.05	.07	.10	.15	.20	.40	.60	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40
	.22½	.06	.08	.11	.17	.23	.45	.68	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.48	2.70
	.25	.06	.08	.13	.19	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
	.27½	.07	.09	.14	.21	.28	.55	.82	1.10	1.37	1.65	1.92	2.20	2.48	2.75	3.02	3.30
	.30	.08	.10	.15	.23	.30	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60

SUMMARY

Contract Price.....

Pd. on Account.....

Bonus.....

Proportional.....

Paid..... 190

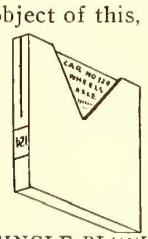
ENTER ON EACH SHEET ITEMS CHARGEABLE TO ONE OPERATION ONLY

FORM 27

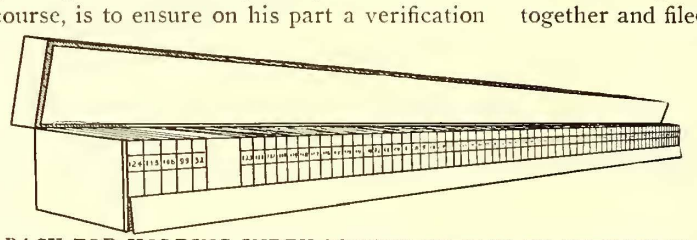
written on the back of the requisition by the purchasing agent. The blank is finally signed with a stamped signature by the general manager before being mailed.

ORDER BLANKS

The form of order book used has been the subject of considerable thought on the part of the management. It has adopted the form illustrated herewith. All orders are made out in triplicate and the upper sheet is that which is sent to the manufacturer. The second sheet is sent to the storekeeper, while the third form (not reproduced but similar in every respect to the original) is kept as an office copy. A special feature of this form of order is that the perforations in the copy sent to the storekeeper are so arranged that the quantity of goods does not appear on it. The result is that the storekeeper is apprised only that goods of a certain description are to be expected, but is kept in ignorance of the quantity ordered. The object of this, of course, is to ensure on his part a verification



SINGLE BLOCK WITH INDEX CARD



RACK FOR HOLDING INDEX BLOCKS OF CARS IN OPERATION AND IN REPAIR SHOP

of the quantity of goods received, as he is obliged to notify the office fully upon the receipt of the goods.

Adjustable binders are used in the main office for holding

Form 68—1—21—03—3m Order 18,77

CAMDEN AND SUBURBAN RAILWAY CO.

NEWTON AVE. CAR BARN. **Transfer Ticket Statement** Date.....

Blk.	Given	Returned	Used	Short	Over	Destroyed to	Blk.	Given	Returned	Used	Short	Over	Destroyed

FORM 68

the office copies of these orders. The stubs are not kept, as there are other means of checking the bills. The office binders used for the order blanks are of the patent kind, which allow the orders to be inserted in their numerical order. Two binders are used, one for filled and one for unfilled orders, the order being transferred from the unfilled to the filled order binder upon notification from the storeroom that the goods have been received.

For.....

Acct.....

Date of Bill.....

Amount.....

Put Order No. on both Bill and Material. Order No. 25690

Req. No.....

ORIGINAL

The Camden & Suburban Railway Co.,

CAMDEN, N. J., ... 190

M.....

Please enter our order for the following:

Quantity	DESCRIPTION	Price

Receipt No.

Previous Order

Remarks

Order No. ..... is a continuation of this order

F. O. B. ..... CAMDEN & SUBURBAN RWY. CO.

Per.....

FIRST, OR ORIGINAL, ORDER SHEET (SENT TO MANUFACTURER)

For.....

Acct.....

Date of Bill.....

Amount.....

Order No. 25690

Req. No.....

STORE KEEPER

The Camden & Suburban Railway Co.,

CAMDEN, N. J., ... 190

M.....

From the above firm we have to-day ordered the following:-

Quantity	DESCRIPTION	Price

Receipt No.

Previous Order

Remarks

Order No. ..... is a continuation of this order

F. O. B. ..... CAMDEN & SUBURBAN RWY. CO.

Per.....

CARBON OF ORDER (SENT TO STOREKEEPER)

All correspondence relating to any particular order is kept together and filed numerically.

PURCHASING AGENT'S FILES

The purchasing agent has four files. The first relates to all orders and consists of the two binders referred to above. The second relates to quotations on miscellaneous goods for which no orders have been placed, but which he thinks may be used in the future. This is arranged alphabetically according to material. There is a special portion of this file in which the purchasing agent keeps quotations for appliances which he believes will be needed before long.

The third file is called the "held-up requisition file," and contains those requisitions which have not been approved for one reason or another.

The fourth file consists of the requisitions which have been approved, and these are filed according to the different departments in the company.

BILLS

All bills received at the office are first laid before the general manager for general inspection, to enable him to know what is going on in the purchasing department and also to permit him to add any memoranda to the bills which he considers necessary or desirable. The bills are then sent to the purchasing clerk, who checks up the price and amount of goods re-

ceived and enters the amounts into a stock ledger. The bills are then sent to the bookkeeping department to be checked off against the orders and then to the treasurer's office for the preparation of the vouchers. In this connection it might be mentioned that the general manager signs all letters sent out from the office and reads all incoming mail.

STOREKEEPER'S REPORTS

Once a week the storekeeper sends to the office Form 138, showing the purchases for which requisitions have been placed but no orders given, also those for which orders have been placed but the material has not been received, also a third division giving orders to be rushed, as the material is urgently needed. The object of this blank need not be pointed out.

Two forms of requisition are used, one employed by the shop foreman, the other by all of the other departments. The latter is a simple statement of the material required with the name of the department and the account to which it is to be charged. The shop requisition is shown in blank 92.

A statement of all material issued from the storeroom is sent to the office daily. The storeroom also has a credit memorandum sheet No. 92, salmon in color, showing the amount of material returned to the storeroom by any department unused and in good condition. A regular ledger is kept in the office from these storeroom records. The pages are numbered consecutively. Each page is devoted to a separate item of material and has the same page number as the stock ledger. In this ledger is recorded the amount of material received and issued and the balance then in the storeroom at certain dates, the additional material ordered, the order number, price and manufacturer from whom it was purchased. The material is debited to the storeroom on its receipt, and as it is received and reported from the storekeeper

Form No. 138 10-6-'02. 37371. 500

WEEKLY REPORT OF REQUISITIONS.

STOCK ROOM

Camden and Suburban Railway Company

REQUISITIONS PLACED, ORDER NOT PLACED

Requisition No.	Date Placed	Description	Office Check

ORDERS PLACED, MATERIAL NOT RECEIVED

Order No.	Date Placed	Description	Firm Ordered From	Office Check

ORDERS TO BE RUSHED, MATERIAL URGENTLY NEEDED

Order No.	Date Placed	Description	Firm Ordered From	Rush on Account of	Office Check

FORM 138

saves all repetition of the different items as they are entered under the proper page number.

When material has been charged out for the stock room, has been used and partly worn (as, for instance, a pinion), and has then been returned to the stock room, it is kept in a small auxiliary stock room used for worn material, and popularly called "purgatory." Material of this kind, partly worn, is never credited back for its value, but the storekeeper has a side memorandum of material of this kind.

Form 92. 4-21-'02. 1 M

Credit Memorandum Stores Department

No..... Date.....190

Camden and Suburban Railway Company

Material returned by Department.

Credit Account, *Armature Number,*

Order Number, *Car* "

Job " *Workman* "

Article No.	DESCRIPTION	Quantity		Cost	Extension
			TOTAL.		

Storekeeper, *Returned by*

FORM 92, CREDIT MEMORANDA

Form 92. 5-2-'03. 1500

Stores Department

No. *Date* 190

Camden and Suburban Railway Company.

Material issued to Department,

Charge Account, *Armature Number,*

Order Number, *Car* "

Job " *Workman* "

Article No.	DESCRIPTION.	Quantity		Cost.	Extension.
			TOTAL,		

Storekeeper, *Received by*

FORM 92, REQUISITION

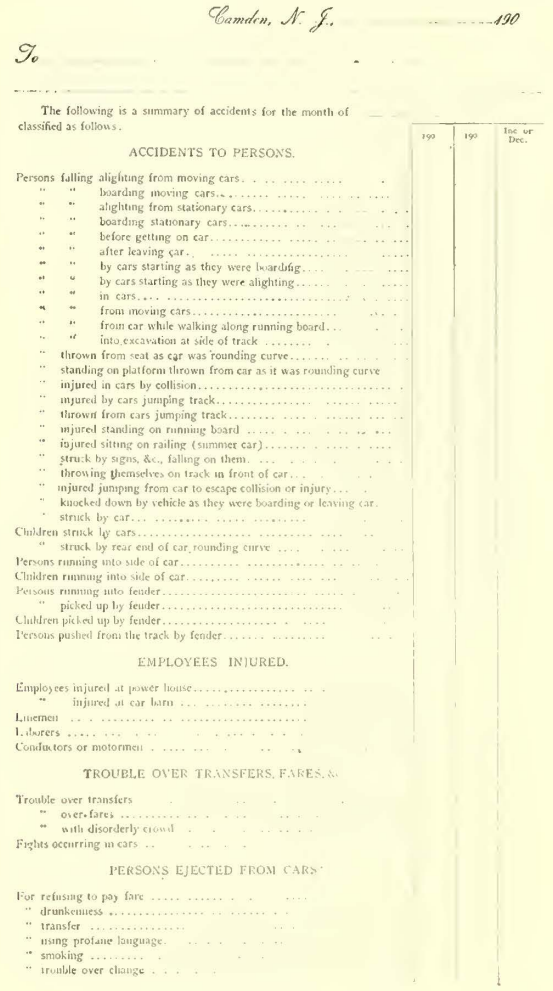
it is credited in the ledger. An index is used in connection with the ledger, giving the page number for every item of material ordered by the company. Small material frequently issued in small quantities, such as bolts, brushes, etc., are not

The stock room is debited with all bills, whether approved or not, and credited with all stock sheets. If before the bills are approved any shortage or overcharge is discovered or any discount allowed, this amount is recorded in a book for this

purpose, and the stock room debited or credited accordingly. The object of this, of course, is that a bill may be held up for sometime, during which it would be inconvenient to otherwise keep track of the material which is being used, and also occasionally bills are not received until all of the goods have been used.

The stock ledger clerk acts as an intermediary between the stock room clerk and the accountants.

The stock room itself is a two-story brick structure fitted with a Morse & Williams elevator, used for carrying heavy stuff to the upper floor. Before the purchasing agent orders any new material upon requisition from the storekeeper he has the stock clerk look up the amount of material on hand in the material ledger in the office to see whether this material is needed.

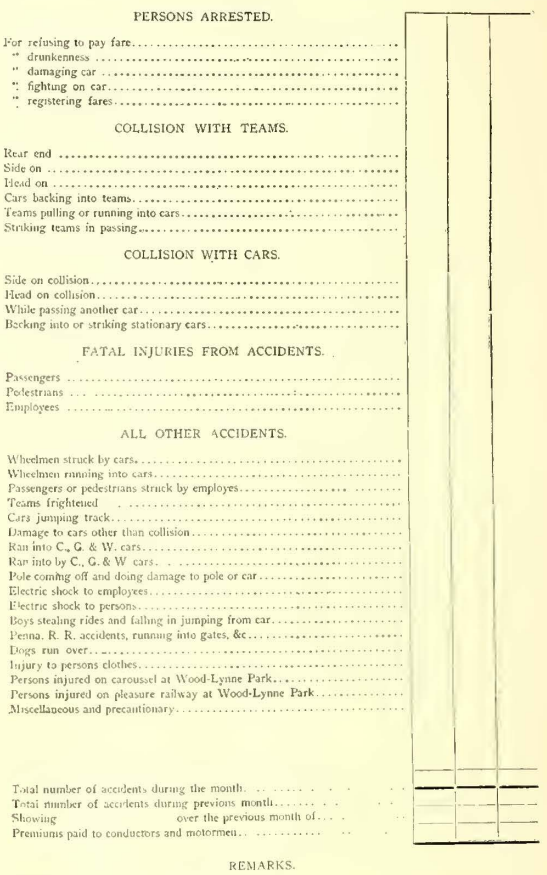


Camden, N. J. 190

To .....

The following is a summary of accidents for the month of ..... classified as follows.

	190	190	Inc. or Dec.
ACCIDENTS TO PERSONS.			
Persons falling alighting from moving cars			
" " boarding moving cars			
" " alighting from stationary cars			
" " boarding stationary cars			
" " before getting on car			
" " after leaving car			
" " by cars starting as they were boarding			
" " by cars starting as they were alighting			
" " in cars			
" " from moving cars			
" " from car while walking along running board			
" " into excavation at side of track			
" thrown from seat as car was rounding curve			
" standing on platform thrown from car as it was rounding curve			
" injured in cars by collision			
" injured by cars jumping track			
" thrown from cars jumping track			
" injured standing on running board			
" injured sitting on railing (summer car)			
" struck by signs, &c., falling on them			
" throwing themselves on track in front of car			
" injured jumping from car to escape collision or injury			
" knocked down by vehicle as they were boarding or leaving car			
" struck by car			
Children struck by cars			
" struck by rear end of car rounding curve			
Persons running into side of car			
Children running into side of car			
Persons running into fender			
" picked up by fender			
Children picked up by fender			
Persons pushed from the track by fender			
EMPLOYEES INJURED.			
Employees injured at power house			
" injured at car barn			
Linemen			
Laborers			
Conductors or motormen			
TROUBLE OVER TRANSFERS, FARES, &c.			
Trouble over transfers			
" over fares			
" with disorderly crowd			
Fights occurring in cars			
PERSONS EJECTED FROM CARS.			
For refusing to pay fare			
" drunkenness			
" transfer			
" using profane language			
" smoking			
" trouble over change			



PERSONS ARRESTED.	
For refusing to pay fare	
" drunkenness	
" damaging car	
" fighting on car	
" registering fares	
COLLISION WITH TEAMS.	
Rear end	
Side on	
Head on	
Cars backing into teams	
Teams pulling or running into cars	
Striking teams in passing	
COLLISION WITH CARS.	
Side on collision	
Head on collision	
While passing another car	
Backing into or striking stationary cars	
FATAL INJURIES FROM ACCIDENTS.	
Passengers	
Pedestrians	
Employees	
ALL OTHER ACCIDENTS.	
Wheelmen struck by cars	
Wheelmen running into cars	
Passengers or pedestrians struck by employes	
Teams frightened	
Cars jumping track	
Damage to cars other than collision	
Ran into C., G. & W. cars	
Ran into by C., G. & W. cars	
Pole coming off and doing damage to pole or car	
Electric shock to employees	
Electric shock to persons	
Boys stealing rides and falling in jumping from car	
Penna. R. R. accidents, running into gates, &c	
Dogs run over	
Injury to persons clothes	
Persons injured on carousel at Wood-Lynne Park	
Persons injured on pleasure railway at Wood-Lynne Park	
Miscellaneous and precautionary	
Total number of accidents during the month	
Total number of accidents during previous month	
Showing over the previous month of	
Premiums paid to conductors and motormen	

REMARKS.

