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PRESIDENT HENRY'S LETTER

We are glad to publish in this issue a letter from President Henry addressed to the members of the American Electric Railway Association and the American Electric Railway Manufacturers' Association explaining in detail the amendments to the constitution adopted at Chicago. As shown by him, their purpose is to provide an invitation to the manufacturers to become full members of the association, and they do not legislate the Manufacturers' Association out of existence. The railway association needs not only the support of the manufacturers but their advice and help in all its councils. The adoption of the amendments makes this possible in the future. If there has been a fear on the part of the manufacturers that their membership in what might be called the "new" association was to be nominal—not real, this idea should be dissipated by President Henry's letter and his plea for united effort in a common cause. These words mean that the proposed co-operation is to be not only by all but for all, and under such a policy results ought to be attained which could not be secured without pooling the interests of all of those concerned in the industry.

THE TECHNICAL COMMITTEES OF THE A. I. E. E.

An interesting discussion as to the relation of the American Institute of Electrical Engineers to societies with activities overlapping its own was a feature of the opening session of the midwinter convention held in New York this week. The Institute is now organized with a number of technical committees, one of them being the railway committee, to which is assigned the duty of bringing out timely papers and discussion in their respective fields. The big problem for these committees and the Institute is so to divide the field with the national societies which devote themselves to specialties that there may be no duplication of effort and that each may perform the function for which it was organized. The A. I. E. E. technical committee on electric railways has devoted most of its attention recently to heavy electric traction. The American Electric Railway Engineering Association has a committee on this subject. Now it is evident that the purposes of these two committees must be different or they will be in competition, which would be an uneconomical condition. There must be a fundamental principle whose application will determine whether a given paper or discussion is appropriate for an A. I. E. E. meeting, or should be incorporated in an A. E. R. E. A. report, or should be published through the technical press. What applies in this example applies equally, of course, in a dozen other fields. The principle was touched upon in the discussion of D. B. Rushmore's paper, the presentation of which provided

the occasion for considering the topic at this time. This principle is that the function of the Institute is to consider the fundamentals of electrical engineering rather than the detailed applications, leaving the latter to the societies organized and especially qualified to handle them, and to the technical press. Only by confining attention to the elements more or less common to all branches of electrical engineering can the Institute hope to meet the demands upon it within the limitations of its resources.

CHICAGO COMMISSION IS NON-POLITICAL

It is indeed refreshing to see a large city like Chicago, when confronted with an important transportation problem, select for its solution a non-political commission of engineers of the highest caliber obtainable in this country. Such men as William Barclay Parsons, Robert Ridgway and Bion J. Arnold manifestly could not have been chosen if political pressure had been brought to bear upon their appointment. Just a decade ago Mr. Arnold was employed by Chicago to prepare plans and specifications for the traction settlement ordinances which were reported to the City Council in December, 1905. The choice was a fortunate one, and the Board of Supervising Engineers, Chicago Traction, was the result. For the past five years there has been considerable agitation and committee work on the question of improved local transportation, but in each instance politics entered, with the result that nothing was accomplished. During this five years of consideration, the traction situation, particularly in the downtown district of Chicago, has continued to grow more critical and has reached a point where everyone realized that something must be done and done immediately. At a meeting of the local transportation committee of the Chicago City Council held last fall, Samuel Insull, chairman of the Chicago Elevated Railways Collateral Trust, and L. A. Busby, president of the Chicago Surface Lines, upon invitation, recommended a course which they believed would lead to an early solution of Chicago's transportation problem. The committee followed the recommendations of Messrs. Insull and Busby to the letter and, after a most painstaking inquiry into the qualifications of some sixty engineers, the present commission was selected. Its make-up was unanimously approved by the sub-committee and the local transportation committee, and as a further expression of confidence the City Council passed the ordinance creating the commission by a vote of 57 to 8. A well-balanced commission was what the sub-committee endeavored to select, as well as one of which some of the members would be from outside of Chicago. With Mr. Parsons, experienced in the solution of many important trans-

portation problems in other cities, with Mr. Arnold, thoroughly grounded in the local requirements, and with Mr. Ridgway, the construction expert, pre-eminent balance was obtained, and the findings of such a body will doubtless receive most serious consideration on the part of the city and the transportation companies.

GOOD WORKMANSHIP CANNOT BE HAD BELOW COST

Recent rumors seem to indicate that at least some of those who took rather heartless advantage of the market conditions of the past year and a half have had reason to rue it. Competition for supplying electric railway equipment never was more keen than during this time, for the cumulative effect of the general business depression and competition by jitney bus and automobile created an unprecedented shrinkage in railway earnings with a consequent limitation of purchases. Price cutting was inevitable on the part of manufacturers to keep their plant organizations intact, and the invariable tendency of purchasing agents to play one bidder against another forced many sales at prices which have been commonly termed "below cost."

As a matter of fact, we doubt whether cars are ever sold below cost. If the truth were known concerning all the conditions surrounding the closing of these contracts at abnormally low figures it would be found that the purchasers were extremely liberal in their specifications. Indeed, there were instances where absolute freedom was granted as regards the details, and where competition becomes sharp advantage is bound to be taken of any leeway in the specifications to reduce the amount of the bid. Skimping may, perhaps, be introduced most readily through the substitution of cheap car-body equipment for the material that would normally be expected, because a large percentage of the cost of a car is set aside for specialties such as heaters, brakes, ventilators, destination signs and the like, and there are many types of each on the market. But if, in addition, the manufacturer is forced to cut his price below the normal cost of labor and material, his product must bear the brunt of this cut, either in imperfect workmanship or low-quality materials, and when this is the case it is only to be expected that unsatisfactory service results should follow.

As an example may be cited a recently-discovered case where, in six holes that were punched in a 4-in. cross-bearer, there were only three rivets, and even when the rivets were placed, instead of being upset with button-heads the ends were simply bent over, looking as though the alleged riveting had been done cold and with a hand hammer instead of an air-driven tool with a rivet set. In another case where two trucks had been built to the same specifications but by different companies, one manufacturer had followed the drawings to the letter, while the other had substituted different sections and castings until the two trucks, placed side by side, actually looked like two radically different designs. When the substitutions were made, the tendency was to put in lighter sections and castings, and this circumstance is hardly surprising in view of the fact that the equipment had

been purchased materially below the average market price. As we see it, this is a commercial age and manufacturers are in the business for profit—not as philanthropic institutions. When a purchasing agent thinks he can obtain something for nothing he is fooling nobody but himself.

THE STRATEGY OF STOPS

It is well understood among electric railway men that unnecessary stops slow up traffic and that it is desirable to make the minimum number of stops which will thoroughly well serve the patrons of the road. But to meet this requirement in city service demands something more than stops at certain designated streets and reasonable care in selecting the corners which by reason of heavy traffic concentrated there plainly indicate the necessity of a stop. It is necessary to examine somewhat into the habits of the traveling public and the local conditions in order to determine just where a stop will do the most good.

For instance, it is the custom among most companies to halt regularly to receive or discharge passengers on either the near or far corner of the street. Consistency in this respect on any one system up to a certain point is desirable, but it should not be allowed to override every other consideration. On a particular cross street conditions may and often do exist which produce a decided preference for one side or the other of the street as the suitable point for stopping the cars, and that point, irrespective of precedent, should be unhesitatingly chosen. It is not absolutely necessary that cars should systematically stop on a particular side of the street provided the stopping place is, as it should be, so plainly marked that the public can make no mistake. It is important that the stops should be made accurately at the same point and at such point as will give the passengers the best chance to get on and off the cars. Nothing is more inconvenient or annoying to the patrons of a road than to be uncertain within 60 ft. or 50 ft. as to where the car is likely to stop and then probably to find it far off the crossing in a sea of mud. It is worth something in the saving of time, if for no better reason, to have the stop made accurately in a place where the passengers can get on and off promptly.

A little attention to picking out those stopping places which best meet the traffic conditions will save time in the runs, make friends, and probably eliminate some needless stops. As a shining example of what a little judgment may do in this matter we may refer to a change worked out in Boston where the stopping place of the cars emerging from the subway was shifted from the west to the east side of a particularly busy cross street infested with automobiles to an unusual degree. The change was a very simple one, fortunately helped by the construction of a suitable place of boarding the cars, but the result has been altogether admirable in serving the convenience of the public, avoiding as it does for the most part the crossing of a particularly troublesome street at a specially bad point. Another instance is at Thirty-second Street and Broadway, in New York, where the cars stop at the far side instead of the near side of

the street as on most parts of the rest of the system. Almost any road can find, with a little judicious foresight, similar cases in which change from one side of the street to the other in the stopping place would be similarly advantageous.

This plan is in line with the main purpose of the skip-stop idea, namely, that stops should be selected at points which will be of the greatest convenience to the majority of passengers and not arbitrarily located at every cross street. So long as the actual traffic conditions indicate a series of stops entirely regular in the geographical sense, very good; when they indicate a departure from this regularity, it ought to be made without hesitation, provided these exceptions are conspicuously marked.

We hope that the time will come when the fetish of a stop at every cross street when passengers wish to board or alight will no longer be believed. It has been respected too long, because it is obvious that if the practice is followed in cities where the blocks are eight to the mile, many unnecessary stops are made when the blocks are twenty to the mile. It is important, it is true, for the intending passenger to know where the car will stop, but this fact can be indicated just as well by signs on the poles or by some other distinguishing mark as it can be by making a stop at every corner. Experience with the plan of reducing the number of stops shows that the convenience of the public is conserved thereby.

INDUCTIVE INTERFERENCE IN HEAVY TRACTION

At the present time one of the most important but little-understood considerations in the field of heavy electric traction is that of the local inductive interference with telephone lines along rights-of-way. The difficulty, of course, is more serious as regards the effect upon commercial wires, which even may not be actually on the right-of-way, than upon the railroad company's wires, because there seems to be a well-defined sentiment in favor of putting the latter in cables underground if only to assure the physical safety of the railway's means for communication. Although underground installation of wires in twisted pairs would likewise reduce the troubles of commercial lines, the fact remains that such circuits are likely to remain overhead for years to come, and for this reason the problem of avoiding interference with them will be a live one until some universal and inexpensive solution is found.

Such a solution is far from apparent to-day, when comparatively little is understood about the real causes and possibilities of remedying the trouble, yet some definite progress at least has been made. In alternating-current installations experience has shown that stub-end feeds must not be made, and that transformer stations must be located at the ends of each line as well as at intervals along it. Thus, a train in any location will always draw current from both directions, the greater current flowing from the nearest transformer station, or from that direction in which the least length of wire exposure exists. The lesser current-flow from the other direction is compensated for by a greater length of wire capable of producing interference, so

that in effect, the inductive action of that part of the line ahead of the train is counterbalanced by the action of the line at the rear, the two approximating equal and opposite effects which neutralize each other.

An equivalent result has been reached on the New Haven by the use of a so-called three-wire system which is, however, by no means the same as the old scheme used in direct-current lighting whereby the load is approximately balanced on either side of a central wire. Instead, the rail is divided into short sections connected at the ends through 2:1 auto-transformers to the trolley which is at 11,000 volts above the rail potential, and to a negative feeder whose potential is 11,000 volts below that of the rail. Current flowing in the trolley is offset by an equal and opposite return in the negative feeder, the flow in the rail being bidirectional and practically confined to the section occupied by the train. This plan has the important advantage of transmission at double generator voltage, but it involves the use of numerous large auto-transformers which work at a low load factor unless the traffic is extremely dense. The arrangement has proved very satisfactory under the circumstances existing on the New Haven, although the two most recent a.c. installations, namely: the Norfolk & Western and Philadelphia electrifications, have the simple rail-return scheme in connection with transformer stations at 10-mile intervals and frequent small booster transformers to confine the return currents to the track rails.

Either one of these two general plans appears to produce good results, and the choice between them is practically independent of the question of relative ability to control inductive interference of a.c. lines. Nevertheless, it is patent from the cost and complication that the common principle of neutralization by opposing parallel currents does not constitute the last word in the elimination of such disturbances. These, it would seem, may even appear in connection with d.c. circuits if the potential and current flow are sufficiently high, because reports of interferences with telephones along rights-of-way served by high-voltage d.c. contact wires have recently been in evidence.

In consequence, there is good reason to believe that it is the higher harmonics, rather than the fundamentals of the current waves, which are responsible for interferences, one case of local disturbance having been traced to the influence of the commutators on a lot of air-compressor motors, and this, together with the indefiniteness that surrounds all problems dealing with the indeterminate paths followed by earth currents, indicate the vast extent of the unexplored portion of the field. It is not unreasonable to suppose, therefore, that the development of induction-proof commercial lines, even aside from installation underground, offers just as good an opportunity to mitigate the evil as the elimination of the inductive action of the railway wires. Certainly, if such an improvement should be commercialized, it would work a distinct advantage to electrification, as the cost of induction prevention may easily reach disproportionately large figures when applied to a long line lacking dense traffic.

Additions to Rhode Island Power Plant

The Manchester Street, Providence, Plant of the Rhode Island Company Has Recently Been Extended, the New Equipment Being Typically Modern—Very Large Turbine Blowers Are a Feature

POWER for the operation of most of the electric railway in the State of Rhode Island is furnished from the plant of the Rhode Island Company located in Providence. The history of the plant is typical of the changes which have been taking place in this field during a dozen years past. In the issue of the *ELECTRIC RAILWAY JOURNAL* for Sept. 23, 1911, horizontal and vertical sections of the station as it then existed were given, and in an accompanying article the chief engineer of the company described the reasoning which led to the conclusion to substitute steam turbines for part of the engine equipment originally installed seven years before. Recently the building has been enlarged and another turbine, with boilers and auxiliary equipment, has been added.