MONTHLY FORM FOR TABULATING CLASSES OF ACCIDENTS

FRANCHISE AND ORDINANCE RECORD

The company keeps a large manila scrap book in which are pasted copies of all the ordinances and agreements with the different municipalities through which the road extends. These are all indexed so that it is very easy to look up any of the ordinances or set of ordinances.

NEW WORK

No important new work is undertaken until the cost is very carefully estimated. Where the head of a department wishes to carry out any piece of work, the total cost of which will exceed about $50, he submits an estimate of the cost in triplicate attached to the plans. If the proposal is approved, one of these blank forms remains with the department making the requisition, another is placed on file in the main office, while the third is the order or authority for doing the work. This form is used for all material not carried in stock, for the purchase of extraordinary apparatus, new machinery, etc., and reads:

Estimated cost

Material to be purchased.....Labor.....
Material on hand .....Material.....
Total .....Total cost.....

Finished cost.

Labor .....Difference .....
Material ..... " .....
Total cost ..... " .....

Approved
(Dept. foreman)

Above work charge to Approved
(Dept. head) Chief.

Approved
V.-Pres. and Gen. Mgr.

Notes:—
.....
.....

The finished cost is filled out after the work is completed, and is of value in determining how closely the estimate was made by the head of the department.

ACCIDENT REPORTS

The space available in this issue will not permit a reproduction of the forms used in reporting and settling accident cases, except the monthly report showing the classification used. They will, however, be briefly described.

Two forms are used by the accident department in reporting accidents to the general manager; one a daily report, giving the names of the conductor and motorman, number of car, where the accident occurred, and a short statement in regard to it. This is placed on the desk of the manager each morning, covering all accidents on the previous day. In addition, the accident department submits monthly a classified report of all accidents with the corresponding number the previous year. This monthly report is reproduced.

In addition, the company has the usual form of report used by conductor and motorman for reporting accidents, form of

statement for witnesses and injured party, release, etc., also a special report submitted after every accident by the master mechanic to the main office, indicating the extent of the damage to the car.

ALTERNATING MOTORS FOR RAILWAY SERVICE

BY LOUIS BELL, PH.D.

It has long been evident that the more serious work of electric traction is impeded by sole reliance upon direct-current motors. No one appreciates more fully than the writer the sterling quality of the standard railway equipments now in use, but just so long as direct-current motors are confined to the very moderate voltage which now seems necessary for them, they are handicapped in the larger struggle of electric railroading. For interurban and long-distance work a distribution of power limited to a few hundred volts upon the working conductors is an economic abomination. Its only decent excuse for existence has been the supposed necessity of clinging to direct-current motors on the cars.

The American interurban road has had a gradual evolution from ordinary tramways, and there has been no point at which most engineers have been willing to cut loose and to use means properly adapted to the end. In avoiding such a break in policy they have carried direct-current distribution far beyond its legitimate field, and when this became finally out of the question, have fallen back on a polyphase distribution with counter sub-stations feeding the same old low-tension working conductors. This composite distribution is a make-shift, albeit very useful in that function, and ten years from now we shall all look back with amused regret at the millions that have been squandered on a system so uneconomical and complicated.

The writer has consistently fought this temporizing policy almost since its initiation, in the firm hope and belief, which now seems to be fully justified, that it would prove possible to carry an alternating distribution clear up to the car, whenever competent engineers should drop the converter fetish and take up the alternating-motor problem with the deliberate intent of solving it.

Within the past few years a considerable group of roads employing polyphase induction motors on the cars has appeared abroad, and the result, as a whole, has been highly satisfactory, although none of the roads in question has been operated under traffic conditions as severe as frequently have to be met in this country. Three objections stand against polyphase induction motors for traction purposes. They require at least two working conductors, which complicate the overhead system seriously; they have no reserve speed unless normally operated, with some loss of efficiency, and, hence, cannot easily make up time; and, finally, they impose, unless very carefully designed, a rather poor power factor upon the system. None of these are forbidding on long, independent lines, but they are formidable in dealing with the closely interlined urban, suburban and interurban traffic characteristic of American railway practice.

Until recently no single-phase motors worthy of consideration for general railway purposes had been developed, and no one seemed to take the trouble to look into the matter save as a source of arguments to promote the use of standard direct-current motors. There were, however, a few aggressive heretics who refused to bow down to the idol of standardization, and went earnestly to work on a scheme of solution of their own. Their labors have been to good purpose, and at the present moment very encouraging results have been announced, not from a single form of alternating motor, but from three.

Obviously, a single-phase motor has a great advantage over polyphase motors in the simplicity of the conducting system, which leaves little to be desired. If the motor also has a good power factor, and can run with good efficiency over a considerable range of speed, it becomes, provided it also starts well, at once available for general traction purposes. Ordinary single-phase induction motors start badly, and have a good power factor and efficiency only near synchronous speed, so that they must be classed as unavailable. The recent experimenters, therefore, took the radical step of building commutating single-phase motors, essentially similar to ordinary series-wound direct-current machines, but laminated to avoid loss from parasitic currents and with various precautions against sparking. That a series motor with laminated field would run pretty well on a low-frequency alternating circuit has long been known. Motors of this type were proposed in the early stages of the Niagara project, and were built experimentally by several investigators, notably the late Mr. Eickemeyer. These early experiments were discouraging, for the sparking appeared to be irremediable, and the power factors obtained were far from satisfactory.

But the art of design has advanced greatly in the last decade, the principles of commutation are better understood, and better materials are available. Consequently, the causes of the early failures do not operate with the same force at the present time, and there is a far better chance of success in obtaining a practical motor.

The first announcement of a commercial single-phase motor for traction came from Mr. Lamme some months since, but it is only within the past few days that the system has passed into active exploitation. The results reported from it are most encouraging. The motor designed to take alternating current at 25 cycles per second is said to run without material sparking, and with an efficiency only a few per cent below that of a first-class direct-current railway motor. From the published curves the performance of the new motor is quite comparable with that of standard railway motors. The alternating-current equipment is somewhat heavier than that for direct current, but it does the same work, and, apparently, does it well. An acceleration of 1 m. p. h. per second was attained, which is quite sufficient for ordinary purposes, and the energy required during acceleration was not at all disproportionate. The average power factor during a 2-mile run was approximately 87 per cent, and rose when the car was at full speed, or near it, to above 95 per cent. At starting, as might well be anticipated, the power factor was low; but even so, the apparent energy was within reasonable limits, and the real energy was moderate.

In the matter of energy required, the alternating-current motor has a material advantage in that its speed can be regulated with very small loss. This gain is most apparent when the cars compared are running at moderate speed with frequent stops and starts, and, therefore, goes far toward compensating for the somewhat lower efficiency at starting of the motor itself.

The Westinghouse Company advertises that it is prepared to stand back of the new equipment, and recommends it freely for heavy interurban work with a certainty of tone that places the apparatus unequivocally upon the commercial list.

Somewhat later in its preliminary announcement and little earlier in promulgating decisive results, comes the Eichberg-Winter alternating motor, manufactured by the Union Elektricitäts Gesellschaft, with which trials have been thoroughly made on the government railroad running through the suburbs of Berlin, 3 miles of track having been equipped for the purpose. This very interesting motor apparently belongs to somewhat the same class as the Lamme motor, that is, it has a commutator, and from the published data has very similar characteristics. It is not, however, an ordinary series motor, but is more akin to the Thomson repulsion type of alternating-current motor. In the road already equipped with this motor the trolley line was worked at 6000 volts, and the working voltage at the motor was reduced by a transformer on the car, an arrange-

ment that would be naturally adopted on long lines. In this instance the electrical equipment of the car is claimed to weigh even less than the equivalent direct-current equipment, and the efficiency seems to be quite as high as with the latter. As in the case of the Lamme motor, the car equipment includes two motors fitted for multiple-unit control with all the latest appliances. The data published as yet are far from complete as regards the details of the motor, but its operation seems to be regarded as highly satisfactory.

Very recently tests of the Finzi series-wound single-phase motor have come to hand. The reports in this instance give more of detail, and one gets a pretty clear idea of what the motor equipment is, and of its practical performance. It was tried in Milan on one of the suburban lines, with a similar car equipped with a General Electric 52-motor as a trial horse. The motor was worked at 18 cycles per second, and weighed a little more than the direct-current motor it replaced. The tests at Milan were made on a light street car, which adds to the interest of the comparison with the much heavier interurban cars and the powerful motors of the Berlin and the Pittsburg trials. In spite of this the Finzi motor appears to have performed admirably, giving, thanks to induction regulation, a total efficiency rather better than the direct-current motor, with a power factor exceeding 90 per cent when up to speed, and exceeding 95 per cent under the best conditions.

Generally speaking, its performance was thoroughly confirmatory of the results obtained with the other motors, and, in particular, the sparking is categorically stated not to exceed that usual in good direct-current motors.

In addition to the three single-phase motors just referred to, it is well known that two other single-phase systems have been developed in this country, of which details will doubtless soon be forthcoming; but confining attention to those already described, it is well to enquire what it all means.

If a single one of these motors had been brought out for commercial use, the writer for one, in spite of his belief in alternating currents for traction, would have been disposed to be somewhat skeptical concerning the results claimed. They are in themselves almost suspiciously good. But they confirm each other in a most remarkable fashion, in spite of being obtained nearly simultaneously in three different countries. The variations are merely such as would be expected in apparatus from the hands of different designers, and, taking the evidence as a whole, one is forced to the conclusion that the commercial single-phase railway motor has been developed.

Improvements will probably be found desirable, and will be promptly made, but there is no dodging the main issue, that the single-phase traction motor must be reckoned with in railway work from now on. On interurban systems the single-phase motor will give a new impetus to long-distance work. Unless Finzi's view is altogether too roseate, urban lines can be easily handled by the same method, and it is worth mentioning that an interurban car taking primary currents at high voltage could slip very easily into urban sections with merely the secondary voltage on the trolley wire. For that matter, the series-wound motors would work well on direct current with suitable regulating appliances, so that there need be no line drawn at the city limits. No reason is yet apparent that would indicate the general replacement of direct current by alternating railway motors, but there is assuredly evidence that a new hand has been dealt in the traction game, and that the often condemned alternating-current contingent holds some pretty high cards.

The limited cars on the Cleveland & Southwestern Company's lines have proven so satisfactory that the company has decided to put on two more limited cars, one additional for Norwalk and another for Wellington, both to leave Cleveland in the morning.

POWER PLANTS AT THE ST. LOUIS EXPOSITION

The elaborate plans for illumination proposed for the St. Louis Exposition, together with the enormous amount of power which will be required for operating the transportation systems and the machinery which will be scattered through the various buildings, will require a correspondingly immense amount of generating apparatus. A considerable part of this is now being installed, and a brief summary of some of the principal features, as definitely arranged for up to date, may be of interest.

There will be three main sources of energy which will be available for exposition purposes. Of these the largest will be the service power plant in Machinery Building, with a nominal capacity of 8000 kw in 25 cycles, 6600-volt current. The Exposition will also purchase from the Union Electric Light & Power Company about 7500 kw of the same kind of current. Besides this there will be available a miscellaneous exhibit of engines and generating apparatus to the amount of about 20,000 kw, though the steam and gas supply will probably not permit this full capacity to be utilized at one time.

The main service power plant in Machinery Hall, with boilers in the Steam and Fuels Building, is now being installed, the contract for this entire plant having been given to the Westinghouse Companies. This plant will have four 2000-kw generators, direct-connected to vertical Corliss engines, supplied from sixteen Babcock & Wilcox boilers in the Steam and Fuels Building. The contract includes switchboard, and, indeed, the complete plant, with the exception of the buildings in which the machinery is placed.

The exhibit power plant in Machinery Building will, of course, have an immense variety of apparatus which it is not necessary to catalogue in a general article of this kind, but some of the features which will certainly attract the engineer will be the steam turbines of the Parsons, Rateau, De Laval and Curtis types, and several large gas engines. The largest steam engine unit will be a duplicate of the 5000-kw units in the Interborough station in New York, and the largest turbine a Curtis of 4000 kw. All engine and turbine units will be direct connected to dynamos, the belt having at last disappeared in exposition power plant work in this country.

The Steam and Fuels Building is the name that has very properly been chosen for a building 100 ft. west of the Machinery Building, where the steam boilers and gas plants will all be located. It seems that the gas engine is to take a prominent part in this exposition. The steam boiler capacity will be 23,000 hp, according to the usual boiler rating. A dozen foreign and American boiler makers will be represented by their products in this building. The boilers will be principally of the water-tube type.