BOILERS

The equipment is housed in a steel and brick structure with concrete foundations and there are now two stacks, one for the original boilers and another for those in the extension. The original sixteen 520-hp. B. & W. boilers are installed on two decks and they discharge their flue gases into a brick stack 312 ft. high and 16 ft. inside diameter. The new installation consists of eight 625-hp. Bigelow-Hornsby boilers, also divided equally between decks and delivering gases into a breeching leading to a chimney 200 ft. high and 21 ft. inside diameter. In the operation of the station the older boilers are now held in reserve, the load being carried mainly on the turbo-driven generators, one of which suffices to operate virtually all the cars in the State except on the service peak.

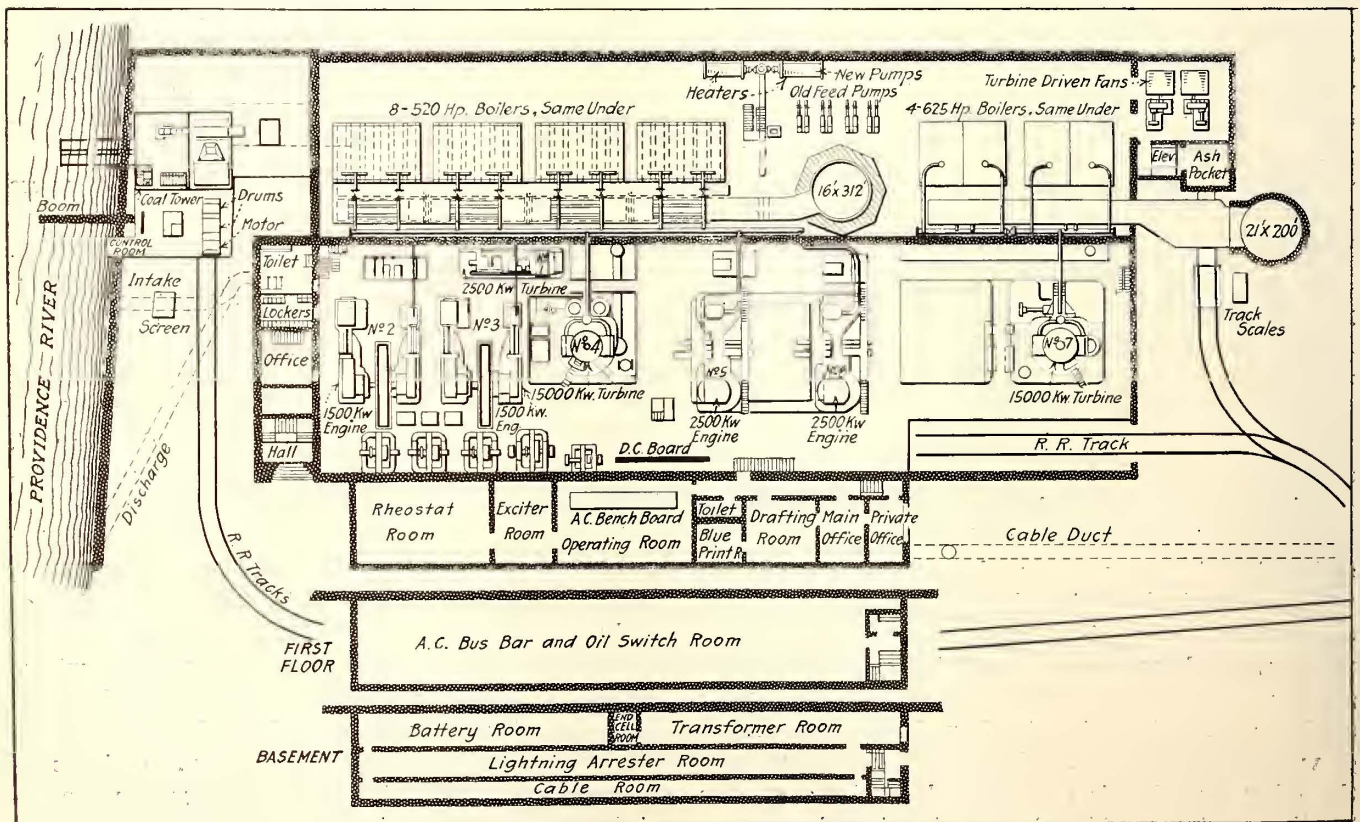
The steam pressure is 200 lb. per square inch and the turbines are run on 125 deg. Fahr. superheat. Above the older boilers is a 3000-ton coal bunker and there is a 973-ton bunker above the new batteries. The eight Bigelow-Hornsby boilers have carried the entire station peak at its maximum of 23,000 kw. The output of the station was 66,731,000 kw.-hr. in 1915.

ELECTRICAL MACHINERY AND CONDENSERS

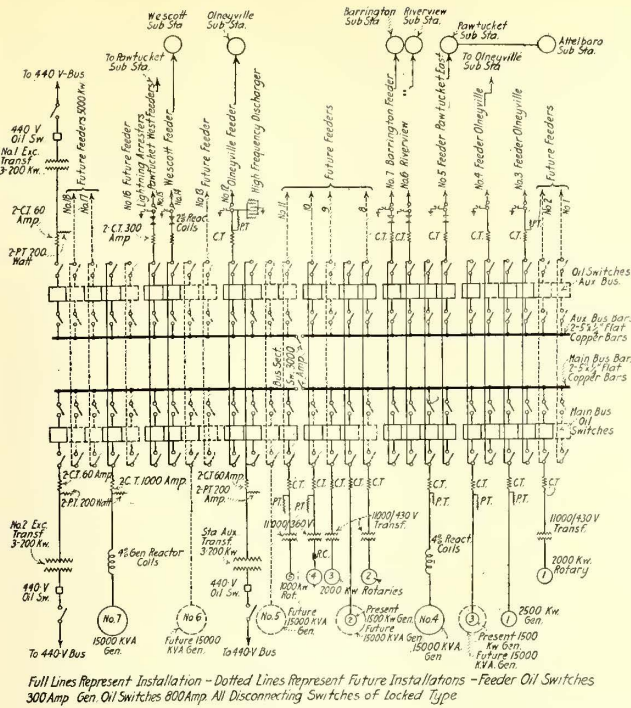
The 15,000-kw. turbines are both of the General Electric vertical type, delivering power at 11,000 volts, three-phase, and 25 cycles. The other generating units consist of two 1500-kw. horizontal engine-driven General Electric generators supplying 11,000-volt power; one 2500-kw. horizontal Westinghouse turbo-alternator wound for 11,000 volts; and two 2500-kw. Westinghouse and General Electric 600-volt d.c. generators driven by vertical engines. All of the reciprocating engines are of the cross-compound condensing type and are held in reserve, except that one generator is frequently used over peaks in winter to help out the rotaries. Minimum loads can be carried on the horizontal turbine set.

Five rotary converters aggregating 9000-kw. rating are installed in the station to supply direct current for local trolley service.

The engines exhaust into Blake twin vertical condensers, an Alberger jet condenser being provided for the 2500-kw. turbine. The two large turbines exhaust into Westinghouse-LeBlanc condensers, and the normal vacuum maintained is 28.5 in. The two horizontal engines are of Filer & Stowell make, the vertical engines



RHODE ISLAND POWER HOUSE—GENERAL PLAN OF STATION, NEW PORTION AT RIGHT



RHODE ISLAND POWER HOUSE—ELECTRIC CIRCUIT DIAGRAM

being built by the Westinghouse Machine Company, and all four are operated at a steam pressure of 150 lb. when required.

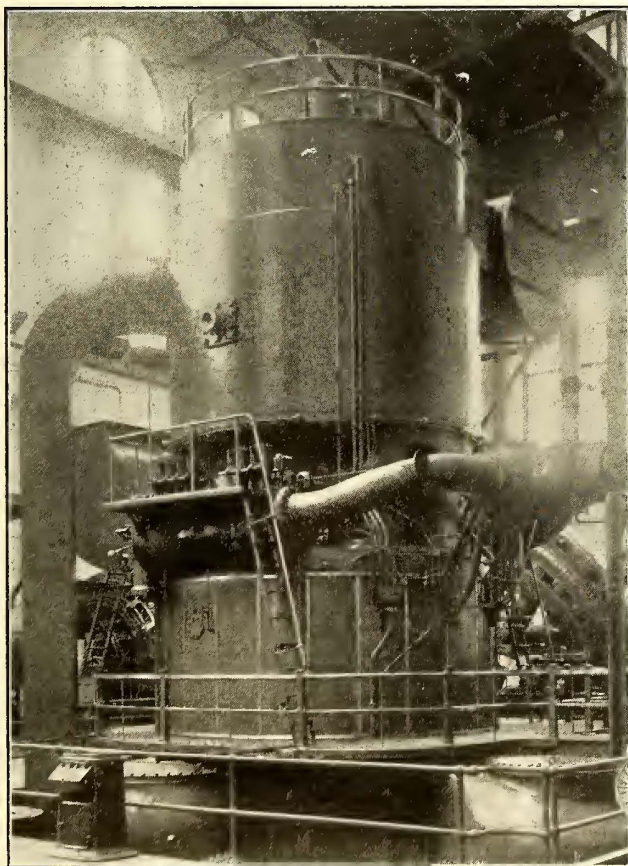
COAL HANDLING APPARATUS

Coal is received at the plant from barges in the Providence River and elevated in a 1-ton bucket to a pocket in a hoisting tower, whence it is discharged through a crusher, falling thence into a chain-driven bucket con-

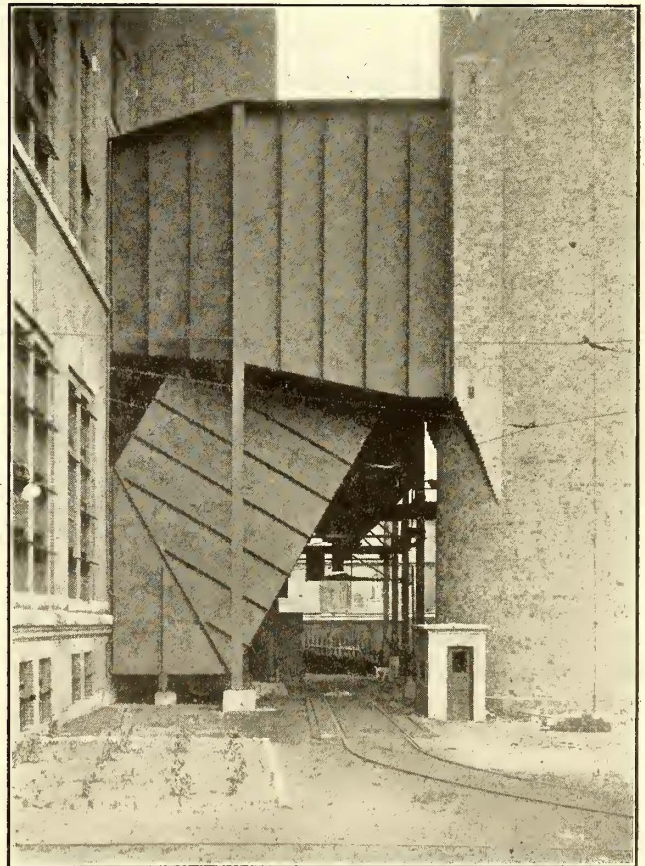
veyor. From the conveyor it is discharged into either coal bunker, all being on about the same level. The hoisting bucket is handled by a 22½-hp. motor and the conveyor is driven by a 50-hp. motor. From the bunkers cast-iron chutes deliver the fuel to stoker hoppers in front of the furnaces, the older boilers being equipped with Roney stokers and the new units with Taylor stokers. Ashes are discharged from below the grates into hopper-bottomed cars which are pushed by hand on narrow-gage tracks to an electric elevator at the west end of the building and thence delivered to a receiving hopper, discharging into cars out of doors just at the rear of the new chimney and behind the breeching shown in an accompanying illustration. The ash hoppers are lined with concrete to protect the sides from hot material. Provision for a 10,000-ton open-air coal storage is made in the station yard at the west side of the plant, the present arrangement being delivery by small hand cars from the bunker spouts to a trestle from which the cars are discharged by gravity. Coal from this storage area is taken to carhouses and other premises of the company by trolley, and in case it is needed within the Manchester Street station it is delivered to the hoisting system at the east end of the building. Two coal towers are provided, one being for emergency use. One is of ½ and the other 1-ton capacity per minute. About 200 tons of coal per day are burned, and the standard fuel is Pocahontas run-of-mine, with a heating value of more than 14,750 B.t.u. per pound.

BOILER AUXILIARIES

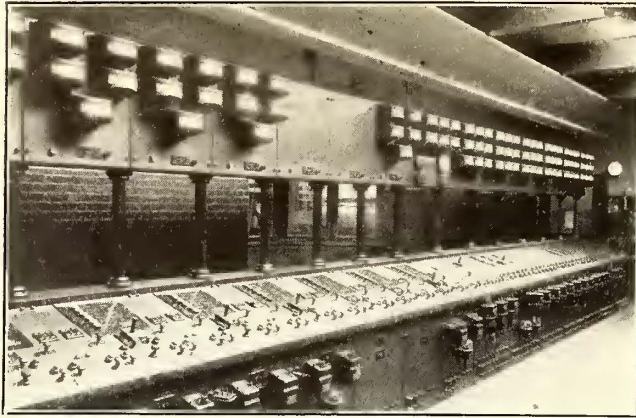
In both boiler installations the batteries are arranged on one side of a firing aisle, which simplifies the steam piping and reduces the necessary width of the building. The supply of air to the Taylor stokers used under the new boilers is from two Sirocco fans, each having a capacity of 250,000 cu. ft. of air per minute. The fans



RHODE ISLAND POWER HOUSE—15,000-KW. TURBO-GENERATOR WITH ROTARY AND LOW-SPEED ALTERNATOR IN BACKGROUND



RHODE ISLAND POWER HOUSE—BREECHINGS TO STACK FROM DOUBLE-DECK BOILER ROOM



RHODE ISLAND POWER HOUSE—BENCHBOARD AND ELECTRICAL INDICATING INSTRUMENTS

are geared in each case to a 600-hp., type "CHS" Terry steam turbine operating at 3370 r.p.m., the blowers each running at 460 r.p.m., under full rating, which includes the delivery of air against a pressure of 5.5 in. static water gage at the fan outlet. The gearing is of the Falk herringbone type, with a 7.35 reduction. The turbines are designed to operate at 200 lb. steam pressure, 125 deg. Fahr. superheat and 16.7 lb. absolute back pressure, and the guaranteed steam consumption under this condition is a maximum of 25 lb. per brake horsepower-hour, including the gear losses. The turbine speed control is automatically effected by a Mason regulator installation. These sets are understood to be the largest of their kind in the world. The air supply is taken from the boiler room and the control is flexible and particularly well adapted to the fluctuations in demand associated with railway service. A partial view of one fan and turbine unit is shown, with an outline drawing illustrating the over-all dimensions of this equipment, which are about 22 ft. length, 9.5 ft. width and 9 ft. 7 in. height. A closed system of oil circulation under pressure is a feature of the turbine equipment.

Feed water is taken from the city mains through two 10-in. independent lines. There are two Platt turbine feed pumps located on the ground floor of the boiler house, each having a capacity of 1500 gal. per minute. Two National open feed-water heaters of 5000-hp. rating each are also provided. Four horizontal, duplex Worthington feed pumps are held in reserve. The feed water is measured by two Simplex V-notch meters, and at present no water treatment is required. One steam flow meter of General Electric make is provided for each Bigelow-Hornsby boiler.

DETAILS OF THE GENERATING UNITS

Each 15,000-kw. turbine unit delivers three-phase, 25-cycle current to the station buses, one unit ordinarily being operated about twenty hours daily. The two units are mounted on concrete foundations with floor openings facilitating observation of the auxiliary equipment. Each unit discharges into a Westinghouse-LeBlanc condenser installed in the basement under one side of the turbine foundations, the latter being supported on piling. The condensing equipment is guaranteed to maintain a vacuum of 28 in. absolute when condensing 250,000 lb. of steam per hour, if supplied with injection water at a temperature not exceeding 70 deg. Fahr., the temperature of discharge being not less than 5 deg. Fahr. below that corresponding to the vacuum carried. At full load one unit requires 8,000,000 lb. of injection water per hour, the lift from the river being about 20 ft. Salt water is drawn from

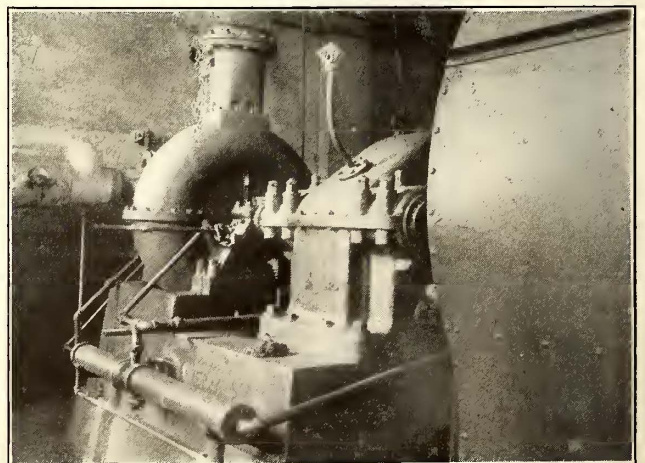
the river through a concrete conduit, discharging into a suction well from which a 36-in. pipe carries it into a manifold located on the basement floor. From the latter two 20-in. main injection pipes lead to each condenser.

The main discharge of each condenser consists of two 18-in. pipes emptying into a chamber of concrete, of 7-ft. by 4-ft. cross-section, located about 2 ft. above the top of the suction chamber. After leaving the building they discharge into the river about 50 ft. above the intake by a conduit leading off at an angle of about 45 deg. A 10-in. pipe leads from the suction manifold on each side of the condenser installation to an air pump of special design, in which a vacuum is produced by the passage of a series of water pistons by the outlet of a 12-in. exhaust pipe leading from the condenser casing to the pump. The air-pump discharge is delivered into the main discharge pipe of the condenser by a 12-in. connection. In the equipment of each condenser there are two main centrifugal pumps, and these, with two air pumps, are direct driven on a single horizontal shaft by a 450-hp. non-condensing turbine running normally at 700 r.p.m. Each main turbine unit is provided with a 36-in. atmospheric, spiral-riveted, galvanized-iron exhaust pipe carried up through the boiler house roof to an appropriate head located about 20 ft. above the latter.

The step-bearing lubrication is provided by duplicate oil pumps of the Deane duplex type, furnishing oil under a pressure of 1100 lb. per square inch to a Wood accumulator, located in the floor opening of the operating room. The step bearing is operated at a pressure of 700 lb. per square inch, the drop being obtained by the use of a screw baffle between the accumulator and the bearing. The supply of oil to the valve gear and to the upper and middle turbine bearings is furnished by Deane duplex oil pumps located in the basement. An oil filter plant is provided for the two units, and there are two priming pumps, one of Platt and the other of Blake manufacture.

BUSES, SWITCHES AND CONNECTIONS

The generator leads are carried away from the machine in a 12-in. x 14-in. sheet-iron casing leading to the basement. For each generator circuit 4 per cent reactance is provided. The reactors are installed in a fireproof chamber at the basement level, and from them the leads are carried to a bus and oil-switch room located in a fireproof extension at one side of the station building. The electrical arrangements of the station include two sets of three-phase, 11,000-volt buses, with motor-operated General Electric type "HG"



RHODE ISLAND POWER HOUSE—LARGE TURBINE-DRIVEN BLOWER FOR BOILER AIR SUPPLY

oil switches with 10-in. pots, arranged to connect any alternator with either set of buses and any feeder or local transformer circuit with either set, the installation being controlled from a benchboard in a gallery overlooking the operating room. The oil switches are of the non-automatic type except on reverse energy. No step-up transformers are required in the station, outgoing circuits to the substations being of 11,000-volt design.

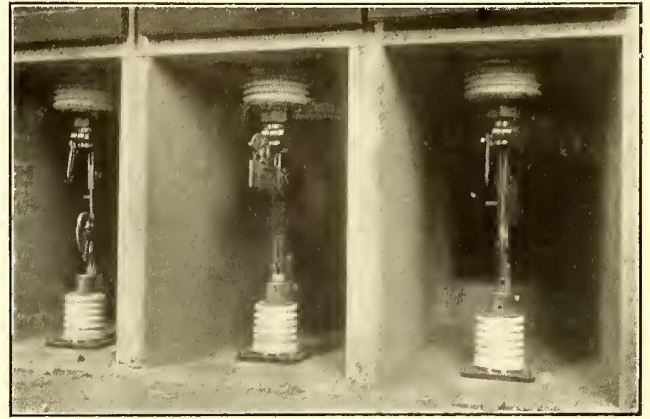
The bus room is 175 ft. long and 28 ft. wide, and contains accommodations for fifty-four oil switches of the motor-operated type. The cells also contain disconnecting switches designed for locking the blades in position, to avoid disruption in case of heavy loads or short-circuits. In the fronts of the oil switch cells are wire-glass windows, 6 in. x 13 in., and 23 in. x 14 in. in size. The buses are horizontally mounted and are of 4-in. x 0.25-in. copper strips. The bus room is illuminated by 60-watt tungsten lamps mounted in deep Holophane reflectors.

THE BENCHBOARD

The benchboard control is operated by 125-volt direct-current derived from the exciter system. The board contains fourteen sections, accommodating eighteen 11,000-volt feeders. There are two dummy buses and seven generator panels, six feeder panels and one station panel. Each generator is provided with a reverse-energy relay in two phases, controlling the oil switch in the generator lead, and a recording wattmeter is mounted behind each generator panel. The local rotary converters are supplied through transformer banks fed through the regular 11,000-volt feeder panels. Other features of the benchboard are field switch, rheostat and governor control, signal control and synchronizing equipment, potential and current transformer terminal taps for testing and calibration, a wattless component indicator reading in kilovolt-amperes, and the usual indicating instruments. Each transformer bank is provided with an indicating wattmeter, and the benchboard is equipped with a temperature indicating set with connections to each generator armature. The main and auxiliary buses are solid throughout, no bus junction switches being provided. A General Electric engine telegraph system with 8-cp., 125-volt carbon incandescent lamps is in service.

OTHER MATTERS

Auxiliary electrical service of various kinds in the station is controlled at a nineteen-panel vertical switchboard on the gallery floor. From this are governed the operation of all motor-driven exciter sets, these being mounted on the floor in an adjacent room, steam-driven



RHODE ISLAND POWER HOUSE—LOCKING DISCONNECTS IN SUB-CELLS OF BUS ROOM

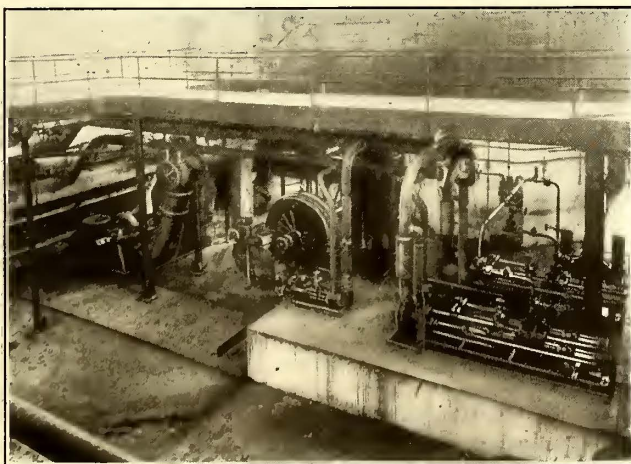
exciters, auxiliary power and lighting transformers, and local service circuits. Two sets of station auxiliary three-phase buses are installed, one at 220 volts for motor starting, and the other at 440 volts for normal operation. These buses are run at the rear of the auxiliary board with a horizontal sectionalizing switch for breaking up the service in emergencies. Three sets of station power transformers are mounted in basement compartments, with adjacent remote-controlled, solenoid-type oil switches in the taps from the transformer secondaries to the 440-volt and 220-volt auxiliary buses.

Feeders are run in duct carried in the wall between pilasters from the bus and switch room to the outgoing line connections. Electrolytic lightning arresters are provided for the various feeder circuits in a separate section of the basement, with choke coils and disconnecting knife switches mounted on pipe framing. Station lighting is at 125 volts, the circuits including provision for both d.c. and a.c. supply. The main operating room is illuminated by forty-six 250-watt wall lamps and ten 500-watt gas-filled lamps mounted below the roof trusses. Two Shaw electric cranes, one of 40-ton and the other of 50-ton capacity, are installed in the operating room, the motors being wound for 600 volts, direct current, which is always available on the d.c. sides of the railway rotaries. A d.c. railway switchboard of the usual type is also a feature of the station. The outgoing 11,000-volt feeders are not equipped with integrating meters, but are provided with inverse time-limit relays.

D. F. Miner is chief engineer of the Manchester Street station with F. L. Barnard as chief electrician, W. C. Slade being superintendent of power and lines for the Rhode Island Company.

Foreign Coins in Fare Boxes

An interesting story on the foreign coins which look enough like a nickel to pass casual inspection and find their way into the pay-as-you-enter boxes of the Louisville (Ky.) Railway appeared recently in one of the local papers. According to Homer E. Bunnell, cashier of the company, hardly a day passes that some of these coins are not deposited by accident or design in the boxes. Ordinarily as soon as the coins accumulate the company ships them to Chicago, where they are exchanged. At present, with much of the foreign money depreciated, redemption is being postponed until the coins return to their normal value. A 20 franc gold piece, sold for \$3.80, was the most valuable coin ever deposited and not called for. Coins from nearly all countries have figured in this collection.



RHODE ISLAND POWER HOUSE—PUMP FLOOR AND BASE OF MAIN STEAM TURBINE

Paving Street Railway Tracks*

Adequate Draining of Subgrade, Reasonable Resilience of Track and the Use of Longitudinal Expansion Joints and Permanent Rail Joints Conduce to Long Life of Paving as Illustrated by Experience in Peoria

By R. F. PALMBLADE

Chief Engineer Peoria (Ill.) Railway

ANY of the salient points pertaining to a discussion of street railway track construction and the paving of the right-of-way, such as drainage, foundations, concrete, treated ties, rail sections, rail fastenings and electrical connections, are each of sufficient importance to warrant most careful attention. The details of track construction which directly affect the life of the pavement in the right-of-way, however, is a subject of live interest, and the practice and experience of the Peoria Railway may be of some value to others.

The average double-track permanent way in Peoria is 17 ft. 8½ in. wide, including 1 ft. outside of the rails. For this pavement area the street railway paid the entire cost of both construction and maintenance. This amounts to paying, on the average street with double tracks, 40 per cent of the entire pavement construction cost. In fact, the investment of a transportation utility in paving alone in the average city the size of Peoria runs into hundreds of thousands of dollars, and yet it uses this pavement scarcely at all. Hence, any improvement in track construction which has a corresponding effect on the permanency of the pavement is of tremendous interest financially and otherwise to both the public utility and the municipality. The pavement in street railway tracks, as a rule, must conform to city grades as nearly as possible, and in our particular case, the paving specifications and rail sections used must be approved by the city authorities.

SOLID CONCRETE FOUNDATION UNSATISFACTORY

Generally track pavements first break down near the rail fastenings, which ordinarily is not the fault of the pavement itself but is due to the vertical vibration or play of the joint. This fact was early recognized, and the first radical move seeking to minimize this undesirable condition was the substitution of 60-ft. rails for the usual 30-ft. rails. This bettered the situation materially but since the practical rail length limit has been reached, further improvements had to be worked out along other lines. Several different types of modern pavement are in use in Peoria at the present time on the streets occupied by car lines. During the season of 1910 we constructed a stretch of double track, using concrete ballast 12 in. deep with 6-in. x 8-in. x 8-ft. untreated oak ties, spaced on 2-ft. centers, 114-lb. 7-in. girder rails, standard six-hole joints, a concrete paving foundation, a 1-in. sand cushion and a creosoted wood-block pavement with a pitch filler. The concrete was mixed in the proportions of 1:3:6. It was hoped that with the concrete almost monolithic in form and the ties completely embedded in it there would be no trouble caused by vertical vibration of the rails at the joints nor along the body of the track. This construction would, it was thought, also insure the normal life of the block pavement. Longitudinal expansion joints were not provided along the rails, the idea being to adhere to a rigid construction.