As to fuel, oil was, of course, given much consideration at first, but was abandoned because of the uncertainties of delivery of the necessary 1400 barrels to 1600 barrels per day, and the high price as compared with coal. By the use of mechanical stokers and by making some of the fine coal into briquettes, it is hoped to make combustion sufficiently smokeless to be inoffensive. Briquette can be made from the tar by-products of gas manufacture. The gas made by the gas plants can either be used directly in gas engines or used under boilers instead of coal.

Besides the interest which will attach to this portion of the Exposition, the street railway visitor will be attracted to the Electricity Building and the Transportation Building. Just in the rear of the latter two tracks have been laid, one 3000 ft. and one 1400 ft. long, for electric railway tests. The short track can be used for imitating the conditions of city surface lines, and the longer stretch for testing higher speed motors. Two types of single-phase railway motors have been promised for test, which is a point of considerable practical interest just now. Although not in the Electricity Building, these tests and

exhibits of electric railway apparatus come under the department of electricity. The exhibits in Electricity Building and Transportation Building are not sufficiently decided upon to permit of detailed mention. Owing to the pressure of the prime movers in the Machinery Building, all the operating generating machinery will be found there.

Owing to the size of the grounds, transformer sub-stations (and rotary converters, if necessary) will be put in the various buildings, and high-tension transmission lines will supply these sub-stations.

TEST OF TURBINES FOR THE CLEVELAND, ELYRIA & WESTERN RAILWAY

An economy test of the Westinghouse steam turbines, built for the Cleveland, Elyria & Western Railway, made last summer, shows some interesting results. Particulars of the test are contained in a report made by Commander A. B. Canaga and E. N. Janson to the chief of the Bureau of Steam Engineering of the Navy Department, at Washington, from which the following facts are taken.

The turbine was of the two-stage type, direct connected to the revolving field of an alternating-current generator, 400 volts, two-pole, three-phase, 3000 alternations. It having become a commercial necessity in this country to build alternating-current generators capable of running at 25 per cent overload, and able to stand 50 per cent overload for an hour or two, the turbine in question, therefore, if used for driving anything but an alternating-current generator, would be rated as a 1500-kw turbine instead of 1000-kw turbine.

The original design, having called for a reheater between the high-pressure and the low-pressure turbine, was the cause of the great length of this turbine (about 43 ft. 3 ins., including the generator and its bearings). The reheater was not used in this machine (and is not likely to be in others), but substituted by an ordinary receiver pipe and separator. The two turbine cylinders and the generator are all bolted down to the same bed-plate, which is made of considerable depth and is quite heavy, approaching 33 per cent of the weight of the whole outfit. This bed-plate is not bolted to the foundations.

The testing of this machine was performed in the turbine department of the Westinghouse Machine Company, and was carried out with great accuracy. Steam was supplied from the boilers of the general plant of the Westinghouse Machine Company, and entered the casing of the high-pressure turbine through a series of valves. There is first an automatic stop valve, then a throttle valve which connects with a steam strainer placed between this throttle valve and the admission valve. This valve is composed of a double poppet, actuated by a piston and a small relay valve, which receives its reciprocating motion from levers connected by an eccentric through gears to the turbine shaft.

The exhaust was taken out at the bottom of the low-pressure turbine and led through a 30-in. exhaust pipe to the bottom of an ordinary surface condenser. The lower part of this pipe was formed into a hot-well, at the bottom of which was placed a nozzle with a by-pass valve, connecting the suction pipe on the pump either direct to the condenser or to the hot-well. A gage glass, with means provided to ascertain the water-level line, gave readings of the amount of water contained in the hot-well when beginning and finishing the trial. The hot-well pump discharged directly into either one of the two weighing tanks placed on scales to ascertain the amount of water condensed.

The circulating pump was driven by a direct-connected Westinghouse standard engine, running at about 360 turns per minute. The air-pump suction was attached at the top of the condenser and connected to an Alberger dry-vacuum air pump. As the name infers, no water is drawn out by this pump, but merely air and vapor. The air pump itself is composed of two tandem cylinders, and is worked at a uniform speed of about 80 r. p. m., maintaining an average vacuum of about 27½ ins. The near ends of the cylinders are connected by means of a pipe, the other end of each cylinder being joined to the condenser and the atmospheric exhaust respectively. A suspicion existing that the vapor discharged contained some amount of water, this atmospheric connection was coupled up with a small condenser, with the result that about 44 lbs. of water was separated per hour. This should be added to the results put down in the test tables.

The water separated in the receiver pipe was measured at every interval of readings and trapped back to the condenser.

After passing through transformers the current was absorbed in a water rheostat, and readings obtained on the usual instruments.

The number of revolutions of the turbine was obtained by counting the strokes of one of the governor levers, and then

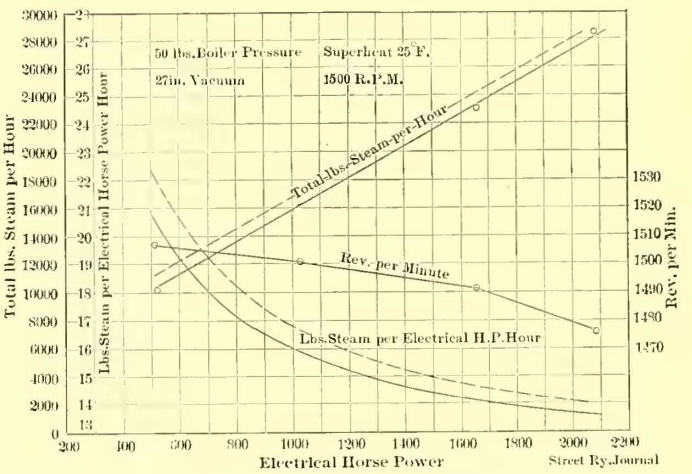


DIAGRAM OF TESTS OF TURBINE

by multiplying same with 9 1-3, which is the ratio between the worm on the turbine shaft and the gear actuating the governor levers. From the table the revolutions will be seen to vary between 1480 and 1456 per minute.

The general results referred to above will be found in the table at the end of this report.

During the whole run of four hours the revolutions of the turbine shaft were nearly constant, or 1500 turns, although the load was increased from its rated capacity of 1000 kw to 1500 kw, an overload of 50 per cent. By comparing the pressure at the horse-power inlet, when working under the two different loads, due entirely to the action of the governor, the above-mentioned fact may readily be accounted for.

The turbine ran without noise, the humming discernible being due to the generator. Its revolving parts, being accurately balanced, ran perfectly smooth, without even the slightest vibrations. All end thrust due to an excess of pressure on the steam side of the moving blades was counteracted, as is usual, by balance pistons, the difference in thrust, when finally adjusted, being so small as to allow the drum to be moved in its axial direction by a slight touch of the finger. Compared with a reciprocating engine there are fewer parts that need watching, a smaller engine room force will, in all likelihood, therefore suffice.

For the purpose the steam turbines now are being used, viz., for driving electrical generators, they are admirably suited, and are undoubtedly, both as a mechanism and a heat engine, in some cases at least, superior in efficiency when compared with the ordinary steam engine.

When analyzing the figures given below, it should be borne in mind that the turbine cylinders were not lagged, but

simply covered over temporarily with felt roughly tied in place, and, therefore, the results obtained may, under other circumstances, be slightly improved upon:

Kilowatts	1,510	1,019
Equivalent brake hp delivered to the generator, at 95 per cent efficiency of the latter	2,131	1,437
Revolutions per minute	1,456	1,480
Steam pressure per gage above throttle	149.4	146.2
Steam pressure per gage below throttle	148.8	101.1
Vacuum referred to 30-in. barometer	27.5	27.83
Dryness of steam at throttle	0.994	0.995
Steam per hour per electrical hp	13.99	15.31
Steam per hour per brake hp delivered at the turbine coupling at 95 per cent generator efficiency	13.29	14.54
Steam per hour per indicated hp of a reciprocating engine at 85 per cent combined efficiency of generator and engines.	11.9	13.01

The dotted line curves in the diagram herewith indicate the steam consumption when dry saturated steam was used, while the full-line curves answer to a superheat of 25 degs. F. of the steam.

INTERURBAN ELECTRIC RAILWAY IN HOLLAND

Work on the new interurban electric railway between Amsterdam and Haarlem, which is being built by J. G. White & Company, Ltd., of London, and in which American capital is largely interested, is being pushed rapidly forward. The operating company is known as the Electrische Spoorweg Maatschappij, and has been incorporated under the auspices of the Netherlands Tramway Company, of New York, with a capital of Fl. 3,000,000, and the same amount of 4 per cent debenture bonds. The directors of the company are: E. Luden (president), of Amsterdam; J. H. Kann, of the Hague; H. J. Pierce, of Buffalo, N. Y.; A. Van Rossum, of Haarlem, and W. C. Th. van der Schalk, of Amsterdam.

The following work is being carried out in connection with the construction of the line: The Government overhead telegraph and telephone wires along the road from Amsterdam to Haarlem are being put under the ground. This work will be done by the State, but the company will pay $60,000 toward this alteration. On account of the unsteady sub-soil, it was found necessary to drive sheet piling on both sides of the Government road on which the track is being laid. The road itself is also being graded, as well as the entire private right of way situated in the Sloterpolder. Considerable bridge construction will also be required.

In Halfweg, a village midway between Amsterdam and Haarlem, a power station is being erected, which will be equipped with six Lancashire boilers, having a heating surface of 860 sq. ft., and three triple compound-condensing, 475-ihp Belliss & Morcom's engines, directly coupled to the three 300-kw Westinghouse generators. High-speed engines were adopted largely on account of the difficulty of securing good foundations.

The line will start from a point near the center of Amsterdam, and in Haarlem joins the Haarlem local, Haarlem-Zandvoort and Haarlem-Bloemendaal electric tramways, the stock of which company is owned almost entirely by the Electrische Spoorweg Maatschappij.

The cars will be mounted on double trucks, with a capacity of about forty-four passengers each.

The distance between the termini in Haarlem and Amsterdam is about 12 miles, and is for the greater part double track. Work was started in January, 1903, and it is expected that trains will be in operation sometime during the summer of 1904.

BLOCK SIGNALING ON DOUBLE TRACK ROADS

BY ORLANDO W. HART

Since the adoption by the American (steam) Railway Association, at its fall meeting, of the report of the committee on "train rules," recommending the use of block signals in lieu of train orders on double-track roads, the report has been widely circulated through the press and more or less briefly discussed. A general misunderstanding seems to exist among electric railway companies who are operating with double track, as to the true application of these rules, and it is naturally felt that if the steam roads can safely use the block signal system the electric roads ought to be able to do the same. It is with the view of correcting this error that the following article has been written. The situation has not changed in the least from what it was before this action was taken, and electric roads are still at a disadvantage, owing to their limited control system of operation.

Nearly everyone who has carefully studied the subject admits that conditions can occur on double track, not properly guarded, which are fully as dangerous, if not more so, than any found on single track. While accidents do not occur as often as on single track it is their very infrequency which makes them dangerous.

In brief, the action of the steam roads will be found in the following rule adopted, and which is in four sections:

1. On portions of the road so specified on the time-table trains will run with the current of traffic by block signals, whose indications will supersede time-table superiority.

2. The movement of trains will be supervised by the superintendent or train despatcher, who will issue instructions to signalmen when required.

3. A train having work to do which may detain it more than —— minutes must obtain permission from the signalman at the last station at which there is a siding before entering the block in which the work is to be done. The signalman must obtain authority to give this permission from the superintendent or train despatcher.

4. Except as affected by these rules all block signals and train rules remain in force.

It will be readily be seen by these rules that it was the intention to abandon the use of train orders, but instead of sending them to the conductor and engineer of a train, as the custom formerly was, the order is now to be transmitted to the signal man, who will then, by means of his semaphore signal, direct the movements of the train which the orders are intended to govern, consequently saving the time formerly required to stop the train and sign for orders.

The plan possesses the additional advantage of enabling the depatcher to correct any error immediately, if one be made.

The system adopted has been in operation on the lines of the Chicago, Burlington & Quincy Railroad, and in outline consists of the following: On portions of the double track designated on the time-table block signal towers are placed, which are manned both night and day by operators who act as signalmen, and to whom all orders are sent by the despatcher.

If a signalman allows a train to enter his block all other trains of the same direction are blocked, and by automatic means the signals are locked and cannot be restored to safety till the train has left the block. Should the automatic lock fail, manual service can be substituted upon an order from the proper authority. Word is then received from the signalman in the next tower that the train has left the block and entered the next. The block now being clear any train, irrespective of class, may proceed with the current of traffic when a clear indication is shown from the signal tower. It is true that the train proceeds without orders, but it is still under the control of the train despatcher, through the signalman, and he alone controls its movements. By this method the system of train despatching is greatly simplified, since all trains are of the same standing.

The use of train orders is as imperative on double track as on single, and no measures for safety used on single track

should in any way be relaxed by the introduction of double tracks.