In the course of two years this track began to vibrate at the joints and even along the rail. This, in turn, caused the block pavement to rupture and heave adjacent to the rail. The blocks, in this particular case, had been rammed tight when laid, a condition which made the problem more complicated. Upon thorough examination it was found that the thousands of wheel impacts of the city cars, in addition to the heavy wheel loads of the interurban cars which operated over this piece of track, had caused the concrete directly under the rail base to pulverize—minutely, it is true, yet sufficiently to cause vertical vibration of 1/16 in. or more, which, in the course of time, became of grave importance. It was found that on account of the monolithic nature of the track construction, there being no apparent resilience whatever, the wheel impacts of the heavy interurban cars operating at 10 m.p.h. or 15 m.p.h., caused the track to fail at the point of least resistance which, in this case, was where the rail base rested on the concrete and ties.

It was also found that the rails had cut into the ties, the speed of the cutting being mainly dependent on the rate of pulverizing of the concrete. We have been repairing this track ever since. We tried to overcome the paving difficulty by placing extra long, specially made tie-plates under the rail and by relaying the blocks with longitudinal expansion joints of pitch on each side of the four-track rails. This method of repair solved the difficulty to a certain extent.

1912 CONSTRUCTION IN AND NEAR PEORIA

In 1912 we constructed through the village of Averyville, a suburb of Peoria, a double track in which we provided a 4-in. drain tile 1 ft. below the subgrade at the center of each track, rock ballast thoroughly rolled, treated ties and a concrete paving foundation. T-rails allowing sufficient space along the web and under the head to take a standard paving brick and continuous rail joints were also adopted for this track. The right-of-way was about 18 ft. wide, and it was paved with brick laid on a 1-in. sand cushion, the bricks being brought up to within ¼ in. of the top of the rail head on the street side and in the "devil strip." The outside of the rail web was plastered with a sand and cement mixture, while on the gage side the ends of the bricks were thrust under the head of the rail at an angle to conform to the crown of the pavement in each track. A pitch filler of high melting point was then hand-poured into the interstices, and care was exercised to see that the voids around the bricks under the rail head on the gage side were completely filled. This, to date, has proved one of the most efficient pieces of track and pavement we have on the system.

During this same year we also built about 2 miles of double track in Peoria, using our standard method of construction, which included 7-in. 97-lb. girder rails. The pavement consisted of standard paving brick, grout filler and cross-expansion joints of pitch spaced every 10 ft. This paving has been quite satisfactory, though we have noted that because the grout filler and brick

*Abstract of paper read at joint convention of Illinois Society of Engineers and Surveyors and the Illinois section of the American Waterworks Association held at the University of Illinois on Jan. 25-27, 1916.

formed practically a monolithic mass, a sounding-board effect was produced. In this connection, it is our opinion that a grout-filler brick pavement in a street railway track intensifies the traffic noises about 20 per cent more than the same pavement with a pitch filler.

CONSTRUCTION OF 1913

In our later track rehabilitation work we have endeavored to adhere to the following principles: First, that the subgrade must be adequately drained; second, that the track itself must be resilient to a certain degree; third, that on both sides of each rail a longitudinal expansion joint must be provided and, finally, that the rail joint itself must be of a permanent and lasting character. All these are factors directly affecting the life of the pavement.

In conformity with these principles we constructed in 1913 a double track in which we used the following: A drainage system, rolled crushed-stone ballast, creosoted ties, a concrete paving foundation, special reinforced rail joints with heat-treated bolts of a high elastic limit, a 1-in. sand cushion, and a creosoted wood-block pavement with longitudinal expansion joints every 10 ft. This particular track, though subjected to heavy traffic, has as yet given no evidence whatsoever of failure at the joints or along the rail. The block pavement has not been disturbed in the least which, from our experience, is the first evidence in track failure and is indicated by a slight rupture of the pavement.

It is needless to say that we have abandoned entirely the use of concrete under the ties in our track construction, though we do use concrete for a paving foundation, beginning at the bottom of the tie and extending 8 in. toward the surface of the street. It will thus be noted that the paving foundation is deep enough to imbed the ties and a portion of the rails, thus forming a comparatively solid mass resting on a rock or gravel ballast cushion of some elasticity. This type of construction has eliminated most of our pavement troubles.

Although, as stated, track pavements usually begin to fail in close proximity to the rail joint, joint troubles rather than pavement troubles have served to spur on the development of various types of improved rail fastenings. In our rehabilitation work we have recently been using an electrically welded joint. In connection with this an electrically-driven track grinder is employed to obtain a perfectly smooth running surface where the rail ends meet. We have recently completed about 1½ miles of double track which included three different types of pavement, using our method of standard construction with the welded joint. A fourth of a mile of this track was paved with brick with an asphalt filler; another section was laid with brick using a sand filler, and approximately 1 mile was laid using a grout filler. In the last instance a patent expansion joint, ¼ in. thick by 4 in. deep, was laid along both sides of each rail and transverse joints were placed every 10 ft. We understand that the paving commission of Baltimore, Md., has specified a bituminous filler similar to the one just mentioned along the outer rails of railway tracks. In our case the patent joint is easy to install, eliminates the difficulties caused by movement of the pavement against the rails, and serves as an expansion joint.

PAVEMENT IN CITIES OF MODERATE SIZE

An ideal pavement for street railway tracks in cities of moderate size, in general, should have a roadway built according to the following specifications, which essentially conform to our standard track construction: All double track is laid with 10-ft. 6-in. track centers. After the grade has been established the roadway is excavated to a depth of 21 in. and a 4-in. vitrified sewer

tile is laid with open joints along the center of each track and 12 in. below the bottom of the subgrade. If the track is level for a distance, a suitable fall is provided for the tile to the city sewer system. The tile is then covered to the level of the subgrade with gravel or fine broken stone, after which the subgrade is thoroughly rolled with a 5-ton or 6-ton roller. Risers or cast-iron hand holes are provided at each street intersection. Five inches of 1-in. to 1½-in. crushed stone or gravel is then spread level over the subgrade and also well rolled. Oak creosoted ties 6 in. x 8 in. x 8 ft. in size are then laid at 2-ft. centers on the rolled ballast and then the tie plates and rails are laid and spiked, after which a sufficient quantity of fine broken stone is scattered between the ties to raise and tamp the track to grade.

PRESENT STANDARD CONSTRUCTION

A standard 60-ft., 7-in., 97-lb. grooved girder rail has been adopted with special reinforced channel bars at the joints. The rails are laid with staggered joints and 1-in. tie rods spaced at 7½-ft. intervals. The joints are of the six-hole standard and all plate and web holes are drilled slightly smaller than 1 in. These holes are then reamed to 1 in. in diameter and a 1-in. turned, heat-treated, high-tensile strength machine bolt is inserted. It is obvious that a driving fit is necessary. After this each bolt is pulled up snug and marked to prevent loosening.

A 10-in. No. 0000 capacity concealed compressed-terminal bond is placed under the joint plates, and when double track is being built the joints on the two inside rails are bonded with an outside 36-in. No. 0000 compressed terminal bond in addition to the concealed bond. Cross bonds of No. 0000 or more in capacity are installed every 400 ft.

Concrete in the proportions of one part of cement, three parts of sand and six parts of broken stone is then poured over the ties and between them to a depth even with the bottom of the rails, or about 8 in. The concrete is thoroughly shovel-tamped under the edges of each tie so that the set concrete will grip the tie firmly. A rail plaster composed of one part of cement and four parts of sand is then placed under the groove and head of the rail and smoothed down perpendicular to the projecting edges. A 1-in. sand cushion is then spread over the solid concrete and either a brick or a wood-block pavement is laid on it, the type of paving being designated by the city. The paving, if left to our choice, is of standard vitrified brick with an asphalt filler and the patent expansion joint previously mentioned. All bricks in the right-of-way are laid at right angles to the track. We do not use a stretcher brick nor a nose brick to form the wheel flangeways.

A smooth running surface at each rail joint is finally provided by grinding it to a perfect surface. It has been found that slight differences in the heights of the rail ends occur as they come from the mills. This in time allows the car wheels to batter down the receiving rail, causing defective joints and failure of the adjacent pavement. This condition was further relieved in 1915 by using the electrically welded joint in our construction work to the exclusion of all others.

The Sault Ste. Marie Bridge Company has placed around its drawbridges and shops a number of effective safety signs. The signs are painted in blue on a white background and they contain the words "Look, Listen, Safety First." At the left center is a red disk, and at the right center a green disk, while the center itself is occupied by a large blue cross, on which is superimposed a hand pointing to the green disk. This company is endeavoring to educate its men to "get the safety habit."

Watch Inspection Systems*

Safety of Operation and Maintenance of Schedules Are Two of the Results Obtained by Systematic Inspection of Trainmen's Watches—Rules Governing Inspections and the Systems of Keeping Records on Different Lines Are Analyzed

ON account of the increasing interest in the systems for maintaining trainmen's watches in first-class condition the editors of the ELECTRIC RAILWAY JOURNAL have secured from a number of roads which maintain such systems data as to their practice and samples of the printed matter which they use. The results are given herewith.

WHAT WATCH INSPECTION DOES

The purposes of watch inspection systems are to enable schedules to be kept up and to increase the safety of operation of the roads. That they accomplish these purposes is attested by the experience of a number of roads. In the matter of the effect on the schedule, in Lancaster, Pa., for example, after the watch inspection system went into operation the public soon discovered that cars were making time points more accurately. The result was an increase in traffic. To encourage this the company is now getting out card time-tables of individual lines, giving times at terminals and at intermediate points. The experience of the Twin City Rapid Transit Company indicates that another advantage of accurate watches is in the reduction of complaints that trains have left ahead of time.

ESSENTIALS OF A GOOD SYSTEM

There are certain elements in the successful accomplishment of the purposes mentioned above, as follows:

- 1. Provision must be made for the possession of a

For previous articles describing the practice of particular electric railways see ELECTRIC RAILWAY JOURNAL, Vol. XLII, Sept. 27, 1913, page 501; Vol. XLVI, Oct. 23, 1915, page 874, and Vol. XLVI, Nov. 20, 1915, page 1034.

good watch by each trainman and other employee concerned with car movement, the company arranging to buy the watches and deduct instalments from wages if necessary. The company must be reasonable in enforcing this requirement.

2. Suitable clear and simple rules must be formulated and promulgated in order that the men may know what they are expected to do. With these may be given such information regarding the construction and care of watches and of the local inspection system as will conduce to intelligent co-operation.

3. There must be an inspection system with suitable certificates and record forms for the inspectors' entries, and the inspectors must be conveniently located.

4. Finally, in order that discipline may be maintained, there is required a follow-up system of records for scrutiny by administrative officers, with a plan for notifying individuals of infractions of the rules.

The requirements of individual roads differ materially, and it is unlikely that a single system of inspection could be devised to suit all, but the general principles apply in all cases and can be adapted to local needs.

GETTING GOOD WATCHES

It is becoming customary to specify the quality of watch which will be passed by inspectors. The Memphis (Tenn.) Street Railway requires a watch of not less than fifteen jewels after a man has been in service three months. The Washington, Baltimore & Annapolis Electric Railway has compiled a watch list comprising nearly forty, of eight standard makes, the watches having from seventeen to twenty-three jewels. The

FORM 50
ORDER OF EXAMINATION
TO BE RETAINED BY INSPECTOR

THE WINONA INTERURBAN RAILWAY CO. No.

Office of Division
Mr.
Dear Sir: The bearer is employed as
..... on the
Please examine his watch, and if the movement is in good order and up to the minimum standard of excellence required by this company, viz.: "Equal to commonly known American grade of 17 jeweled Patent regulator, adjusted to heat and cold and three positions," and otherwise in conformity with the General Time Order, Fill Up AND SIGN THE ATTACHED certificate and return to me.

Date: SUPP.

THIS CERTIFICATE TO BE SENT TO THE GENERAL INSPECTOR

THE WINONA INTERURBAN RAILWAY CO. No.

This certifies, that on I examined
the watch of and found it to be equal
to the standard of excellence required, and in such repair as will in my judgment enable it to run
(with proper usage) within a variation of not to EXCEED THIRTY seconds per week.

..... Watchmaker and Inspector.

Rejected and Reasons why

No. of Movement Accepted.

Maker and Grade

No. of Case and Description

TIME INSPECTION—SAMPLE EXAMINATION ORDER AND CERTIFICATE FORM

Form T.S. 200J. 500-1-3-11

BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY
INTERURBAN DIVISION

Superintendents or Trainmasters send this report to the Watch Inspectors, and a carbon copy to the Manager Interurban Division on the 15th day of each month.

Mr.
Watch Inspector at.....

Changes on Watch Inspection Lists for the month ending
.....15th, are as follows:

STRIKE OUT

Name	Occupation	Why?	District

ADD ON

Name	Occupation	District

Signature.....
Title.....

If no changes, send "Nil" report

TIME INSPECTION—FORM FOR USE IN CHANGING INSPECTION LISTS

Form ME-60-10-11

WATCH COMPARISON DAILY REGISTRATION SHEET

SIGN OPPOSITE RESPECTIVE BADGE NUMBERS 191

I have compared my watch on the above date with the Standard Time as given by the Train Dispatcher and found the variation as given below.

NO.	EMPLOYEE'S SIGNATURE	TIME		VARIATION			
		A. M.	P. M.	FAST		SLOW	
				MIN.	SEC.	MIN.	SEC.
1							
2							

TIME INSPECTION—FORM FOR DAILY TIME REGISTRATION, DOMINION POWER & TRANSMISSION COMPANY

People's Railway, Dayton, Ohio, has a minimum standard seventeen-jewel watch adjusted to heat and cold and to three positions. The general custom appears to require a watch capable of adjustment to within thirty seconds per week. The Pacific Electric Railway, Los Angeles, Cal., specifies for old watches movements with seventeen jewels, Breguet hair springs and patent regulator, lever set and adjustable to temperature. New watches must also be adjusted to three positions and have steel escape wheel and double rollers. This and other companies have lists of makes which will not be accepted, one company barring watches of makers no longer in business, as such watches cannot be maintained at a high standard.

WATCH INSPECTION RULES

In the matter of rules there is wide divergence of practice. Some companies, The British Columbia Electric Railway, for example, have booklets of regulations, containing rules for employees and instructions for watch inspectors. This company ends its instructions with the following comment to inspectors: "Make a friend of the employee; be courteous; win his confidence by square and fair dealing—it will pay you financially. Bear with him, though sometimes he may appear to be unreasonable. Generally speaking, if he complains he has a cause—try and remedy it. Mutual forbearance all around will give what we aim at, viz., the most successful system in existence." With this spirit any system of rules will be effective. This company's booklet is substantially bound and will wear for a long time. The Winona Interurban Railway, Warsaw, Ind., has a similar booklet put up in cheaper fashion, suitable for carrying in a pocket book. The Pacific Electric Railway issues official circular letters to heads of departments, watch inspectors and others, giving rules, special instructions, etc.

ORGANIZATION

Obviously the success of any system depends upon the machinery used in carrying it out and in this case every-

BENTON HARBOR-ST. JOE RY. & LIGHT CO.

SEMI-MONTHLY COMPARISON From _____ To _____ 1912

Date	CONDUCTORS			MOTORMEN		
	Rate	Sec.	Net Reg.	Rate	Sec.	Net Reg.

TIME INSPECTION—FORM FOR TABULATING INSPECTION DATA

NAME <i>John Doe</i>			
OCCUPATION <i>Conductor No 3753</i>			
QUARTER	COMPARISONS	QUARTER	COMPARISONS
Jan. 1915	X O X X O	Jan. 1917	
April		April	
July		July	
Oct.		Oct.	

TIME INSPECTION—PERMANENT RECORD CARD USED BY PACIFIC ELECTRIC RAILWAY

Form 1822

City *Los Angeles* District *Newton Moore* 1915

WATCH INSPECTORS WILL FORWARD THESE RECORDS TO SUPERINTENDENT PROPERLY OF THE LINE AND LAST DAY OF EACH MONTH. EMPLOYEES WILL SIGN WITH INK OR INDELEBIL PENCIL.

DATE	SIGNATURE OF EMPLOYEE	OCCUPATION	SEC. FAST	SEC. SLOW	SEC. IN P.M.	DATE	SIGNATURE OF EMPLOYEE	OCCUPATION	SEC. FAST	SEC. SLOW
1st	<i>John Doe</i>	<i>Conductor</i>	<i>10</i>							
9th	<i>Robert Smith</i>			<i>5</i>	<i>5</i>					
12th	<i>James Jones</i>								<i>R</i>	

TIME INSPECTION—FORM FOR COLLECTING ORIGINAL DATA, PACIFIC ELECTRIC RAILWAY

thing depends upon the chief watch inspector. The Pacific Electric Railway has a general time inspector reporting to the general manager, with an assistant and local inspectors for the several divisions. On the Oakland, Antioch & Eastern Railway there is one regular watch inspector to whom the men report for comparison twice each month. The men are also required to compare their watches with the standard clock in the dispatcher's office once each day, those making more than one trip comparing before starting on each trip. This practice of requiring the men to check up their watches frequently in the train dispatcher's office is followed on a number of roads.

The duties of the inspector are to insure the possession by the men of watches of the proper quality, to see that these are cleaned and oiled at suitable intervals, about once a year, and to keep the watches within the prescribed limits of accuracy.

FORMS AND RECORDS

The Dominion Power & Transmission Company, Hamilton, Ont., requires motormen and conductors to call for standard time from the dispatcher before taking their runs. A daily registration sheet, with spaces for 224 entries, is used for the record of this procedure.

An inspector's certificate of some form is a necessity in any system. In the case of a first examination the certificate form may be a part of a superintendent's order authorizing the inspection. The periodical inspection records are usually kept on small time comparison cards, vest pocket size, on which the inspectors make their entries. Special loaner watch cards are usually provided also. In some cases the standard clocks are checked up also on a somewhat similar form. Instead of cards the inspection records may be entered on printed forms with the employees' signatures, this plan having the merit of reducing clerical work, but leaving the employee to depend upon his memory for his watch rating.

In any case the results of the inspections must be

Form T.S. 2600I, 500-1-3-11

**To The British Columbia Electric Railway Company
Interurban Division**

Please pay.....Watch Inspector of.....the sum of.....dollars, on account of Watch Movement No.....Case No..... purchased from him, and deduct this amount from my wages due me for the month of....., 191 : but in case my wages are garnisheed or attached under legal process, or I am discharged or die in said Company's service, then the amount unpaid upon the said watch shall immediately become due and be paid to the said Watch Inspector out of any wages then earned by me, said watch to remain the property of the said Watch Inspector until entirely paid for.

Witness..... Signature.....
Dated..... Occupation.....
....., 191

TIME INSPECTION—FORM FOR USE IN AUTHORIZING PAYMENT BY COMPANY

tabulated for transmittal to the administrative officers, and considerable ingenuity is displayed in the designing of forms for this purpose. For permanent record one road uses a card record, one card for each employee, upon which the results of inspection for several years can be recorded.

CONCLUSIONS

The use of systematic time inspection, while comparatively new on electric railways, is on the increase. The steam railroads have of necessity had such systems for many years and their experience is available for electric railways. There is a distinct disciplinary value in having accurate operation of watches and clocks on an electric railway, as this not only makes it possible to keep up schedules but fosters a pride in doing so. Snappy, enthusiastic co-operation in this matter can be secured and is worth all that it costs. There is an innate human desire to have first-hand knowledge of the correct time and the modern electric railway manager is not slow to utilize this.

New San Diego Transfers

Time-Limit, One-Direction Transfers, Which Eliminate Many of the Abuses Formerly Prevalent, in Use Since Jan. 1

At the beginning of this year the San Diego (Cal.) Electric Railway adopted a new form of transfer, shown in the accompanying illustration, which has eliminated in a large measure the abuses of stopping over and round-trip and indirect-route riding formerly prevalent on this system. The transfer entitles the passenger to a journey in one continuous direction within the time limit shown, but it is not transferable and does not permit a stop-over. When a second transfer is necessary, a red one is issued. No passengers are allowed a red transfer except for one or two routes to remote parts of the city.

P.M. COUPON
VOID IF DETACHED

San Diego Electric Railway Co.
TRANSFER
GOOD WHEN USED BY PASSENGER IN ACCORDANCE WITH CITY ORDINANCE No. 3721 CONCERNING USE OF TRANSFERS.
W. CLAYTON
See Reverse Side

GOOD ONLY for one continuous passage in one general direction and via most direct route to be provided at one of the following transfer points:

ADAMS AVE.	12TH & B
NORMAL	14TH & BOWY.
UNIV. AC. HUNN. BLDG.	11 21st & F
UNIV. AC. CLARK BLDG.	STATE & BOWY.
30TH & UNIV.	STATE & F
20th UNIV. NORTH	1ST & BOWY.
5TH & UNIV. EAST	1ST & F
5TH & B	30 & B
5TH & F	30 & BOWY.
5TH & H	30 & F
5TH & K	4TH & BOWY.
10TH & K	25TH & M
16TH & K	
16TH & M	

CAR TO CAR
POINT LOMA

094134

NEW SAN DIEGO TRANSFERS

on the day the new transfers went into effect every one of the conductors was thoroughly instructed and information was given promptly to patrons when any question arose.

The transfers have been in effect for a month and are considered a decided success both from the viewpoint of the company's officials and the public.

Progress is being made with the construction of the electric railway connecting Turin, Italy, with Lanzo. Extensive construction has been required, including five tunnels, of which four are already finished, also six bridges and two large viaducts.

Efficient Snow-Fighting System

New York Streets Are Quickly Cleared of Snow by Special Squads of Motor-Bus Company Employees

At the beginning of the snow storm that struck New York City on Feb. 2 a novel and effective snow-fighting system was put into operation just off upper Fifth Avenue, as shown in the illustration. When less than 1 in. of snow had fallen, twenty-five snowplows manned by more than 100 motor-bus employees were starting out from the garage of the Fifth Avenue Coach



NEW YORK MOTOR BUSES HAULING SNOW PLOWS IN DIAGONAL FORMATION

Company in East 102d Street to fight the storm. The company has voluntarily offered to the city to keep clear in times of storm those thoroughfares on which its motor buses operate. This service, including about 20 miles of city streets, was performed during the recent storm in an unusually short time.

In order to render this service the motor-bus employees have been so organized that each one has a definite post and job, and is subject to call at any hour of the day or night. The recent storm was an illustration of this, for at 3.30 o'clock on the second morning, when the snow had begun to fall again, messengers were dispatched from the garages to assemble the snow-fighting corps. A record is kept of the exact floor on which each man lives and the messengers have a stated route which will collect the greatest number of men in the shortest time. The first plow usually leaves the garage within ten minutes of the alarm time.

The snow plows are of the road-scraper kind and are pulled along by the big motor buses. A man on the plow and the driver and conductor of the bus constitute the crew. These teams travel in pairs or in threes or fours, according to the width of the street, so that the plows follow along diagonally behind one another. In this way the snow is pushed to one side and banked. After the storm when ice forms on the cleared roadway the coach company sends out motor sand cars which automatically sift sand over the glassy thoroughfare. In addition each plow is equipped with bags of sand and ashes.

The Ealing chamber of commerce, Ealing, England, has decided to ask the London United Tramway Company to permanently reduce the speed of its cars, owing to the noise and risk of accidents on the down grades.

Electric Railway Earnings in New York

Up-State Commission Issues Comparative Earning Figures for Last Nine Years—Mr. Hasbrouck, Statistician of Commission, Says Loss in Net Income Is Not Due to Decreased Business or Increased Operating Expenses, But to Higher Taxes and New Capital Costs

THE division of statistics and accounts of the Public Service Commission for the Second District of New York has compiled some figures, shown in the accompanying table, which cast an illuminating light upon the progress made during the last nine years by electric railways under its jurisdiction. It will be recalled that this commission regulates all the railways in the State outside of New York City. The figures now published were contained in the annual report of the commission for the year ended Dec. 31, 1915, recently submitted to the Governor. The table is self-explanatory, but it may be well to point out some of the most striking features.

For the first time since 1907, the electric railway operating revenues for the fiscal year ended June 30, 1915, showed a decrease as compared with those for the preceding year. The decrease amounted to 2.9 per cent of the returns for the preceding fiscal year, although the total was still 57.4 per cent greater than the railway operating revenues for 1907. Railway operating expenses also decreased 2.5 per cent from the 1914 figure, but this was not enough to prevent a decrease in net revenue from railway operations, which in 1915 showed a loss of 3.7 per cent. This falling off was intensified by the tax charges, which increased to a smaller degree than usual but still gained 1.5 per cent as compared to 1914. It may be noted, incidentally, that the tax charges for 1915 increased 124.5 per cent above the figure for 1907. The railway operating in-

come showed a falling off in 1915 of 4.8 per cent as compared to 1914, although this item was still 44.8 per cent greater than the returns for 1907. The net revenue from other operations decreased 3.5 per cent and non-operating income increased 2 per cent as compared to 1914, so that the net effect upon gross income for 1915 was a decrease of 4.3 per cent as compared to the preceding year.

Interest charges, which have shown a steady increase over 1907 from 19.2 per cent in 1908 to 111.3 per cent in 1915, also increased 5 per cent in 1915 as compared to 1914. Other deductions from gross income, which have displayed a much more rapid increase over 1907 from 14 per cent in 1908 to 450.6 per cent in 1914, showed in 1915 a slight decrease of 3.1 per cent from the 1914 result, so that the net increase over 1907 for the last year was reduced to 433.3 per cent. The net income available for dividend and other appropriations, which has been falling off since 1911, suffered in 1915 a decrease of 67.5 per cent as compared to 1907. The decrease in 1915 as compared to 1914 amounted to 46.3 per cent, this figure being exceeded only by the return for 1913, when the decrease from the net income for the preceding year totaled 50.8 per cent.