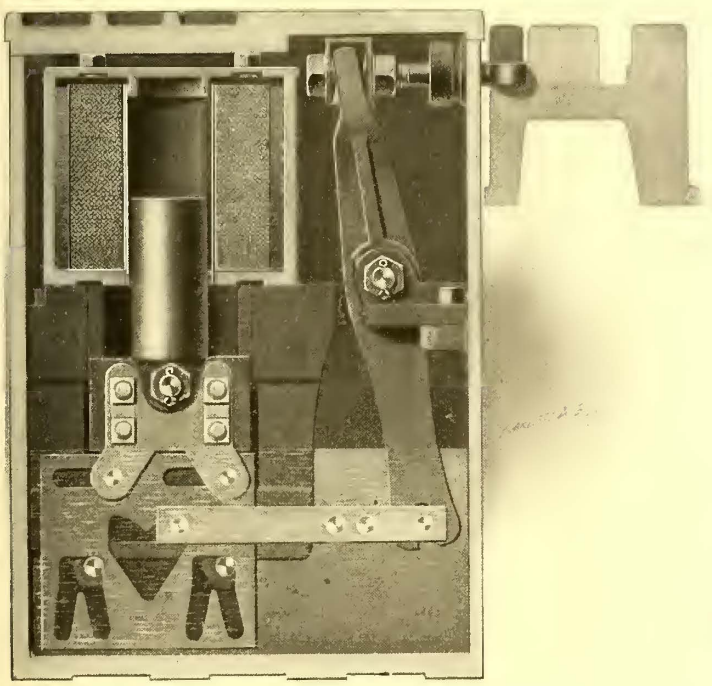
Passing points should be maintained by schedule, so as to separate the cars at proper distances. A system of communication and signaling should also be installed, by which the despatcher can, at will, stop, hold and communicate with all cars under his control.

Steam railroads use automatic block signals only as a precautionary measure; owing to the existing conditions of their track, the system employed is far more reliable than any now offered to electric roads. Managers of electric railways should guard their whole system, whether single or double track, in the same manner, instructing their employees that the same dangers exist in both systems, and for the sake of safety both should be treated in the same manner.

In the writer's opinion there is at present no satisfactory block signal system adapted for the use of electric railway companies, and many of the systems now on the market are worse than useless, owing principally to the fact that they will not show a danger signal by day and night, when any part necessary for their operation is out of order.

AUTOMATIC TRACK SWITCH

A new electromagnetic track switch has been recently placed on the market by the American Automatic Switch Company, of New York. This switch has been thoroughly tried out under the supervision of Aldred K. Warren, the company's consulting engineer. Mr. Warren is a practical railway man, and was formerly assistant engineer of line and equipment of the Brooklyn Rapid Transit Company, and for the last year and a half has been one of the electrical engineers of the Interborough Rapid Transit Company, of New York.



DETAILS OF AUTOMATIC TRACK SWITCH

The great advantages of this switch lie in its durability, simplicity, certainty of operation and safety from lightning. As will be noted by reference to the accompanying cut, the principal operating parts consist of but one magnet and one steel cam-plate for the reverse motion. The magnet is immersed in a special oil in a sealed case, giving it absolute protection from moisture. The switch may be adapted to take operating current either through rail or overhead wire.

To operate this device, the motorman must leave the controller at one or two points while passing over the breaker or insulated rail. If the switch is right, the car passes over the breaker or insulated rail with the power off. This method is very simple, and prevents the motorman from becoming careless, as it compels him to look at the switch every time before running the car over it. It is unnecessary for the motorman to memorize switches in order to operate them.

The switch mechanism is made of the finest tool steel. There are no wearing surfaces or pivoted points, nor is there any possible chance for short circuits. As the operating mechanism is enclosed in a strong sealed box, placed under ground, no dirt, water, salt or ice can come in contact with the magnet or working parts of the switch, thus reducing maintenance to practically nothing. The cam-plate produces a semi-lock, but does not prevent turning the switch with a switch-iron. The switch is easily accessible for inspection. It is also stated that switch tongue splitting and car derailments are impossible.

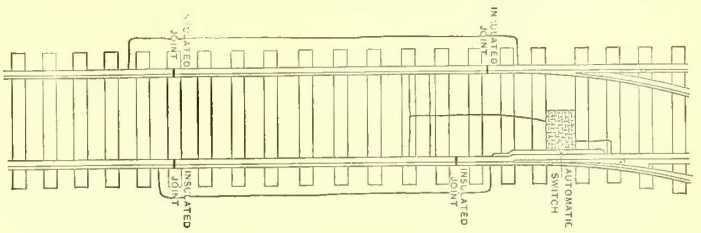


DIAGRAM OF CONNECTIONS WHEN CURRENT IS TAKEN FROM RAILS

Diagrams are published herewith of the connections used with rail and with trolley wire connection. When the former is employed a short section of track is insulated, and the current, after passing through the motors, operates the switch. With the overhead connection a breaker or insulated section is inserted in the trolley wire, so that the switch is in series with the motors. This breaker need not be placed so far away from the switch, that on streets where the cars follow closely, the car following the one crossing the switch can turn the switch before the second truck of the first car reaches it, thereby sending one truck one way and the other truck another way. The breaker is arranged to spring on the trolley wire without cutting it.

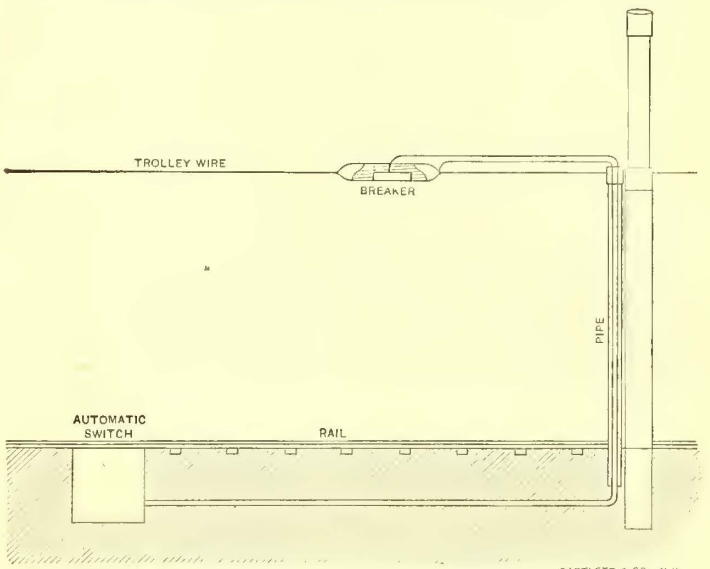


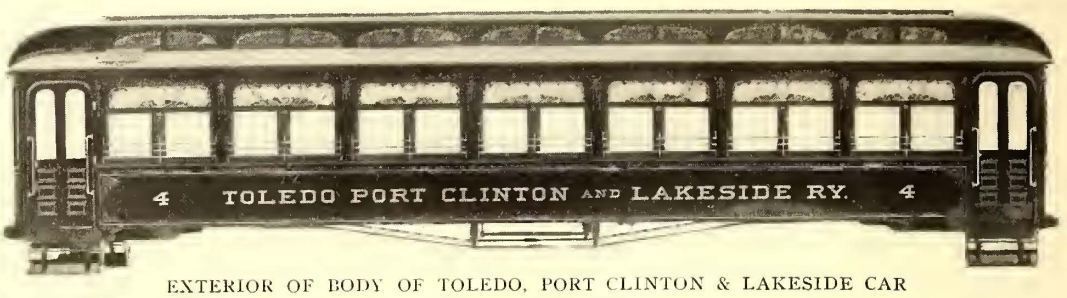
DIAGRAM OF CONNECTIONS WHEN CURRENT IS TAKEN FROM TROLLEY WIRE

One of these switches has been in practical operation for the last nine months at 149th Street and Eighth Avenue, New York, and has given excellent satisfaction. The company also has orders for installing these switches in Brooklyn, on the system of the Public Service Corporation of New Jersey, and at Albany, Utica, Trenton, Cleveland and other cities.

INTERURBAN CARS FOR AN OHIO ELECTRIC RAILWAY

The accompanying illustrations show the exterior and interior of one of several fine interurban cars built by the G. C. Kuhlman Car Company, for the Toledo, Port Clinton & Lakeside Railway Company. This railway company has about 73 miles of track under construction, and will reach an amusement resort at Lakeside. These cars have attracted much attention on account of their excellent design and appearance.

Each car is 51 ft. long over all, 49 ft. 8 ins. over vestibules, and 40 ft. over body; width over sills, 8 ft. 6 ins.; height from under side of sill to top of roof, 9 ft. 4 ins. The bottom framing is composed of longitudinal sills of long-leaf yellow pine, with end and cross sills and framing of white oak. Side sills are made of one piece, 5 ins. x 8 ins., and one piece, 2 ins. x 6 ins., with 6-in. channel, securely bolted to same, extending the full length of car body and thoroughly bolted to end sills. The sills on the left side extend through to the buffers. The center sills are of 6-in. I-beams, filled with yellow pine, and are bolted to the side sills. The end sills are 6 ins. x 8 ins., with 3-in. angle-iron bolted thereto, and extend the full width of the bottom frame. All the framing is tied together with ⅝-in. tie-rods, extending the full width of the bottom, and fitted with heavy square washers with turn buckles in the center. The bolsters are made of 8-in. x 1-in. steel plates, with iron filling blocks. The body framing is of the Kuhlman standard, with 1¼-in. x ½-in. steel carlins at each post. The roof has a monitor deck, steam coach hood type. The car is trussed with 2½-in. x ⅜-in. flat iron running the full length of car body down through side sills, fitted with washers and plates. The truss is supported alongside of car underneath sash rest by being tightly gained into side posts. This makes a car suitable to withstand any service to which it may be put in ordinary commercial service.



EXTERIOR OF BODY OF TOLEDO, PORT CLINTON & LAKESIDE CAR

INTERIOR OF TOLEDO, PORT CLINTON & LAKESIDE CAR

The car finish is quartered sawed oak, and is furnished with neat marquetry work and side panels inlaid in neat design. The car is also furnished with stationary plush seats, dry closet at rear of car containing water-cooler, etc. The ceiling is of Empire design, neatly decorated in gold leaf. The deck lights are of leaded glass of neat design, as are also the upper window sash.

The interior trimming of the car is of highly polished and lacquered bronze of extra heavy design.

UNDERWRITERS CONSIDER CAR WIRING

At the recent annual meeting of the Underwriters' National Electric Association, the committee on car wiring reported that the American Street Railway Association had appointed a committee of five to consult with it, and that, as a result of two conferences, a set of rules are being considered, which cover the following points:

First.—The protection of that part of the under side of the car, over all electrical apparatus, by fire-resisting material.

Second.—The use of standard conductors and for all conductors outside of conduits, a flame-proof braided outer covering.

Third.—The use of an approved line of switches, cut-outs, etc., with those having exposed live metal parts located in cabinets.

Fourth.—The running of wires in metal conduit, in fire-resisting moulding, under certain conditions, in hardwood moulding, or cleated direct to fire-resisting material.

Fifth.—To do away, as far as possible, with the use of clusters and lighting by individual lamps.

Sixth.—To have heaters so designed that when they are in place there will be a safe distance between current-carrying parts and woodwork of the car.

Seventh.—To improve the design of terminals that loose contacts may be avoided.

The matter was referred back to the committee for further consultation with the American Street Railway Association.

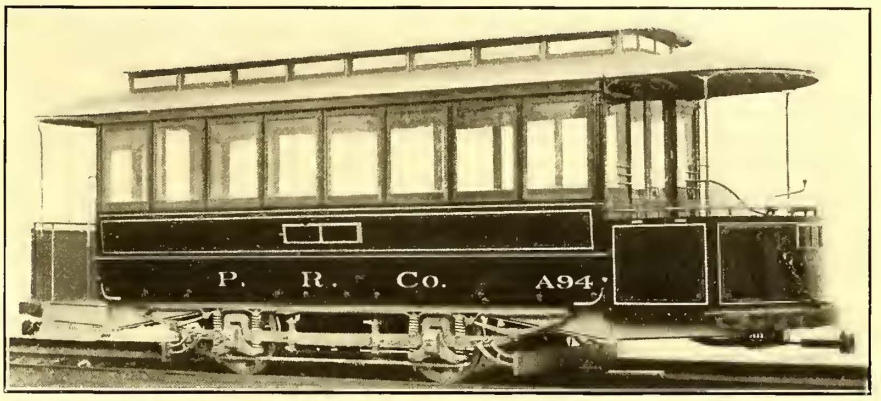
GLAZED VITRIFIED CLAY CONDUITS FOR RAILWAY AND LIGHTING WORK

The Standard Sewer Pipe Company, of Rochester, N. Y., although it has for some years manufactured glazed vitrified clay conduits, has not until recently entered into the street railway and lighting field on a large scale. It supplies sewer pipe for municipal drainage purposes on an extensive scale. The conduits heretofore manufactured have been sold and installed principally in New York State and New England, several million feet having been located in the territory mentioned above within the past two years or three years.