The dividend payments have been declining since 1913, when they amounted to 161.4 per cent of the total paid in 1907. In 1914 the disbursement was cut to 135.4 per cent of the 1907 payment, while in the last fiscal year the disbursement amounted to only 74.1 per

STATISTICS OF ELECTRIC RAILWAYS IN NEW YORK STATE, OUTSIDE OF NEW YORK CITY, FROM 1907 TO 1915

Year Ended June 30	PER CENT OF INCREASE OR DECREASE		Amount	PER CENT OF INCREASE OR DECREASE		Amount	PER CENT OF INCREASE OR DECREASE		Amount	PER CENT OF INCREASE OR DECREASE	
	Compared with Preceding Year	Compared with First Year of Series		Compared with Preceding Year	Compared with First Year of Series		Compared with Preceding Year	Compared with First Year of Series		Compared with Preceding Year	Compared with First Year of Series
Railway operating revenues											
1907			\$19,774			\$6,152			3,804		418,622
1908	9.3	9.3	21,617	1.1	1.1	6,219	1.1	19.2	4,536	19.2	448,846
1909	3.4	13.0	22,354	2.1	3.2	6,349	2.1	9.3	4,960	30.4	462,456
1910	11.5	26.0	24,917	7.628	24.0	7,628	20.1	3.6	5,141	35.1	499,357
1911	8.5	36.8	27,041	8,804	43.1	8,804	15.4	3.0	5,293	39.1	542,695
1912	3.6	41.7	28,010	8,648	40.6	8,648	D 1.8	2.8	5,441	43.0	575,431
1913	7.9	52.9	30,234	8,993	46.2	8,993	4.0	28.8	7,009	84.3	600,956
1914	6.0	62.1	32,062	9,360	52.1	9,360	4.1	9.2	7,656	101.3	632,902
1915	D 2.9	57.4	31,127	8,909	44.8	8,909	D 4.8	5.0	8,037	111.3	608,471
Railway operating expenses											
1907			\$12,736			\$333			243		80,000
1908	12.5	12.5	14,333	50.8	50.8	502	50.8	14.0	277	14.0	85,446
1909	3.6	16.6	14,844	9.2	64.6	548	9.2	22.7	340	39.9	86,144
1910	7.6	25.4	15,977	13.9	87.4	624	13.9	86.8	635	161.3	93,557
1911	5.1	31.9	16,796	2.9	92.8	642	2.9	32.3	840	245.7	96,474
1912	6.1	40.0	17,827	2.8	95.2	660	2.8	16.8	981	303.7	97,894
1913	9.1	52.8	19,456	3.5	105.1	683	3.5	24.4	1,220	402.1	102,197
1914	6.6	62.9	20,741	7.6	120.7	735	7.6	9.7	1,338	450.6	106,177
1915	D 2.5	58.8	20,228	D 3.5	112.9	709	D 3.5	3.1	1,296	433.3	102,517
Other operations, net revenue											
1907			\$333			\$26.1			26.1		64.41
1908	50.8	50.8	502	26.1	26.1	320	D 26.1	22.3	229	D 22.3	66.30
1909	9.2	64.6	548	192.2	115.9	926	D 192.2	13.6	532	D 11.8	66.40
1910	13.9	87.4	624	74.4	74.4	755	D 74.4	12.6	323	D 12.6	64.12
1911	2.9	92.8	642	126.6	126.6	981	D 126.6	32.9	294	D 49.6	62.11
1912	2.8	95.2	660	107.5	107.5	1,220	D 107.5	2.8	1,174	D 45.4	63.65
1913	3.5	105.1	683	40.4	40.4	2,055	D 40.4	50.8	2,055	D 50.8	64.35
1914	7.6	120.7	735	46.9	46.9	1,737	D 46.9	15.5	1,737	D 39.5	64.69
1915	D 3.5	112.9	709	49.9	49.9	933	D 49.9	46.3	933	D 67.5	64.99
Other deductions from gross income											
1907			\$243			\$2,870			2,870		64.41
1908	14.0	14.0	277	26.1	26.1	2,229	D 26.1	22.3	2,229	D 22.3	66.30
1909	22.7	39.9	340	115.9	115.9	2,532	D 115.9	13.6	2,532	D 13.6	66.40
1910	86.8	161.3	635	74.4	74.4	3,232	D 74.4	12.6	3,232	D 12.6	64.12
1911	32.3	245.7	840	126.6	126.6	4,294	D 126.6	32.9	4,294	D 49.6	62.11
1912	16.8	303.7	981	107.5	107.5	4,174	D 107.5	2.8	4,174	D 45.4	63.65
1913	24.4	402.1	1,220	40.4	40.4	2,055	D 40.4	50.8	2,055	D 50.8	64.35
1914	9.7	450.6	1,338	46.9	46.9	1,737	D 46.9	15.5	1,737	D 39.5	64.69
1915	D 3.1	433.3	1,296	49.9	49.9	933	D 49.9	46.3	933	D 67.5	64.99
Net income											
1907			\$7,038			\$433			\$2,870		64.41
1908	3.5	3.5	7,284	26.1	26.1	320	D 26.1	22.3	2,229	D 22.3	66.30
1909	3.1	6.7	7,510	192.2	115.9	926	D 192.2	13.6	532	D 11.8	66.40
1910	19.0	27.0	8,940	75.5	74.4	755	D 75.5	12.6	323	D 12.6	64.12
1911	14.6	45.6	10,245	31.9	126.6	981	D 31.9	32.9	4,294	D 49.6	62.11
1912	0.6	44.7	10,183	29.3	107.5	1,220	D 29.3	2.8	4,174	D 45.4	63.65
1913	5.8	53.1	10,778	52.8	40.4	2,055	D 52.8	50.8	2,055	D 50.8	64.35
1914	5.0	60.9	11,321	4.6	46.9	1,737	D 4.6	15.5	1,737	D 39.5	64.69
1915	D 3.7	54.9	10,899	2.0	49.9	933	D 2.0	46.3	933	D 67.5	64.99
Net revenue, railway operations											
1907			\$7,038			\$433			\$2,870		64.41
1908	3.5	3.5	7,284	26.1	26.1	320	D 26.1	22.3	2,229	D 22.3	66.30
1909	3.1	6.7	7,510	192.2	115.9	926	D 192.2	13.6	532	D 11.8	66.40
1910	19.0	27.0	8,940	75.5	74.4	755	D 75.5	12.6	323	D 12.6	64.12
1911	14.6	45.6	10,245	31.9	126.6	981	D 31.9	32.9	4,294	D 49.6	62.11
1912	0.6	44.7	10,183	29.3	107.5	1,220	D 29.3	2.8	4,174	D 45.4	63.65
1913	5.8	53.1	10,778	52.8	40.4	2,055	D 52.8	50.8	2,055	D 50.8	64.35
1914	5.0	60.9	11,321	4.6	46.9	1,737	D 4.6	15.5	1,737	D 39.5	64.69
1915	D 3.7	54.9	10,899	2.0	49.9	933	D 2.0	46.3	933	D 67.5	64.99
Railway tax accruals											
1907			\$887			\$6,917			\$1,600		64.41
1908	20.1	20.1	1,065	1.8	1.8	7,042	1.8	29.1	2,065	29.1	64.41
1909	9.0	30.9	1,161	11.2	13.2	7,832	11.2	6.1	2,191	36.9	64.41
1910	13.0	47.9	1,312	15.0	30.2	9,007	15.0	1.7	2,153	34.6	64.41
1911	9.9	62.6	1,442	15.8	50.7	10,427	15.8	28.9	2,776	73.5	64.41
1912	6.4	73.1	1,535	1.6	53.2	10,597	1.6	27.7	3,546	121.6	64.41
1913	16.2	101.1	1,784	3.0	48.7	10,284	D 3.0	18.0	4,183	161.4	64.41
1914	9.9	121.1	1,961	4.3	55.1	10,731	4.3	9.9	3,767	135.4	64.41
1915	1.5	124.5	1,991	4.3	48.4	10,267	D 4.3	26.1	2,785	74.1	64.41
Gross income											
1907			\$6,917			\$6,917			\$1,600		64.41
1908	1.8	1.8	7,042	1.8	1.8	7,042	1.8	29.1	2,065	29.1	64.41
1909	11.2	13.2	7,832	15.0	30.2	9,007	15.0	1.7	2,153	34.6	64.41
1910	15.8	50.7	10,427	1.6	53.2	10,597	1.6	27.7	3,546	121.6	64.41
1911	1.6	53.2	10,597	3.0	48.7	10,284	D 3.0	18.0	4,183	161.4	64.41
1912	4.3	55.1	10,731	4.3	55.1	10,731	4.3	9.9	3,767	135.4	64.41
1913	4.3	48.4	10,267	4.3	48.4	10,267	D 4.3	26.1	2,785	74.1	64.41
Dividends during year											
1907			\$1,600			\$1,600			\$1,600		64.41
1908	29.1	29.1	2,065	1.8	1.8	7,042	1.8	29.1	2,065	29.1	64.41
1909	6.1	36.9	2,191	1.7	34.6	9,007	1.7	28.9	2,776	73.5	64.41
1910	1.7	34.6	2,153	1.6	53.2	10,597	1.6	27.7	3,546	121.6	64.41
1911	28.9	73.5	2,776	3.0	48.7	10,284	D 3.0	18.0	4,183	161.4	64.41
1912	27.7	121.6	3,546	4.3	55.1	10,731	4.3	9.9	3,767	135.4	64.41
1913	18.0	161.4	4,183	4.3	55.1	10,731	4.3	9.9	3,767	135.4	64.41
1914	9.9	135.4	3,767	4.3	55.1	10,731	4.3	26.1	2,785	74.1	64.41
1915	D 67.5	74.1	2,785	4.3	48.4	10,267	D 4.3	26.1	2,785	74.1	64.41

In all the monetary columns in the accompanying table the last three figures are omitted. The letter D prefixed to a figure indicates a decrease.

cent of the 1907 amount. From the point of view of successive years, the increase of 18 per cent in 1913 over 1912 was cut in 1914 to a decrease of 9.9 per cent from 1913 and in 1915 to a decrease of 26.1 per cent from 1914. As compared to 1914, the year 1915 showed a falling off in traffic of 3.9 per cent as measured by passengers carried and of 3.4 per cent as measured by revenue car-miles, although the total traffic in each instance was greater than in any year preceding 1914. The operating ratio for 1915 continued the steady increase of the last four years, although the percentage of increase over 1907 is still only 0.9 per cent.

RESTRICTIONS ON THE USE OF THESE FIGURES

In an interview with a representative of the *ELECTRIC RAILWAY JOURNAL*, Henry C. Hasbrouck, head of the division of statistics and accounts, stated that totals as given in the commission reports should be used with caution. They are compiled by simply adding the revenues, expenses, etc., stated in the annual reports of the seventy-four operating electric railways, practically as these are contained in the published "Abstracts of Annual Reports" of the commission. Any differences between present figures and those previously published are caused almost entirely by corrections necessitated by late returns from some of the companies amending the reports originally filed.

According to Mr. Hasbrouck, this method of compilation obviously contains several sources of errors. Perhaps the most important is the impossibility of segregating urban from interurban business, for it is clear that figures which contain revenues and expenses for both these classes of operations lose something of their significance for either. Moreover, the comparison from year to year of totals for electric railways reporting to the commission is not a comparison of exactly the same properties. For example, new lines which have been under construction may be opened for operation; railroads which have been operated by steam power may be electrified, and an interstate corporation may transfer its operations outside of New York to a foreign subsidiary, thus reducing the totals although traffic may have actually increased. It is also true that in spite of all insistence on uniformity of accounting there are sometimes important items concerning the accounting treatment of which a difference of opinion may exist that causes two or more companies to report the same kind of transaction in different ways.

Mr. Hasbrouck said, however, that an analysis of the sources from which these particular figures are derived does not indicate that any of the possible errors due to comparing unlike quantities are such as should materially affect the totals. The mileage operated by electric railways has increased somewhat from year to year, approximately 280 miles from June 30, 1907, to June 30, 1915, but it is quite evident that the steady decrease in net income since 1911 is not caused by high fixed charges and low earnings on a few large new properties. Neither can the decrease be accounted for by any difference in the number of reporting corporations due solely to the transfer of properties outside the State by or to corporations whose operations extend beyond New York State boundaries. Two lines, the James-town, Westfield & Northwestern and the Niagara Junction, which are included in the electric railway totals for the last fiscal year, were formerly classed among the steam railroads, but this inclusion would not seriously alter the tendency of the figures as compiled.

HIGHER CAPITAL COSTS AND TAXES THE REAL DRAIN

With all due allowances for the various sources of errors, as previously outlined, however, Mr. Hasbrouck

felt that there was no escape from the conclusion that during the last four years, while net revenue from operations had remained fairly constant, taxes, interest, rentals and other charges against gross income had increased so rapidly that the amount available for dividend appropriations had very materially diminished. It did not appear to what extent these factors had affected city lines as compared to interurban lines, but Mr. Hasbrouck was inclined to think that both classes of traffic were equally concerned. Moreover, there was no indication of any extraordinary loss in operating revenues, although as before noted there was some falling off in the year ended June 30, 1915, as compared to the preceding year. Apparently this in a large part was due to the general business conditions during these periods. In Mr. Hasbrouck's opinion it was not a decrease in the amount of business done by electric railways or an increase in the expenses of operation, properly so-called, which reduced the sum available for dividends. It was rather increases in the amount required to pay for the capital necessary for improvements and extensions and in the amount of taxes.

INCREASE IN "OTHER DEDUCTIONS"

Referring particularly to the item of "other deductions from gross income," which showed a higher percentage of increase than any other during the nine years covered by the tabulation, Mr. Hasbrouck stated that this appeared to be in part caused by differences of accounting classification resulting in the inclusion of certain charges under this head during the later years that were formerly carried in the operating expense group. Rentals for leased railroad property and for the joint use of tracks, terminals and equipment owned by another railroad, are items which might be affected by such differences in accounting practice so as to indicate an increase in fixed charges that would be more apparent than actual. This group also includes sinking fund payments and gradual amortization of accounts which have been carried among the company's assets, but which represent either previously unrecognized losses (such as property retired but not written off the books) or large charges for intangible items of various sorts which it is not conservative policy to carry in the investment account indefinitely. Such sinking fund payments and amortization charges do not, of course, represent for the most part actually increased cost of procuring capital, but rather a more conservative accounting policy. At any rate their effect in reducing net income is considerable by comparison with the increase in taxes, interest and rentals.

Standards for Southern Pines

The Southern Pine Association, New Orleans, La., has issued a reprint from the copyrighted standards of the American Society for Testing Materials which includes a definition of the "density rule" which was approved and adopted by the association. This new classification eliminates the names "long-leaf," "short-leaf" and "loblolly" pines and provides two classes: Dense Southern yellow pine and sound Southern yellow pine. Dense Southern yellow pine includes the best pieces of what has hitherto been known as long-leaf pine, and excludes the occasional pieces of inferior quality, for structural purposes. It also includes those pieces of short-leaf pine, Cuban pine, and loblolly pine which, because of their density and strength, are in every way equal to high-grade long-leaf pine, as shown from numerous tests by the United States Forest Service and many other well-known authorities.

imately 700 freight trains and 25,000 freight cars, each of from 60,000 lb. to 180,000 lb. capacity, east-bound up Elkhorn Hill. In addition they pushed an average of two passenger trains per day up the hill and cared for an unknown quantity of switching service and west-bound freight traffic."

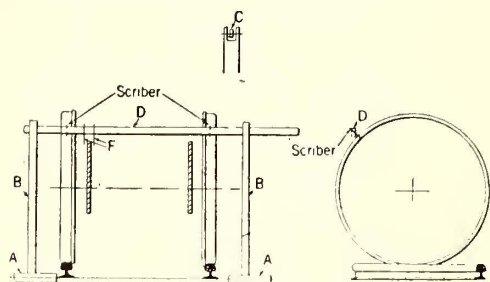
Chattering Wheel Slip in Electric Motive Power

In his paper on the above subject, G. M. Eaton, engineer Westinghouse Electric & Manufacturing Company, showed that chattering wheel slip is characteristic of all types of electric motive power. Comparing electric motive power with steam, he explained that the chattering which occurs with the former is due to the considerable mass of those moving parts which have high moments of inertia. He proceeded substantially as follows:

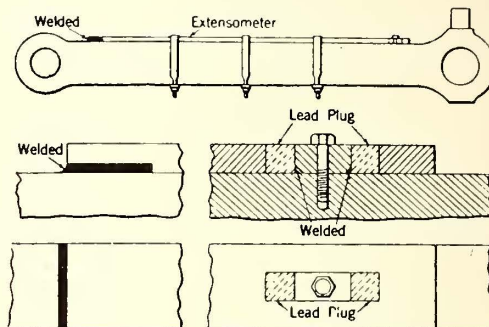
"In an electric locomotive the moment of inertia of the rotors, especially when operating through a gear reduction, may be as great as, or greater than, that of the

the rotors, the rotors are losing their load and will tend to speed up. This is true not only of motors of series characteristics, but also of induction motors when running below synchronism, as they will be ordinarily doing in traction work when the wheel slips. In fact, the induction motors, because their generated counter e.m.f. with increased speed is less than with series motors, will hold up their torque better and, therefore, accelerate faster. The induction motor, in this particular, more nearly approaches the steam locomotive, in which at starting steam is cut off as late as possible in the stroke so as to get the maximum starting tractive effort.

"Analyzing next the other division of the system, the adhesion at the rail will decrease, as the velocity of the wheel tread relative to the rail increases. The effort being transmitted through the transmission system, however, will decrease very rapidly due to expenditure of stored energy, and as soon as this effort which is tending to accelerate the wheel is less than the adhesion



HAND-OPERATED DEVICE FOR RECORDING CHATTERING SLIP



EXTENSOMETER TO INDICATE CONNECTING-ROD STRAINS

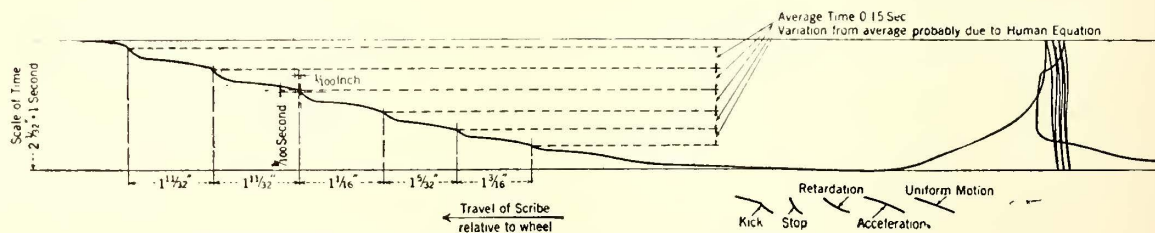
driving wheels. The combined inertia of connecting rods, crossheads, piston rods and pistons in the steam locomotive is practically negligible as far as it affects acceleration of driving wheels, after slipping starts.

"When slipping occurs in an electric locomotive, the sequence of events is as follows, regardless of the type of drive: Current is applied to the motor, and the rotor starts to turn. Clearances in the entire transmission mechanism are first eliminated. Then, as the torque is increased, the metal of the transmission, framing, etc., is bent and twisted, or otherwise deflected. This stressed metal becomes a storage battery of energy. Finally the tractive effort reaches a value sufficient to overcome the existing adhesion of the rail, and the wheel

at the rail, which is tending to retard the wheels, the wheels will start to slow down.

"There are, then, two sets of rotating masses mechanically coupled, the masses at one end of the system accelerating and those at the other end retarding. As soon as the clearances in the transmission are taken up, there is liable to be a jolt on the mechanical system accompanied by a recoil. This sets up the chattering action which has been experienced in practically every type of electrically-driven rolling stock, where the motors are sufficiently powerful to slip the wheels at high adhesion.

"The same characteristic occasionally occurs in city and interurban cars, although this is much less frequent



OSCILLOGRAPH RECORD SHOWING MOTION OF WHEEL DURING CHATTERING SLIP

starts to slip. The instant that relative movement occurs between wheel and rail, the coefficient of friction drops from that of repose to that of relative motion. There is, therefore, an opportunity for the stressed metal to start discharging its stored energy, since part of the resisting force has disappeared. This energy is expended in accelerating the wheels ahead of the angular positions they occupied relative to the rotors at the instant slipping started.

"It is necessary next to analyze independently the two divisions of the rotating system, namely, rotors and wheels. Since the wheels are being accelerated ahead of

than in heavy-hauling electric locomotives. This is due to the greater tractive power which is employed in the latter type of motive power. In the case of freight locomotives where the motors are geared directly to the axles, the same phenomenon has been observed.

"On the Norfolk & Western locomotives, chattering slip occurred in the running gear, and, after the locomotives had been in service for some months, evidences of failure were detected in the crank pins. The cause was traced to chattering slip by means of a rough oscillograph, illustrated herewith.

"The brakes were set on three trucks, and the oscillo-

graph frame was set up on the fourth truck, the wheel tread was chalked, and the oscillograph frame was oscillated about the supporting point A, the amplitude of oscillation being 2 in. The time of a complete oscillation was two seconds. The scribes were pressed against the wheel treads. The wheel treads were then slipped and the characteristic diagram of the chattering slip was obtained, as shown in another figure. From this diagram it is possible to calculate the forces necessary to produce the acceleration and retardation which occurs, and the resulting stresses in the rods, pins, etc.

"To check the oscillograph figures, extensometers were arranged, as shown herewith, by means of which the connecting rods indicated their own stresses. The extension and compression of the rods were recorded by means of blocks of lead arranged as shown. The results obtained by the two methods checked very closely. On the basis of the results, new pins, rods, etc., were applied on the locomotives, and have proved adequate. This chattering slip was more evident on the Norfolk & Western locomotives than could have been anticipated, since this is the first time electric haulage has been applied in service where such extremely high tractive efforts were required.

"In all heavy-hauling electric motive power the problem of chattering wheel slip must be considered with every type of drive. The great number of variables entering, and the wide fluctuation of certain of these variables, renders broad experience necessary in securing a successful solution of the problem."

The Liquid Rheostat in Locomotive Service

In discussing the subject of liquid rheostats, A. J. Hall, engineer Westinghouse Electric & Manufacturing Company, stated that liquid rheostats were first successfully used in locomotive service in this country to control three-phase induction motors on the Norfolk & Western locomotives, the principal functions of such rheostats being to cut out the resistance in the secondary circuits of the main motors while accelerating or regenerating, to compensate for the slip between the different pairs of motors due to variation in the size of drivers, and to make and break the main circuit to reduce wear on the primary switches. He gave the accompanying circuit diagram of the locomotive connections, showing the liquid rheostats connected in the three-phase motor secondary circuits. He then described the construction of the rheostats in substance as follows:

"The rheostats are operated in pairs, each pair having one operating mechanism, storage reservoir, cooling tower, and circulating pump. The accompanying illustrations show the mechanical structure of the rheostat, which consists of one main casting, divided into four compartments, a central one and three arranged in triangular form around it. A set of electrodes is mounted in each of the three outer compartments. In each compartment, one electrode is grounded to the side of the main casting, and the other is suspended from the top cover and insulated from ground by three porcelain insulators. The rods which support the latter electrode are connected by copper straps on the outside of the cover.

"Each set of electrodes is connected through a pole change-over switch to the secondary of a three-phase motor. The electrolytes furnish resistance between the insulated electrodes suspended from the cover and those grounded on the side of the main casting, thus making the main casting the common point of the star connection. The center compartment provides space in which a steel tube, which can be raised or lowered, acts as an overflow pipe for the liquid. The height of the liquid in

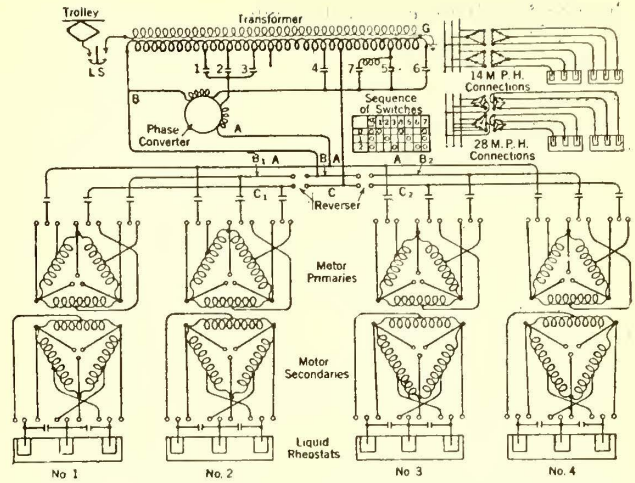


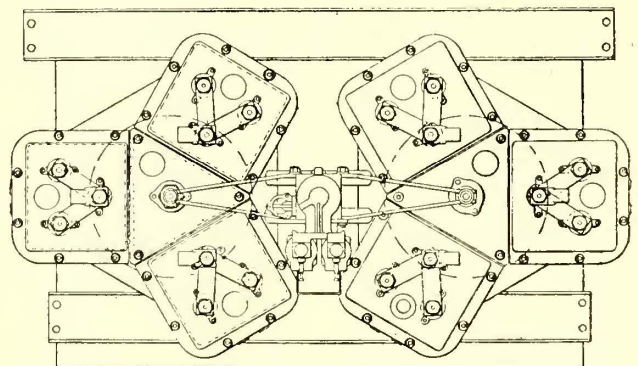
DIAGRAM OF MAIN CIRCUITS OF NORFOLK & WESTERN SINGLE-PHASE LOCOMOTIVE

the rheostat is thus varied by the condition of the overflow tube. The electrodes are made up of iron plates, of which the effective area gradually increases and the resistance of the circuit decreases as the surface of the liquid rises.

"Two of these rheostats are mounted on the top of the main supply tank containing the electrolytes, which consist of a 0.5-per cent to 1-per cent solution of anhydrous sodium carbonate. The intake to a pump which will circulate about 300 gal. per minute is connected to the supply tank, and the outlet is divided into two paths which lead into the bottom of the rheostat casting mounted on top of the supply tank. The upper portion of the regulating or overflow tube is about 3 in. smaller in diameter than the lower portion, so that when this tube is at its lowest position, there is a space around the valve for the liquid to flow through from the rheostat to the supply tank without coming into contact with the electrodes. When the overflow tube is raised, the upper portion of the larger part of the tube comes in contact with the valve seat, preventing the liquid from flowing through. It then flows over the top of the tube, raising the level of the electrolyte in the rheostat and submerging a portion of the electrodes. This position is called the 'flush-level' of the rheostat.

"The operating mechanism in the center of the rheostat is controlled by a balanced pressure operating mechanism, which is mounted above and between the two rheostats. The cross-arm extending from this mechanism is connected to each of the overflow tubes by a rod. Thus the raising or lowering of this cross-arm raises or lowers the level of the liquid.

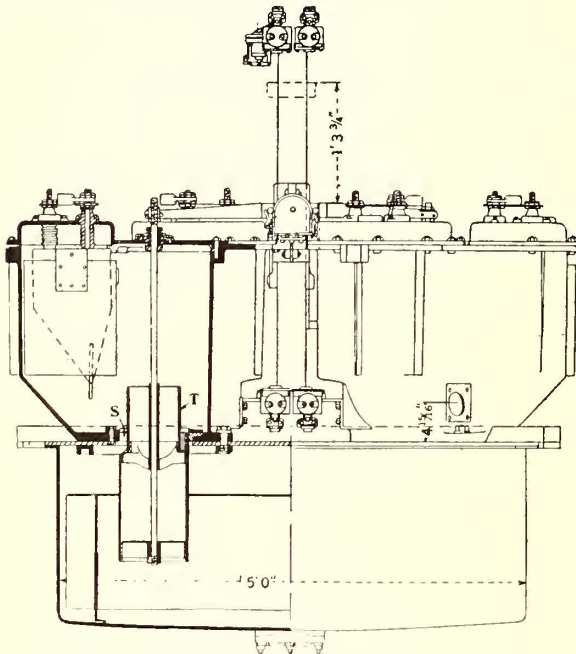
"The master controller consists of two separate and independently operated drums, not mechanically interlocked, but both interlocked with the reverse drum, so that both handles must be in the 'off' position before



PLAN VIEW OF RHEOSTAT TANKS AND OPERATING MECHANISM

the reverse drum can be thrown. The speed drum has four 'on' positions to set up the required combination of pole change-over drums, reverses and primary switches. Between the 14 m.p.h. and 'off' positions there is a notch which will give a 14 m.p.h. combination on one truck only in each unit. This is useful for handling a light engine, switching, or starting long trains of empties. The other division is between the 14-m.p.h. and 28-m.p.h. combinations. This is for changing over from 14 m.p.h. to 28 m.p.h. without losing tractive effort or causing sudden jolts in the train. The transition is made by first changing over one pair of motors in each unit to 28 m.p.h. and as soon as the rheostat for these motors has reached the 'flush-level' condition on the 28-m.p.h. combination, the speed handle is moved to the full 28-m.p.h. position, thus changing over the remaining pair of motors.