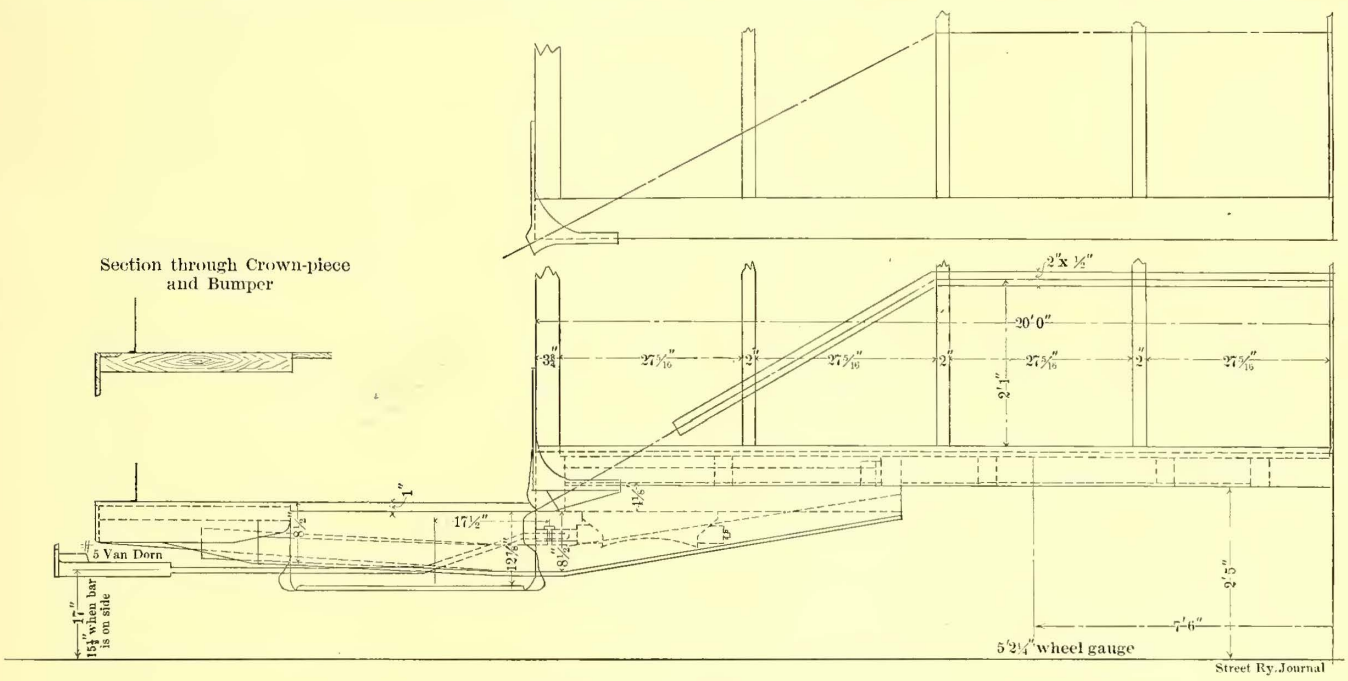
The company has an extensive plant in the suburbs of Rochester, and is fortunately located near some of the best clay beds in this country, and the material entering into the composition of the ducts is claimed to be the best in use. Single and multiple ducts, with round or square centers, are manufactured. The inside of the conduit is as smooth as porcelain, giving absolute protection to the passage or removal of cables through the ducts. Careful inspection of each conduit is made before it leaves the plant. Any defects in the conduit, such as imperfect glazing, cracks or brittleness through over burning, are carefully inspected. The result of such methods has given the company a number of large, steady customers, who have heretofore taken its entire output. Extensive enlargements of its plant and the recent improvements of its manufacturing facilities, however, now enable the company to enter the railway and lighting fields on a large scale.

NEW CARS FOR PITTSBURG RAILWAYS COMPANY

The Pittsburg Railways Company has lately received 100 closed trailer cars from the J. G. Brill Company and fifty motor carvs from the American Car Company. The only differences between the two types are that the motor cars are furnished with vestibules and are a trifle longer and wider. The illustration shows one of the trailer cars, the dimensions of which are as follows: Length over end panels 20 ft., over crown pieces 30 ft., and over bumpers 31 ft. Width over sills and panels 6 ft. 7¾ ins., and over posts 7 ft. 2 ins. Height from bottom of sill over roof boards 8 ft. 5½ ins. The combined truss-rod anchors and corner castings, which may be seen in the illustration, are a regular feature of the cars of the Pittsburg Railways Company. Truss-rods of flat iron are 2 ins. x ½ in., and are supported on the posts 25 ins. above the floor. The corner posts are 3¾ ins. thick, and the side posts 2 ins. The side sash lights are 24 ins. x 30 ins., and end sash lights 14¾ ins. x 30 ins. Five steel rafters, 1 in. x ⅝ in., are sandwiched between the car lines. Long-leaf yellow pine side sills are 4 ins. x 6¼ ins., and the end sills 4 ins. x 9 ins. The cross sills and cross bracings are 2¾ ins. x 4 ins. The motor cars have 6-in. x ⅝-in. plates on the outsides of the sills, bent around the corners for a distance of 20 ins. From the rail to tread of platform step is 15⅜ ins., and from step to platform 12⅞ ins. The platform timbers are 2¾ ins. thick by 7 ins. deep at the widest point, and are reinforced with angle-iron. The crown pieces are flush with the angle-iron bumpers. Platforms are 5 ft. 6 ins. long, measured at the centers. There is one entrance to the side, as the dashes extend from the hood-post around to the corner, and the front portion is supported upon the crown pieces with 1-in. x 1-in. angle-iron, to which it is riveted. The brake handles, angle-iron bumpers, alarm gongs and conductors' bells are of Brill manufacture.



TRAIL CAR FOR PITTSBURG RAILWAYS COMPANY



CONSTRUCTION DETAILS OF PITTSBURG RAILWAYS CAR

A report made by the Boston & Worcester Street Railway Company shows that on Nov. 1 nine cars on its line each earned $140. The company is doing a very satisfactory business, and it is estimated that its earnings will be $300,000, a ratio of capitalization to earnings of eight to one.

A NEW SMOKE-CONSUMING FURNACE

A few months ago a new smoke-consuming furnace was introduced to steam users by J. B. Harris, M. D., of Nashville, Tenn. Although long a member of the medical profession, Dr. Harris was formerly a mechanical engineer, and the subject of fuel economy has always been of great interest to him.

It is well known that the imperfect combustion in an ordinary furnace causes the generation of carbon gases of high calorific value, which are utterly lost unless enough hot oxygen is introduced to consume them.

To overcome this loss it is now common practice to increase the grate surface for a given amount of fuel to permit increased air circulation by spreading the coal in thin layers over the grate bars. This, however, often works more harm than good, for if too much cold air passes through the fuel the temperature of the fuel gases is lowered and their volume increased, which results in greater losses than ever. The use of forced or induced draft sometimes produces similar effects, as the oxygen which passes through the fuel will not consume the furnace gases unless both the gases and oxygen are at the kindling or flashing temperature. Chemical action would occur only in the latter case, and result in the formation of carbon dioxide—the product of perfect combustion.

In this smoke-consuming furnace, instead of trying to get oxygenated air above the coal pile by spreading the coal in thin layers or by using forced or induced draft, supply flues of sheet

iron are placed in the brick walls so closely in contact with the fire as to heat the air up to flash point by the time it meets the gases and floating carbon. While the coal is heating, dry distillation is going on, and the gases and floating carbon are rising to the top of the coal, 40 per cent of the total draft is permitted to reach the fire through the flues, and the remaining 60 per cent is allowed to go through the ash pit under the grate bars in the usual way.

Fig. 1 shows the construction for a return flue tubular boiler. Two flues beginning at the rear—one in each side wall—supply the double arch. The air from this double arch surrounds the gases and floating carbon above, and the air from the bridge (which has been delivered by the two other flues beginning at the front, one in each side wall, and running the whole length to the rear wall and then doubling back to the bridge) catches the smoke and gases on the under side, thereby completely surrounding the rising gases and smoke with hot, oxygenated air. The hot air, smoke and gases are dashed against the checker-work (rising on the bridge and extending back from 4 ft. to 6 ft. under the boiler), and recoil and swirl around until thoroughly mixed and consumed. The checker-work of brick being white-hot, keeps up the temperature, so that the gases and smoke are consumed under the boiler, and no heat units are wasted. If anthracite coal is used with this furnace, it is claimed that 9 per cent in fuel is saved, because there is 9 per cent of gas in such coal. If soft coal is used 35 per cent to 50 per cent is saved, as there is in that class of coal 35 per cent of gas and from 10 per cent to 20 per cent of volatile carbon.

This furnace has a bridge built in the shape of a circular arc, to conform to periphery of boiler for cylindrical, horizontal set boilers, with a baffle carried up with side walls (width of one brick) over each rising end of bridge, and up to where side walls embrace boiler just under the water level, forcing smoke and gases to pass under it and igniting them by hot air from the

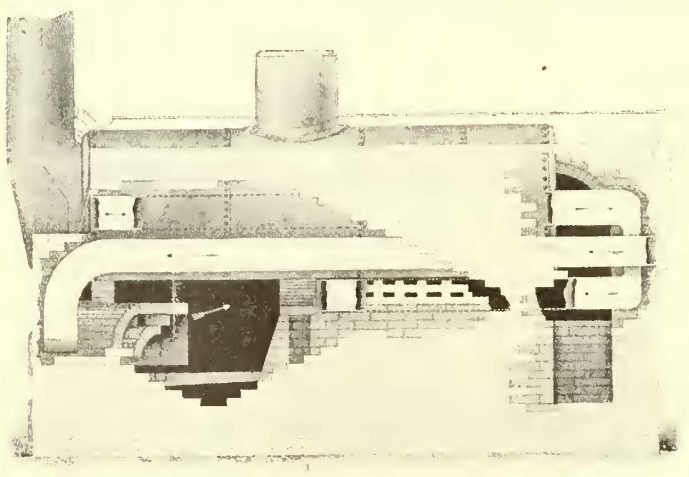


FIG. 1.—FULL SIDE ELEVATION OF CYLINDRICAL HORIZONTAL RETURN FLUE TUBULAR BOILER, SHOWING CONSTRUCTION OF SMOKE-CONSUMING FURNACE.

bridge ports. The interior flue gases in this smoke-consuming furnace, when the latter is properly built and regulated, show from 17 per cent to 18 per cent carbon dioxide, the highest efficiency attainable.

The evaporation of water in this furnace when properly designed and handled, is stated to be for cylindrical boilers of the first class, 11 lbs. of water per pound of first-class steam coal; and in water-tube boilers, 12 lbs. and above under best conditions.

The only difference in the building in of the sheet flues in a water-tube boiler, such as Babcock & Wilcox and any horizontally-set, return-flue tubular boiler, is that in the return-flue tubular-boiler furnace the last section of the flue, which conducts air from the crescent-shaped section in the rear end wall from rear to bridge, is triangular in shape, and lies in the corner of the combustion chamber. In water-tube boilers the crescent-shaped piece in rear end wall continues its lower horn further, and the same corresponding section of pipe conducting the air from this crescent to bridge is rectangular, lying wholly in the side walls as the others do. When it reaches in the side wall opposite the hollow bridge it turns out of the side walls on either side into the hollow of the bridge.

The only other distinction between the two in building in is

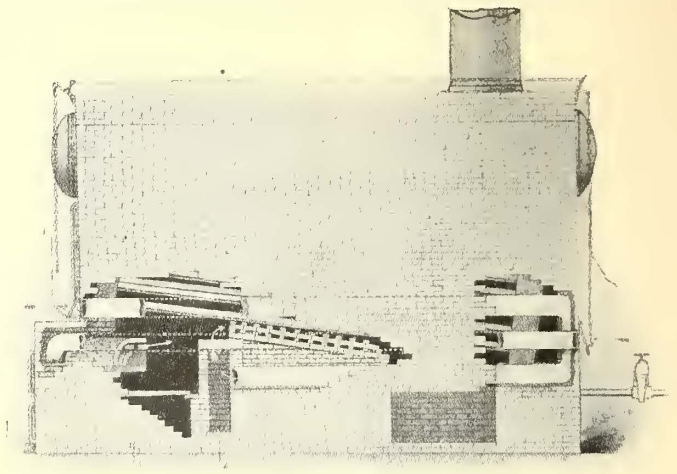


FIG. 2.—FULL SIDE ELEVATION OF WATER TUBE BOILER, SHOWING CONSTRUCTION OF SMOKE-CONSUMING FURNACE.

that the round return-flue tubular boiler furnace has a round bridge, and the checker-work of firebricks is built up immediately behind this bridge, and not on it. The water-tube boilers named have a straight, transverse bridge, and the checker-work is built up immediately behind it.

In all furnaces of this type a water pit is used in the ash pit under the grates, because the falling pieces of hot coal and ashes which wall in this water and the radiation from the grate fire evaporate it into a very heavy wet steam. This steam is carried up to the coal burning on the grate bars, and by passing through this burning coal is disassociated into hydrogen and oxygen, thus helping to produce better combustion and a hotter fire.

Several of these furnaces have already been installed, notably in the Crown Woolen Mills, Marcellus, N. Y., and the Banna Cotton & Oil Mills, Goldville, S. C. The manufacturer is also negotiating important contracts.

REORGANIZATION OF SPRINGFIELD & XENIA COMPANY

A reorganization of the Springfield & Xenia Traction Company, which was placed in the hands of a receiver about a month ago, is under way. The bondholders may decide to buy in the property and bond it for less than the present issue of $500,000, in which event the common stock would be wiped out. About half the bonds are held in Cleveland, and at a recent meeting of bondholders it was decided to appoint a committee, composed of Warren S. Hayden, W. H. Lamprecht, of Cleveland, and J. M. Hutton, of Cincinnati, to act as a protective committee and undertake the reorganization of the property. It was understood that at the time the road was sold by Cleveland interests that the control passed into the hands of a syndicate headed by Ex-Governor Bushnell, of Springfield, but that has since been denied.

The Springfield (Ohio), Troy & Piqua Railway, which has its line from Springfield to Troy partially completed, is planning to build a branch through Christiansburg, Fletcher, Lena and Conover. This will give the company direct connection with both Troy and Piqua.

FINANCIAL INTELLIGENCE

WALL STREET, Dec. 16, 1903.

The Money Market

The drift of the money market during the week has all been toward greater ease. Call money, while occasionally quoted at 6 per cent, is lending more commonly at 5½ per cent to 5 per cent. Time money for both long and short periods is distinctly easier, the rate for sixty to ninety days being 5½ per cent, and for four to six months, 5 per cent. This movement toward a lower level has been foreshadowed clearly by all the developments of the last few weeks. Up to yesterday evening gold imports from London since the 1st of November reached a grand total of over $22,000,000. This, of course, has been the primary influence in the market's improvement. Had it not been for this help it is not hard to see that the surplus bank reserve at New York, instead of standing now at $8,000,000, would have been nearly, if not quite, at the vanishing point. The season's shipments of currency to the South, on account of the abnormal cotton prices, have been almost unprecedented in their magnitude. The Treasury, in spite of the revenue deficit, has been a creditor, rather than a debtor on its ordinary operations with New York. But the enormous takings of gold from across the water have balanced these demands so effectually that the local bank surplus is sustained above the average total for this time of year. Another agency in helping the situation has been the large lending by local trust companies and out-of-town banks, which have been induced to employ their balances here by the high rates prevailing in the call money market. It is chiefly owing to this that the New York Clearing House institutions were able to reduce their loans between Sept. 12 and last Saturday no less than $46,000,000. These movements are sufficient to explain the relaxation which the market has already enjoyed. Looking to the future, the enormous capital requirements of the first-of-the-year settlements will naturally cause some temporary hardening of money rates. But after the first ten days of January the signs all point to the usual inflow of funds from the country and the usual let-down in market quotations. Assurance on this point is made doubly sure by the remarkable persistence of conditions favorable to gold imports in the exchange market.

The Stock Market

A highly professional market, with one strong contingent working for higher prices and another for lower prices, sums up the immediate situation on the Stock Exchange. A sharp reaction after the advance in the early part of last week was the natural result of selling by speculators, who had bought stocks lower down, and were taking their profits. The bear party sought to take advantage of this condition to make a turn on the short side. With this end in view, they made a well-directed attack upon the Steel shares, which was successful in forcing considerable liquidation and carrying these securities back pretty near to their low records. Later in the week the bear speculations were extended to the Pennsylvania group of stocks, but here the raid met with no success. Very little real stock was brought out, and on Monday a sharp rally set in which not only affected the stocks most under pressure, but carried back many of the active trading favorites to the high figures in the movement. The outside public has hitherto taken no part in the operations for a rise. Nor are there any indications either in the bond market or the stock market of the customary purchases by investors anticipating the first-of-the-year interest and dividends. The course of prices has been entirely governed by the cross currents of professional speculation, and opinion as to the immediate future is extremely undecided. The indications of returning ease in the money market which have been pointed out in the article above, are, perhaps, the most forceful reason for higher prices at this time. Then again the earnings of the railroads, especially in the West, are showing up much better than has been all along expected. Wherever a decrease in gross earnings has occurred, expenses have been reduced accordingly, and as many of the plans for extraordinary improvements on the various properties have either been suspended or abandoned altogether, net earnings are able to make a very favorable comparison with a year ago. Meanwhile, fears of a coming business depression count for much less than they did a month ago. One reason is that the record of the country's bank clearings, which, both by sections and as a whole, are well above last year's totals, continues to refute the idea that any serious reaction in trade is in progress. Another reason is that the iron and steel industry, which has fallen off more than any other branch of commercial activity during the last nine months, is now giving pretty plain evidence to careful observers of having turned the corner. These causes at the moment seem to be more powerful than any that favor the advocates of lower prices.

The local traction stocks continued to engross attention up to the close of last week. The sensational rise in Brooklyn Rapid Transit was the cause of much conjecture as to the reasons why such enormous purchases of the stock should be going on at this time. Obviously, there was no such improvement in the earnings of the property as to justify so violent an advance. The theory most favored in speculative circles was that of competitive buying by certain large financial interests having some ultimate undisclosed purpose in finding representation in the management. With the reaction in the stock during the last few days a saner view is taken of the matter, and it is now seen how easily the rise can be explained by the technical condition of a limited market supply, and skilful manipulation in the interest of a powerful pool. Manhattan and the Metropolitan stocks advanced rapidly for a time, while the speculation in the Brooklyn specialty was at its height. But they, too, have recoiled sharply during the more recent dealings, and interest is now shifted to other quarters of the market.

Philadelphia

Trading has not been particularly active during the week in Philadelphia, but the leading stocks have managed to hold their own. American Railways went as high as 44, and then dropped back to 43. Philadelphia Traction sold up a half point to 96. Philadelphia Electric rose 3-16 to 6 5-16, then eased off to 6 3-16. Philadelphia Company common ranged between 37⅞ and 38¾, and was notably strong. The preferred was unchanged at 43. Union Traction, with the dividend on, sold as high as 46⅛; later selling ex-dividend, the price dropped to 45⅜, but rallied to 45¾. Rapid Transit was weak at a decline from 11 to 10¾ on sales by speculative holders who disliked the proposed call for another assessment. It was given out that the proceeds of this call, which was issued some time before it was expected, are needed to carry on the underground tunnel building, which will be pushed vigorously during the winter. The advance in Consolidated Traction of New Jersey continued, the stock rising from 64½ to 65. Scattered sales were reported in Chicago Union Traction, from 7 to 7⅜, and in Thirteenth and Fifteenth Street Passenger, at 305.

Chicago

Whatever speculation there has been during the week on the Chicago Exchange has centered in the Lake Street Elevated shares. The stock, which last week sold as low as 1¾, advanced to 2⅝ on rather heavy trading, and then relapsed to 1⅞. Lake Street receipts—which mean the certificates issued to holders depositing their stock under the reorganization plan—sold as high as 2⅜, and then eased off to 2¼. The reason for this demonstration is the belief that enough of the securities have been deposited with the committee to insure the success of the reorganization. According to reliable information, about 64 per cent of the stock and about 75 per cent of the income bonds have been already deposited. Only $945,000 of the first mortgage bonds have been turned in, but, with what are owned by the Lake Street Company and allied interests, there would be $4,500,000 of these securities, or 97 per cent of the total issue, favorable to the reorganization project. On the excellent earnings, both present and prospective, Northwestern Elevated common moved up from 15 to 16, with sales of 600 shares. South Side sold at 94 and 95; Metropolitan common, from 17¾ to 17, and the preferred, at 54. Union Traction common was bid up to 7 in sympathy with a speculative movement in the stock originating in New York, but later the price fell back to 6

Other Traction Securities

The dealings in the Boston tractions have amounted to scarcely anything worth recording during the week. Massachusetts Electric common, which a week ago sold as high as 21⅞, declined on light transactions to 19. The preferred selling ex-dividend dropped from 77⅞ to 76, but the sales at the lower figure were too small to be of consequence. Boston Elevated changed hands between 140 and 140¾; West End common lost a half point, 90 to 89½, and the preferred sold at 110. The Baltimore list was also exceedingly

dull. A few sales of United Railway stock have occurred around 9 and 8⅞, the prevailing figures of the last few weeks. The income bonds, after going as high as 57⅞, reacted to 56⅞. The general 4s fluctuated between 92 and 91⅜. Transactions were recorded in Atlanta Street Railway 5s at 106, Baltimore Traction convertible 5s at 100⅝, City and Suburban of Baltimore 5s at 112, and Norfolk Street Railway 5s at 108. All the securities of the New York and Brooklyn traction companies have been active and strong in the local curb dealings, in sympathy with the traction movement on the Stock Exchange. Brooklyn Rapid Transit 4s, which for a long time past have been selling around 76¾, rose to 79. Nassau Electric 4s sold at 79¾ and 79, and a thousand shares of Brooklyn City Railroad changed hands on an ascending scale between 232½ and 238. Interborough Rapid Transit was also strong at an advance from 92½ to 95⅛ on sales of 800 shares. It may also be noted that the bonds of Kings County Elevated and the Brooklyn Union Elevated were unusually active in the trading on the Stock Exchange. Other curb sales for the week included St. Louis Transit at 13½, Washington Traction 4s at 71¼, New Orleans common at 10¼ to 11, the preferred at 30¾, and the 4½ per cent bonds at 80¼, American Light and Traction common at 36, and Chesapeake Traction 5s, from 94 to 86.

Detroit United featured at Cincinnati, about 300 shares selling from 69 to 70, an advance of two points over the best of last week. Toledo Railways & Light advanced to 26 on small sales, and Cincinnati Street Railway advanced to 133. Cincinnati, Newport & Covington preferred brought 82½ and 83 for small lots; also an advance over last week. A block of Cincinnati, Lawrenceburg & Aurora 5s sold at 105.

Columbus Railway & Light common is enjoying remarkable activity at Columbus. Probably 4000 shares changed hands during the past week. On Monday the stock was offered at 29, and it advanced steadily during the week, and sold as high as 35. There have been numerous rumors of consolidation with the interurban companies, which, together with the fact that the road is showing earnings and is likely to declare a dividend on the common, accounts for the demand. Columbus, Delaware & Marion preferred has been attracting attention at around 90.

Tractions were very quiet in Cleveland. Northern Ohio Traction advanced to 13½, and on Monday 14 was offered. Detroit United holders are asking 75 with no sales. Toledo Railways & Light advanced to 25½. Cleveland Electric was quiet, and a small lot sold at 70. Monday it sagged to 69½ for a small lot. Northern Texas Traction sold at 32, an advance over previous sales. Syracuse Rapid Transit sold at 75½ for a small lot. The quarterly dividend of 1 per cent has been declared for this stock.

Security Quotations

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

	Closing Bid Dec. 8	Dec. 15
American Railways	42	42½
Aurora, Elgin & Chicago (preferred)	a57½	a55
Boston Elevated	140	140
Brooklyn Rapid Transit	46⅞	49⅝
Chicago City	160	*159¾
Chicago Union Traction (common)	5½	5¾
Chicago Union Traction (preferred)	28	25
Cleveland Electric	68	67
Consolidated Traction of New Jersey	63½	64
Consolidated Traction of New Jersey 5s	105½	105
Detroit United	69	69⅛
Elgin, Aurora & Southern	—	a38½
Lake Shore Electric	—	—
Lake Street Elevated	1½	2
Manhattan Railway	141¼	*141
Massachusetts Electric Cos. (common)	20	18½
Massachusetts Electric Cos. (preferred)	75	76
Metropolitan Elevated, Chicago (common)	17	16
Metropolitan Elevated, Chicago (preferred)	51	51
Metropolitan Street	120½	121¼
New Orleans Railways (common)	10½	9
New Orleans Railways (preferred)	30¼	30¾
North American	75	75
Northern Ohio Traction & Light	12⅝	12¼
Philadelphia Rapid Transit	11	10½
Philadelphia Traction	95½	96
St. Louis Transit (common)	13	13
South Side Elevated (Chicago)	93¼	93½
Third Avenue	115	115
Twin City, Minneapolis (common)	94	92
Union Traction (Philadelphia)	45⅝	*45½
United Railways, St. Louis (preferred)	59	59

a Asked.

Iron and Steel

The thing that has excited more interest than anything else in the iron trade of the week was the publication of the usual monthly blast-furnace statistics by the "Iron Age." From these it appears that the pig iron output was 251,181 tons on Dec. 1, as against 282,219 tons per week on Nov. 1. Yet, despite this considerable restriction of the product, there was an increase during the month of 61,000 tons in stocks on hand. The meaning of this, of course, is that at the beginning of the current month, after all the extraordinary efforts made to check production, production was considerably ahead of consumption. But this unfavorable situation has undoubtedly been relieved a great deal during the past fortnight, which has witnessed a much more active buying demand and some advance in prices. The suggestion is now made by competent authorities that purchases are apt to be larger on a rising market than they were on a falling market, the theory being that the consuming interests in their endeavor to catch the bottom will find that they have waited too long. Quotations are as follows: Bessemer pig iron $14.85, Bessemer steel $23, steel rails $28.

Metals

Quotations for the leading metals are as follows: Copper 12½ cents, tin 26⅞ cents, lead 4⅛ cents, and spelter 4½ cents.

NEW DEVELOPMENT COMPANY IN NEW YORK

The Traction Development & Securities Company has just been organized and incorporated, with offices at 74 Broadway, New York, to undertake the financial and engineering development of electric or steam railways, electric or gas lighting plants, and water works or water powers. The directors and officers include a number of men who are favorably known and have successfully carried out important enterprises.

The company will form or aid in the formation of syndicates for developing properties, underwriting securities, promoting consolidations and examining properties. It will acquire and develop properties as principal or agent, put them on a paying basis, organize subsidiary companies to own and manage them, and own or dispose of the securities therefor. It is prepared to act as adviser or agent in the organization or reorganization of companies, negotiate capital, furnish expert opinions, determine values of investments, obtain concessions, franchises, contracts or other privileges. To carry on this work the company has organized a competent staff, including experts in financial, engineering and legal affairs, with the view of having their reports accepted by banking houses, investors, and others whom it may be desirable to interest or influence. The projectors consequently claim that they should not be confounded with ordinary promoters as they have a competent staff of engineers and managers who have made a specialty of such properties.

The company recognizes the mistakes made by many promoters of such properties who usually offer the prospective investor a host of glittering generalities but lack the detailed knowledge to carry out their projects successfully. The Traction Development & Securities Company has entered the field well equipped to handle such matters in a thoroughly practical manner, thus ensuring the best results both to promoters and capitalists. The company has already been retained to examine several properties, and has arranged for the consolidation of competing railway lines upon a satisfactory basis, so that a better service is insured the community and dividends are assured to stockholders where formerly there was discontent among patrons and constant loss among stockholders.

VOTE AGAINST STRIKE IN PITTSBURG

The vote of the employees of the Pittsburg Railways Company to express their sentiments on the question of the advisability of ordering a strike if the conference with President Callery of the company failed, has resulted in a decision to accept several minor concessions of the company.

MR. WESTINGHOUSE ON THE THIRD RAIL VS. THE TROLLEY

George Westinghouse contributes an interesting discussion on the third rail vs. the trolley in the New York "Evening Post" for Dec. 15. Mr. Westinghouse's letter follows:

"Replying to your letter of Dec. 12, concerning the third-rail question, I think the following points will be generally admitted:

"(1.) That the operation of the elevated trains by electricity has been an undoubted success, and an enormous advantage to the traveling public, notwithstanding the fact that the continuous third rail has been employed to supply the current.

"(2.) That the deaths and injuries to passengers and employees, considering the number of people involved, compare most favorably with any other railway operation in the world.

"(3.) That if a third rail, charged with an immense power of electricity, and located upon the surface near the other rails, is to be used for the supply of electricity to the trains, then there will always be a source of danger to those who have occasion to come near such third rail, and, in addition, there will always be a great source of danger, due to the fact that a car may be derailed, or that some iron material may become detached and make a short-circuit between such third rail and the train.

"(4.) That this third-rail danger may be lessened by the subdivision of the third rail into sections, with provision for the automatic supply of the required amount of current to each section only as required, but that such arrangement will only minimize the third-rail danger.

"(5). That such third-rail danger may be entirely obviated by resorting to the use of overhead conductors, for which the elevated structure is peculiarly suited.

"(6.) That there never was a good reason why the overhead wire should not have been used.

"In support of these last two propositions it may be stated that the third rail is impossible for use on main railways at important junctions and terminals; that the Pennsylvania Railroad does not propose to use the third rail in its underground work between New Jersey and Long Island; that the overhead wire was used at the Zossen experiments in Germany, when a speed of 120 m. p. h. was obtained; and finally, that the New York Railroad Commissioners have recently declared that they would not permit the use of a third rail on interurban lines crossed many times by highways.

"It may seem to be heresy to advocate the use of the overhead wire, but I venture to predict that there will be a complete revulsion of feeling on this point. When I speak of an overhead wire, I do not mean the slight construction which has prevailed, and the breaking down of which has occasioned trouble, but a substantial engineering arrangement so erected that it would, in fact, not be an offense to the eye. It is obvious that the use of an overhead trolley, with the removal of the third rail, would make impossible the present risks of short-circuits between the car or parts of the car and the third rail; but it would leave other questions yet to be settled: namely, first, the proper application of the electric apparatus to those cars, so that in no event could the passengers be frightened by a short-circuit visible to them, and this means that all of the wiring and electrical apparatus would have to be located beneath the bottom of a fireproof car and with no wires carrying large currents above the floors or near the ends of the cars which might be damaged by accident.

"I am satisfied, from my conferences with railway officials, that they are moving in the right direction and giving this subject the attention it deserves; but it must be borne in mind that it has required experience to demonstrate what is necessary for safety."

A NOVEL STRIKE

One of the most novel strikes on record was inaugurated on Dec. 2, by the order of the Charlotte, N. C., Street Railway Union. The Charlotte Electric Railway, Light & Power Company had seen fit to abandon the use of its electric heaters; and, for this reason, the employees refused to take the cars out of the car house on Wednesday morning, Dec. 2. The management gave the men until 9 o'clock to change their minds, which they refused to do: in consequence, the few cars that were operated were manned by the employees attached to the different departments, the managers and the superintendent. Outside of a greased rail and a few broken windows the company has suffered no inconvenience from the hasty action of the union, and the schedule has been properly maintained since 9 o'clock of the same morning. The officials who so promptly took the situation in hand were M. N. Latta, superintendent of the gas light and fuel department; E. D. Latta, Jr., superintendent of engineering and construction, and F. D. Sampson, superintendent of the electric power and street railway departments.

THE SOUTHERN PACIFIC AND ELECTRICITY

The Southern Pacific Railroad Company is again showing especial activity in the way of planning for the electrical operation of its local and suburban lines on the Oakland side of San Francisco Bay. Allan H. Babcock, who was electrical superintendent of the North Shore Railroad, during the construction of the electric lines from Sausalito to San Rafael and Mill Valley, Cal., has been appointed electrical engineer and attached to the maintenance of way department, under engineer J. H. Wallace. Mr. Babcock was sent East by the North Shore Company to study the best Eastern electric railway practice before constructing the North Shore system, which has been highly successful. It is understood that with his assistance plans and estimates will be prepared for the conversion of the Southern Pacific local steam roads in Oakland, Alameda and Berkeley into a modern electric system. Several years ago the Southern Pacific officials had an engineer of the General Electric Company engaged for some months on the same problem, but the expense and the difficulties of handling the heavy trains prevented a consummation. The recent opening of the local electric line of the San Francisco, Oakland & San Jose Railway Companies to Berkeley, in connection with new ferryboats and the Oakland Transit Company's street railway system, have roused the Southern Pacific Company to activity, and steps will be taken to improve the ferry and local service, so as to make as good time as the new system, which is known as the Key Route. It is probable that a large electric power house will be built.

CLEVELAND TRACTION MATTERS

President Springborn, of the Cleveland Board of Public Service, has submitted a plan to the Cleveland Electric Railway Company for relieving traffic congestion on the Public Square and on the leading downtown streets. Incidentally he proposes to work out the aims of his chief, Tom Johnson, and secure lower fares for the "suffering public."

At present the city cars operate through the Public Square east, west, north and south. The crossing in the center is thought to be the cause of many of the blockades. Mr. Springborn proposes to have tracks laid along all sides of the square and form loops around all four corners, with additional loops on several side streets near the Public Square. He proposes abolishing the through lines which now operate from one end of the city to the other through the square, and make all lines short lines, extending only to the Public Square and returning. Then he proposes that the company reduce its rate of fare to three cents, or ten tickets for a quarter, and abolish transfers, except in the case of the Wilson Avenue crosstown line, and a Union Station belt line which would traverse only the downtown streets. This would obviate the through town lines and oblige a passenger who desired to cross the city to pay another fare. On the basis of the company's own statement that 40 per cent of all passengers now ask for transfers, he figures that the company could eliminate all transfers and be able to reduce its fare 40 per cent.

President Horace Andrews, of the Cleveland Electric Railway, was asked for his views of the scheme by a STREET RAILWAY JOURNAL representative, and that railway official made it obvious in no uncertain terms that the company would never consider such a proposition. He stated that while the loop plan would undoubtedly relieve the congestion, it would cause an immense amount of changing cars in the center of the Public Square and would be a great annoyance to the public. The proposition of ten tickets for a quarter, he said, was out of the question, no matter how many transfers it would save. He said that a considerable portion of the people who ask for transfers only ride a short distance on the second car, and if asked to pay another fare they would walk rather than ride, even on the basis mentioned. No company could live and give so low a fare, he said.

Certain Councilmen recently attempted to force the company to operate its Scranton-Fairfield cars around the Public Square, but the resolution was voted down by the Board of Public Service. In revenge, the disgruntled Councilmen have announced that they will attempt to pass a measure barring all interurban cars from the Public Square.

President Andrews has suggested that much of the congestion might be relieved if the company were permitted to extend the four-track system now on Superior Street as far as Erie Street, thus giving two additional tracks through the Public Square.

PUBLIC HEARINGS IN CHICAGO

The new franchise ordinance of the Chicago City Railway Company has been undergoing the ordeal of a set of public readings in Chicago, at which various individuals and organizations have had opportunity to appear before the Council committee and give their views on the subject. This committee happens to be composed of an unusually well-informed body of Aldermen who have been studying the street railway situation carefully and conscientiously for a number of years. They have listened with remarkable patience to the tirades of those who have nothing to offer but visionary schemes and abuse of the committee and of the companies. However, after listening to many hours of impractical, and at times insulting, talk, it is satisfactory to note that the chairman of this committee announced that nothing more of the kind would be tolerated and that those having their views to present must present them in a businesslike way, must give something besides generalities, and must formulate some definite, practical plans for carrying out their ideas. After reading the reports of several unfruitful sessions before this committee, it is refreshing to see the attitude taken by the Civic Federation of Chicago. The report of the Civic Federation franchise committee presented to the Council committee condemns strongly the municipal ownership idea, on the ground that it is impractical at present, would involve several years of litigation which the city might and might not win, and that important improvements must be made for which the city has not the money, even if it had the street railway lines. The committee recommends the passage of the Chicago City Railway proposed franchise ordinance as now drawn up, with the insertion of a suitable compensation clause, although its views as to the proper compensation are not stated.

Municipal ownership advocates were given another shock last Monday evening, when the Taxpayers' Association of the Tenth Ward, which is supposed to be the very hot-bed of municipal ownership, sent a communication to the Mayor and members of the Council opposing municipal ownership.

CHICAGO UNION TRACTION MATTERS

Judge Grosscup heard the petition of the receivers for making improvements in the Chicago Union Traction System Dec. 10. The attorneys for the company and city both appeared in court at that time to show cause why the court should or should not order the city authorities to issue permits for certain extensive improvements contemplated. The judge announced that his ruling in this case was entirely independent of any recommendations he might make to the receivers. The judge said that his proposal for the changes in the system for bettering the service pending a settlement of all matters with the city was made on the theory that the city would consent. He had now to consider the case in the light of the city objecting, without regard to he receivership, of which he has charge.

Judge Grosscup has asked Justice William R. Day to sit with him in the hearing of the arguments on the ninety-nine year act in January. From the decision of Day and Grosscup the case, it is thought, can be immediately appealed to the Supreme Court of the United States without the intervention of any other courts, and if the case could be brought to a trial before the United States Supreme Court in Washington next October, the company's legal rights would probably be settled inside of a year from now.

UNION BUTTONS CAUSE MORE TROUBLE IN CHICAGO

The wearing of union buttons by the union employees of the Chicago City Railway Company continues to cause serious outbreaks by passengers against non-union employees. The demonstrations against the non-union men are particularly bold in the stock yards district. On Dec. 10 a car on the Halsted Street line had all the glass broken and seats ruined by a mob which drove the motorman and conductor from the car at Halsted Street and Archer Avenue. Traffic was blocked for over an hour while the wrecking crew was at work on the car to clear the line. The trouble occurred owing to the refusal of passengers, among them several women, to pay fare to the conductor, who wore no union button. When the nickels were refused he announced that the car would stop unless the money was paid. At this several of the passengers in the car seized him, while others proceeded to the front platform and ordered the motorman to start the car. At first the motorman refused, but when one of the passengers exhibited a revolver he started the car and did not stop until Archer Avenue was reached. The high-handed practice of the union in refusing to order the men to stop wearing the buttons has been endorsed by the Chicago Federation of Labor, which has actually adopted a resolution ordering trade unionists to refuse to pay fares to conductors who have not the insignia of the street car union.

STORING CARS IN THE OPEN IN CLEVELAND

The Cleveland Electric Railway Company has decided to adopt the plan followed in Detroit of storing cars in yards, after the manner of steam roads, rather than in car houses. The recent fire, in which the company lost about seventy-five of its best cars, caused the company to investigate the plan and it has now been decided to adopt this method. At the present time the company is storing about 150 cars outdoors. The company will not rebuild its car house on Pearl Street, but will clear away the ruins and utilize the tracks for outdoor storage. In favor of this plan, it is claimed that there is less danger of loss from fire and that where cars are kept painted properly the damage from exposure to the weather is not serious. The present large car houses will be utilized largely for cars which are out of season.

THE RIGHT TO ASSESS INTERURBAN LINES IN IOWA

The right of the Executive Council of Iowa to assess interurban railway companies for taxation purposes is to be questioned by the Cedar Rapids & Marion City Railway Company, which operates between and within the cities of Cedar Rapids and Marion. The company's officials have asked for the issuance of a writ of certiorari requiring the members of the Executive Council of the State, the said council being composed of the Governor, Secretary, Auditor and Treasurer of State, the members of the Board of Supervisors and the County Auditor of Linn County, to certify their records to the district court of Linn County for review. The Executive Council, through the Attorney General of the State, opposed the issuance of the writ on the ground that the Executive Council represents the executive powers of the State and is not subject to review by the district courts, and also that the acts complained of were legal. Judge Thompson ordered the writ issued as prayed and the Attorney General appealed. The Supreme Court will take up the case at the January session, 1904.

At the session of the Executive Council in July, 1903, as an assessment board, the property of the Cedar Rapids & Marion City Railway Company was assessed for taxation purposes for the first time under the law passed by the Twenty-ninth General Assembly of Iowa in 1902, providing for the assessment of all interurban railways by the Executive Council. Heretofore the company had been assessed locally. The Council found the length of the track of the company to be 12.06 miles, fixed the actual value thereof at $14,024 per mile, and the assessed value thereof at $3,731 per mile. Section 3 of the act authorizing the assessment of interurban railways to be made by the Executive Council reads as follows:

"Any interurban railway shall, within the corporate limits of any city or town, or of any city acting under a special charter, upon such streets as it shall use for transporting passengers, mail, baggage and such parcels, packages, and freight as it may carry in its passenger or combination baggage cars only, be deemed a street railway and be governed by the laws affecting street railways."

The officials of the railway company take the position that their company is a street railway company, as all but about three-quarters of a mile of the total mileage of the line is within the corporate limits of Cedar Rapids, Kenwood Park and Marion: that the company should be assessed for taxation purposes under Section 1343 of the Code of Iowa, which provides for the assessment of street railways by the local authorities. The question at issue arises out of the interpretation to be placed on Section 3 as above given. The Executive Council contends that the above section was put in the act for the sole purpose of exempting the interurban companies from assessment of damages by abutting property owners, so long as they conform to its requirements in regard to transporting baggage and freight, and that is does not apply to assessment of interurban railways at all. On the other hand, the officials of the company claim that the section means not only that interurban companies in city limits should be called street railways, and governed by the laws exempting such companies from assessments of damages by abutting property owners, but also by the laws governing the assessment of street railways.

The case is an important one and its final result is awaited with much interest. If the Supreme Court sustains the issuances of the writ by the district court, the case will then come up for trial at once. If not, the company will seek some other way of bringing the case to an issue. This section will no doubt be amended at the next session of the Legislature which convenes in January in a way which will leave no doubt as to its meaning.

ENGINEERING PUBLICATIONS

The first number of Engineering Book Notes, containing a list of 400 engineering books published since Jan. 1, 1903, with a few issued late in the year 1902, is now being distributed by the McGraw Publishing Company. It is announced that this will be a monthly publication, and that it will deal very largely with engineering books which have appeared during the previous month. Subsequent issues will include also the books of a single month and will be supplemented by extended mention of important new books. It is also announced that in the next issue an index to electrical and engineering literature will be presented. The present number contains some interesting information regarding new books on engineering topics and other works now in course of preparation. The first number contains 32 pages and is a very valuable list of recent publications in this line.

A "Classified Catalogue of Engineering Books" is issued by the same company, covering the standard works in every line of modern engineering, and containing 96 pages. It is a very complete list, and contains a summary of the contents.

JOURNAL OF WESTINGHOUSE SHOP EMPLOYEES

"The Electric Club Journal" will be the title of a publication to be issued by the Electric Club, of Pittsburg, made up principally of the officers and employees of the Westinghouse Electric & Manufacturing Company. The first number of this journal will be issued on Feb. 1, 1904, and it is proposed to have it appear monthly thereafter. In addition to its engineering work, the club affords an opportunity for the social entertainment of its members through a series of dancing parties, whist and chess clubs and musical entertainments, as well as athletic exhibitions. The purpose of the club is primarily to supplement in a general way the shop practice of the members in much the same manner that laboratory or shop practice in colleges is relied upon to round out the course of textbook classes and the lecture room. The chiefs of departments in Westinghouse works will favor the club with lectures and informal discussions of practical subjects at frequent intervals, and it is now proposed to embody a record of these transactions in the "Electric Club Journal."

STORAGE AIR BRAKES FOR ST. LOUIS

In a short item published in our last issue an error was made in stating that the order for storage air-brakes placed recently by the St. Louis Transit Company was awarded to the National Electric Company. This order is probably the largest single order which has ever been given for air-brakes by a street railway company, and calls for 1500 storage air-brake equipments and forty station storage air-compressor outfits. The order for the equipments is being filled by the Westinghouse Traction Brake Company, while the Ingersoll-Sergeant Drill Company is filling the orders for the air-compressors. The St. Louis Transit Company placed this order largely in view of the coming enormous traffic which is expected during the summer of 1904 on account of the St. Louis Exposition. The St. Louis Company has also ordered from the Westinghouse Electric & Manufacturing Company 450 car equipments, each consisting of four No. 95 Westinghouse motors. This is a new type of motor being manufactured at East Pittsburg, and is designed for oil lubrication throughout, in place of grease.

MITIGATING THIRD RAIL DANGERS IN NEW YORK

Replying to the report of the State Board of Railroad Commissioners that the third rail on the Manhattan Elevated should be protected so that passengers and employees will be safe-guarded against accidentally coming in contact with it, E. P. Bryan, president of the Interborough Rapid Transit Commission, writes to the State Board that the company is trying to devise a plan for protecting the third rail, but that it is impossible to do anything this winter. Mr. Bryan says in his letter:

"We have plans that are now being carefully considered. I beg to advise that we have not at present anything with which we are sufficiently satisfied to submit to you. We have installed additional telephone stations, so that now every station on our line, on both sides, is being connected independently with the power station and the sub-station, and we have written Commissioner Sturgis that we can guarantee that the interval between notice from the fire department of their desire to use the structure and the time of shutting off the current will be very brief, indeed, which will be much better than any protection to the third rail. Of course, whenever the fire department comes upon the structure and places the hose across, it immediately stops traffic, and the current should be shut off, and this can be done."

BIDS FOR THE PENNSYLVANIA RAILROAD TUNNEL

Bids for the construction of the Pennsylvania Railroad's fifty-million-dollar tunnel connecting New Jersey with Long Island by way of Manhattan Island were opened on Tuesday, Nov. 15, at the company's offices in New York, in the presence of the chief operating officials and engineers, and it was announced by the officials that a cursory examination showed them to be within the company's estimate. The principal bidders were:

O'Rourke Construction Company, of New York, which put in a bid only for the land portions of the tunnel, including the work under the Borough of Manhattan, together with the great depot and the work in New Jersey and Long Island.

John B. McDonald, who bid for the whole job.

Andrew Onderdonk, who bid only for the sections under the North and East Rivers.

A Philadelphia company, which bid through a dummy for the whole job, without disclosing the names of the principals.

A Chicago syndicate, which also bid through a dummy for all the work.

New York Contracting & Construction Company, which bid for the land work only.

Mr. Pearson, an English contractor, who is said to have bid for the river sections of this job.

Charles Sooysmith and an undisclosed partner, the details of whose bid could not be learned.

United Engineering & Contracting Company, which bid for the land sections.

John Peirce Company, the terms of whose bid were not disclosed.

NEW BOND ISSUE OF THE TWIN CITY RAPID TRANSIT COMPANY

The Minneapolis Street Railway and the St. Paul City Railway, both controlled by the Twin City Rapid Transit Company, of Minneapolis, Minn., have jointly made an issue of 5 per cent consolidated mortgage gold bonds, due in 1928, authorized issue limited to $10,000,000. These bonds are secured by direct mortgage lien, subject to existing bonds, on all the properties of the two companies, whether now owned or hereafter acquired, including the entire street railway systems of St. Paul and Minneapolis, with their power houses, equipment, real estate, etc. The present issue will be only $3,500,000. It will reimburse the Twin City Rapid Transit Company in part for expenditures made in providing important additions and facilities required by the growing traffic, including the cost of erecting a large new steam electric power plant; new motor cars of the largest size for street railway service; new track construction, and other revenue-producing development work, for which the company has been compelled to make provision in order to meet the demands of the steadily growing traffic.

The mortgage is intended to provide for the present needs and the future growth of the Twin City Rapid Transit system. The apportionment of the bonds follows: Reserved, to retire the going general mortgage bonds of the Minneapolis and St. Paul Companies, due in 1911, $1,000,000; issuable to pay for new power house, equipment, track construction, new extensions, etc.; issuable only for future expenditures, etc., at 90 per cent of actual cost, $5,500,000.

NEW PUBLICATIONS

Calendar of Invention and Discovery. By John C. Wait. Published by McGraw Publishing Company. Cloth, $1.00; Wall Calendar, 60 cents.

The compiler of this calendar is well known in railway circles, having been associate editor of the "Railroad Gazette" for a number of years, and as having charge of the 1895 edition of the "Car Builder's Dictionary." He is also the author of "Engineering and Architectural Jurisprudence," and is a prominent attorney in New York City. Mr. Wait deserves the thanks of the entire engineering fraternity for his present work, which has been compiled with a great deal of care. For each day he has found a number of events of engineering interest. He has also given for each day short biographical notes concerning two prominent inventors or engineers, and has followed these sketches with one or more appropriate quotations from classical writings. Opposite nearly every calendar page, in the cloth edition, a page is left blank for notes. In addition a number of illustrations of

engineering interest is included. Indices are published of persons mentioned, inventions, quotations and illustrations.

Poor's Manual of Railroads for 1903; 1720 pages. Price, $10.

Published by H. V. & H. W. Poor, New York.

This is the thirty-sixth annual number of this well-known manual, and contains statistics in most cases for the fiscal year ending either June 30 or Dec. 31, 1902. The volume is considerably larger than in previous years and the statistics more complete than ever before.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED DECEMBER 8, 1903

746,160. Trolley Guard and Finder; William F. Reichenbach, Rochester, N. Y. App. filed June 13, 1903. Flaring arms project from the fork and have elongated, inclined rollers to receive the wire in case it becomes displaced and return it to the wheel.

746,170. Switch Operating Mechanism; Theodore Rundorff, Burlington, Ia. App. filed Sept. 26, 1903. Comprises a pivoted member journaled upon the platform of a car, a detachable end portion of the member projecting above the platform, a projection carried by the member and arranged in the path of a portion of the switch to be operated upon.

746,172. Brake-Shoe and Process of Making Same; William Durham Sargent, New York, N. Y. App. filed June 26, 1902. Consists of forming a shoe with recesses extending from the back toward the face, whereby when the shoe is worn back to a point beyond said recesses a new wearing sole may be cast thereon.

746,340. Underframing for Railway Cars; George I. King and John H. Frank, Middletown, Pa. App. filed Sept. 19, 1903. Details of construction of the main framework of a car.

746,351. Trolley; Frank A. Merrick, Johnstown, Pa. App. filed March 12, 1902. Strap springs carried by the wheel pass through holes in the hub and rub against the fixed axle to give good contact.

746,357. Fender for Street Vehicles; Emilie Munte, Langenfelde, Germany. App. filed March 17, 1903. A roller of soft elastic material projects from the front of the car and is continuously rotated in a direction opposite to the direction of movement of the car.

746,395. Underrunning Trolley for Electric Railways; Charles A. Singer, Larchmont, N. Y. App. filed Feb. 7, 1902. The fork carries two trolley wheels, either of which can be thrown into service at will.

746,417. Apparatus for Use in Electric Traction on the Conduit System; Edouard Vedovelle, Paris, France. App. filed April 7, 1899. Relates more particularly to the construction of a conduit and to the protecting and covering of the conductor therein.

746,424. Trolley Pole; Thomas F. Wetton, Newark, Ohio. App. filed Aug. 29, 1903. Details.

746,436. Hanger for Trolley Wires; Juan Antiga, Mexico, Mex. App. filed July 1, 1903. The hanger is made up of two hinged parts to which the ends of the wire are attached; when the wire breaks, the corresponding part tilts to operate a circuit controller which renders the fallen wire dead.

746,437. Hanger for Trolley Wires; Juan Antiga, Mexico, Mex. App. filed July 1, 1903. A modification of the preceding invention.

746,512. Electric Railway; Robert Hubner, New York, N. Y. App. filed Dec. 19, 1902. A third-rail covering-plate built in sections which are lifted successively by a plow in advance of the collector.

746,556. Cover for Third Rails; Harry C. Morgan, Lagrange, Ill. App. filed May 9, 1903. A two-part box hinged to a suitable support and adapted to be swung open by the action of a plow carried by the car.

746,610. Generator or Motor Suspension; Montgomery Waddell and Henry K. Brooks, New York, N. Y. App. filed Feb. 24, 1903. Details.

746,614. Trolley Pole; Edwin A. Wakefield and George W. Morse, Mechanic Falls, Maine. App. filed July 8, 1903. A device preventing the pole from flying upward when the wheel leaves the wire.

746,644. Railway Switch; James P. Pulsifer, Philadelphia, Pa. App. filed May 23, 1903. A wheel provided with radial teeth on its periphery is set in the roadbed, and when reciprocated by a lever from a passing car, moves the switch point to which it is connected.

PERSONAL MENTION

MR. PAUL DOHRMAN, formerly division superintendent on the Detroit United Railway, has been appointed assistant general superintendent under Mr. Harry Bullen, who was recently made general superintendent.

MR. F. A. BOUTELLE, formerly superintendent of the Hudson Valley Railway, of Glens Falls, N. Y., has been appointed superintendent of transportation of the Columbus, Buckeye Lake & Newark Traction Company's system, with headquarters in Newark.

MR. ROBERT J. MERCUR has been promoted from the position of manager of the Hamilton branch of the Canadian Iron & Foundry Company to the position of manager of sales on the executive board at Montreal, the head office of the company. Mr. A. E. Domville succeeds Mr. Mercur as manager of the Hamilton branch.

MR. EDWARD O'HARA has been appointed superintendent of the Lorain Street Railway, of Lorain, Ohio, succeeding Mr. T. G. Cherry, who has gone with the Saginaw Valley Traction Company, of Saginaw, Mich. Mr. O'Hara formerly was with the Muskegon Traction & Lighting Company, of Muskegon, Mich., where he started as a motorman. He became despatcher on the Lorain Street Railway in 1895.

MR. A. H. BABCOCK has resigned his position as electrical engineer of the North Shore Railroad Company, of San Francisco, and has been appointed electrical engineer for the Southern Pacific Company. In his new position Mr. Babcock will have charge of all the electrical work of the company, which will include repairs and maintenance of existing apparatus, with the engineering and design of new work. He is attached to the maintenance of way department, with headquarters in San Francisco.

MR. F. L. WANKLYN has resigned as vice-president and general manager of the Montreal Street Railway, and the Montreal Park & Island Railway, of Montreal, Que. It is said that he will become vice-president of the Dominion Coal Company and that he will also be vice-president of the Mexican Light & Power Company. It is said, unofficially, that Mr. R. W. Blackwell will be elected as his successor with the Montreal companies and that Mr. W. S. Ross will become managing director of the company. Another announcement of a change in the personnel of the companies is the appointment of Mr. P. Dube as secretary.

MR. SAMUEL J. DILL, superintendent of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway for the past two years, has accepted a position as superintendent in charge of the Michigan Traction Company's property in Michigan, which consists of the city lines in Kalamazoo and Battle Creek and the interurban line between these cities. His headquarters will be in Kalamazoo. Mr. Dill, during his service in his present office, by his tact, industry and faithfulness, made many friends for his line and himself. He was formerly connected with the train service of the New York, New Haven & Hartford Railroad and later with the operating department of the Metropolitan Street Railway, of New York City.

MR. EDWARD E. GATES, claims attorney of the United Railroads, of San Francisco, and one of the foremost men in that line in the country, severed a very successful career with the United Railroads on Dec. 1, 1903, to engage in the general practice of law, which he believes offers greater advantages than his present position. Mr. Gates was born in 1871, and is now nearly thirty-three years of age. He graduated from Yale in 1891, studied law at the New York Law School, New York City, and took a degree of L.L.B. from the Indianapolis Law School, of Indianapolis, Ind. After practicing law for about six years in that city he abandoned his law business in 1900 to assume the duties of assistant claims attorney of the Southern Pacific Company, resigning his position to accept that of claims attorney of the United Railroads of San Francisco in March, 1902, at the time that company was organized. Mr. Gates is a director in the Union League Club, of San Francisco, and served with the 27th Light Battery, Indiana Volunteers, in the Spanish-American War.

E. E. GATES