"The accelerating drum has three operating conditions, marked 'lower,' 'hold' and 'raise.' These terms refer to the level of the liquid in the rheostat.



PARTIAL SECTION AND PARTIAL ELEVATION OF
LIQUID RHEOSTAT

"When the rheostats are full of liquid the proper short-circuiting switch is closed, short-circuiting the motor secondaries. These switches do not come into action until the operating mechanism is in the full 'on' position.

"Two limit switches are used, one for each speed combination, their function being similar to an overload trip, except that they do not open the main circuit. Should the torque exceed a predetermined amount, the limit switch will open the control circuit of the liquid-rheostat operating mechanism, and thus lower the lever of the electrolyte, inserting more resistance in the secondary of the motor.

"The cooling tower for the electrolyte consists of a series of inclined trays, the liquid flowing over them while air is blown over the surface of the liquid to dissipate heat by vaporization. A supply pipe for the cooling tower is connected to the main circulating system near the outlet of the pump. This pipe will by-pass a certain amount of liquid, which, after flowing over the surface of the trays, flows back into the supply tank. The cooling tower operates whenever the locomotive is in service, the rate of cooling varying according to the temperature of the liquid."

Notes on the Discussion on the Norfolk & Western Electrification

After the presentation of Mr. Wynne's paper, A. H. Armstrong, General Electric Company, asked a number of questions as to the operating features of the locomotives equipped with constant-speed motors, particularly in regard to making up time, etc. R. E. Hellmund, Westinghouse Electric & Manufacturing Company, stated that from observation of the locomotives on the Italian State Railways and of the Norfolk & Western locomotives he was convinced that the supposed disadvantages of the constant-speed characteristics were not really serious.

F. H. Shepherd, Westinghouse Electric & Manufacturing Company, said that the great thing about the Norfolk & Western locomotives was the perfection of control. When the possible damage to tonnage trains through irregularity in control was considered the perfection in this line due to the use of the liquid rheostats was appreciated.

B. A. Behrend, consulting engineer, Boston, Mass., regretted that the steam railroad men forced upon the manufacturers of electric railway apparatus the use of a system as complicated as that which had to be used in this case. If it had been possible to employ the straight three-phase system the capacity of the power plant would have been greater and the apparatus on the locomotive simpler.

Prof. W. I. Slichter, Columbia University, emphasized the fact that much progress has been made in ten years in that the superiority of the electric locomotive has been demonstrated, and Prof. C. F. Scott, Yale University, thought that the result achieved by such installations as that on the Norfolk & Western should be appreciated. When one considers that the electric locomotives are actually hoisting the coal much better than it had been hoisted by steam locomotives the minor defects should be overlooked. This is really a hoisting proposition and not one of main-line electrification.

William Arthur, engineer with McHenry & Murray, called attention to the unimportance of the weight item in heavy traction. Weight is needed to give required tractive effort. Recent studies had shown him that in the three systems in use in heavy traction the locomotive weights were about the same.

H. M. Hobart, General Electric Company, put in a plea for economic considerations in heavy traction and elsewhere. He disagreed with previous speakers who, he thought, overlooked this phase of the question. After all it is the "dollars and cents" consideration which must determine the superiority of one system over another and not merely its technical qualities. He also thought that it is not enough that a locomotive will handle the freight even if some of the details are not perfect. The whole installation is composed of details which must each be excellent for the best results.

In response to a question Mr. Hellmund stated that the rheostats on the Norfolk & Western locomotives easily handled 800 amp. at 750 volts for ten minutes or more and that the evaporation of water in the cooling tower was so slow that the addition of make-up water once a day was sufficient. He also said that there is an interlock on the rheostat to prevent the short-circuit switches from being closed before the resistance is minimum. Another question answered by Mr. Hellmund referred to the effect of voltage variation on the performance of the locomotives. He said that while the torque varies as the square of the voltage, there is ample margin in the design to take care of this. Mr. Wynne said that the maximum voltage drop in this case is about 25 per cent.

Reducing Accidents on the Union Traction System

The Union Traction Company of Indiana Last Week Received the Brady Medal on the Basis of Its Accident Record for the Year Ended June 30, 1915—This Article Gives in Detail Some of the Reasons Why the Record Was So Good

IN view of the fact that the Union Traction Company of Indiana was awarded the Anthony N. Brady medal for its 1915 safety record, as announced in the issues of this paper for Jan. 22 and Feb. 5, the editors have secured from President Arthur W. Brady of that company some details of this record.

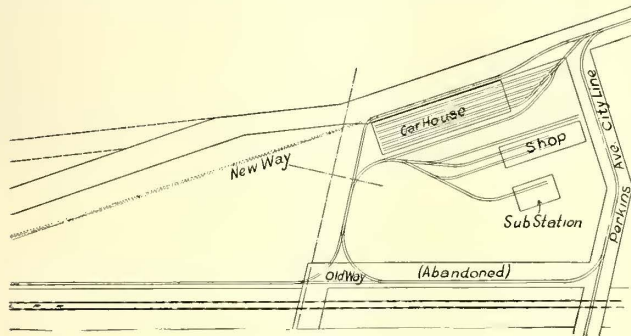
STATISTICS RELATING TO SAFETY

The company last year operated more than 400 miles of single track, of which 47 miles were in cities and 330 on private right-of-way. Practically 17,000,000 passengers were carried and more than 8,000,000 car-miles were run.

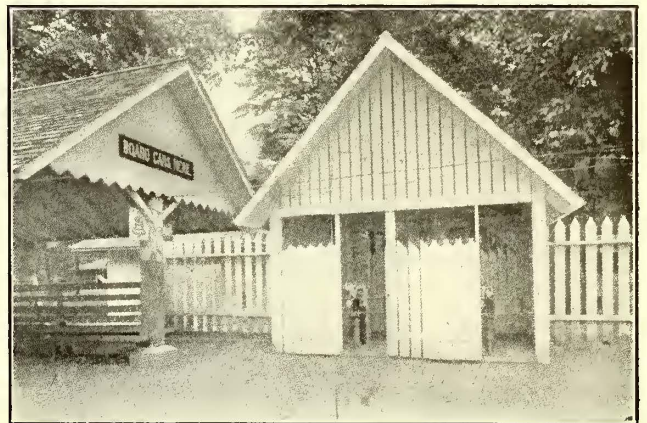
Out of about \$6,135 earned per mile of track \$243 was set aside for accident claims, although but \$53½ was required. The ratio of accident costs to gross income was 0.881 per cent.

The company employed on an average 1394 persons and operated 232 passenger cars and forty-eight freight cars, 221 of the cars being motor cars. On the system are 1361 highway grade crossings in a highly prosperous country, and the cars operate through active and wide-awake cities, in a section where one out of every

The company has three dispatch offices located at important division terminals, which take care of the dispatching of interurban trains. In each of these dispatch offices there are four dispatchers, a chief and three assistants. The dispatching is done in three tricks; one six-hour trick, and two nine-hour tricks. The chief dispatcher takes care of the light, six-hour trick; two dispatchers are used for the afternoon nine-hour trick, and one for the night nine-hour trick. In addition to working the six-hour trick, the chief dispatcher rides certain trains each day on his division, so as to get closely in touch with the train crews and to instruct them in train operation. The dispatch circuits are connected to all sidings, stations and substations, making it possible for the dispatcher readily to communicate with a train crew at any point desired. The dispatching is done by what is known as the "double order system," that is, the same order, in the identical wording, is given to all trains interested.



TRACK REARRANGEMENT AT MUNCIE CARHOUSE



SAFETY GATES AT MOUNDS PARK LOADING STATION

thirty-five inhabitants is the owner of an automobile. The tracks are built for and used by high-speed limited cars, some of which are scheduled at 45 m.p.h. with no passenger stops for 38 miles. There are 194 grade railroad crossings, some of the most important of which are guarded by a total of thirteen flagmen, but all cars are required to make a full stop before crossing.

For education of employees and the public the company has a modern safety organization with which the readers of this paper are familiar from the many references which have been made to it in these columns. The equipment is also designed to minimize the number and severity of accidents. This applies to track and structures, line and power plant, rolling stock and shops. Several illustrations have been chosen to show typical safety efforts.

Fifty-one miles of track are protected by the General Railway Signal Company's continuous track circuit automatic block signals of the absolute permissive block signal type with light signals. Equipment for 25 miles more is on hand.

All trainmen are required to have watches with at least seventeen jewels, and which will not exceed a variation of thirty seconds in one week. All watches are required to be thoroughly inspected semi-annually, and each trainman must report to the watch inspector semi-monthly for the purpose of having his watch set, regulated or adjusted, as the case requires.

During the year ended June 30, 1915, the company had no casualties in train accidents, but two industrial accidents occurred and in transportation casualties other than train accidents thirteen persons were killed and nine were injured. Most of the fatal accidents were due to intoxication, to trespassing or to carelessness, and the liability of the company was not great.

SUGGESTIONS FROM EMPLOYEES

The company has been quick to adopt suggestions received from employees. Among those adopted last year the most important are tabulated on the next page. The list is printed here as suggestive to employees on other properties.

Suggestions Acted Upon by Local Committee

That air pressure in auxiliary reservoir be tested each day in cold weather on all cars equipped with HL control.

That the foot gong in Car No. 251 be placed near the brake staff, so that it can be more easily used.

That two barrels of salt water be put at the Anderson freight house for use in case of fire.

That there be four windows cut in the oil-house basement for ventilation.

That grab handles and stirrups be placed on all corners of freight trailers for the safety of trainmen in placing flags, and also to make it more convenient to get on after leaving the train to flag crossings and throw switches, etc.

That a trespass sign be placed at the north end of White River bridge, and the one at south end be restenciled.

That a better system of car inspection be had before accepting cars from foreign lines at places where cars are accepted from other companies.

That shrubbery which obstructs the view on the south side of the track east of Brightwood Avenue be cut. It is understood that permission was secured at one time to keep this cut.

That a bulletin calling attention to fire hazard be reissued and read at meetings of all local safety committees.

That all trainmen bleed air tanks when leaving cars at the end of a run on account of air lines freezing and causing delay, and that the transportation department place bulletins at all division points, calling trainmen's attention to this help for better service.

That all grab handles be made tight in sockets, so that they cannot turn.

Suggestions Acted Upon by the General Board

That Polk milk station at Fortville be asked to take care of exhaust steam from the station, as it completely obstructs the view of the track.

That a stairway be built at the south end of the Anderson power house for the convenience of coal men.

That loose rails be not carried on work cars, as in case of collisions or serious accident the results might be disastrous. This applies to loose rails being carried on the cars to weight them down.

That folding fenders be placed on a city car in Elwood to prevent boys from riding on the fenders as they do on the present fenders.

That the company have new posters printed with several suggestions pertaining to safety of shop men or other employees working in or about cars and engine rooms, the general safety board to decide what suggestions would be best for such posters.

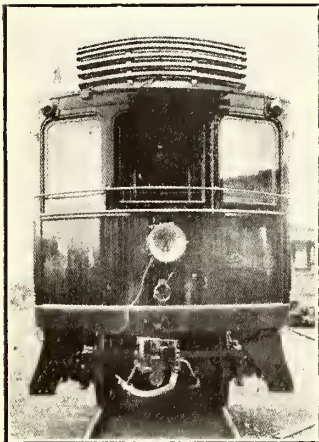
That oil boxes, bull-rope boxes and trolley pickups be sealed, and that one man be appointed at the shops to replace material when the seals are broken.

That double whistle signals be sounded at all obscure country crossings.

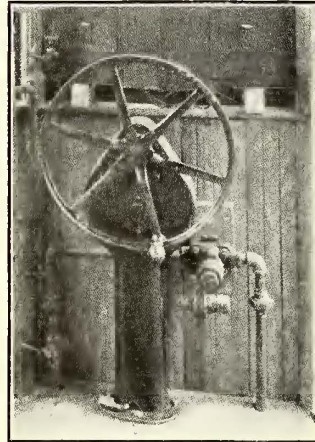
That, as passengers open the rear outside doors of pay-as-you-enter cars while conductors are flagging railroads or throwing block lights, signs be placed on the doors, reading "Passengers must not open these doors."

That something be done to keep children from playing on bridge abutments.

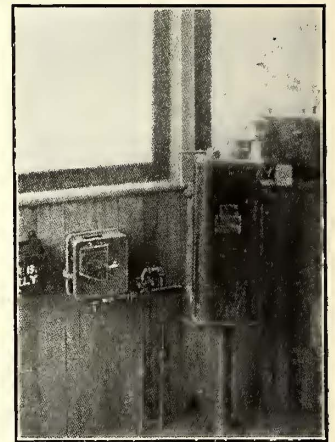
That compulsory stops be established at certain designated points, to be made by all cars before crossing streets.



REAR END OF CAR WITH GRAB RAIL; SCALING LADDER AND HANDLES IN SIDE OF CAR



NEW STAFF BRAKES ON INTERURBAN CARS; NEW EMERGENCY REVERSE



That as the gong on Car No. 26 does not ring loud enough for safety a louder gong should be installed.

That the company provide posts or a fence between Cowan Station and the bridge just south of the station, in order to prevent rigs backing into the ditch and upsetting.

That the line car carry poles on the side opposite traffic, when on double track.

That when a chemical fire extinguisher has been used, it should be turned in at the first shop reached; also that crews be instructed by bulletin on bulletin boards that a charge is useless after a part of it has been used.

That crews keep fuse boxes cleaned of papers and lamps, as there should be nothing in boxes but what is marked on them.

That "high tension" at Lafontaine substation be fenced off.

That the dirt piled by the "Big Four Railroad on the Cemetery Line near the railroad crossing at Marion be removed.

That ties along the right-of-way between Highland Avenue bridge and Matter Park, Marion, be removed.

That limbs be trimmed from the tree at Fairmount between the hand block and water fountain.

That all cars using the cemetery tracks round the curve at "Creamery" be under perfect control, so as to stop within 5 ft.

That all the roadway telephone booths be kept locked at all times.

That all cross-cut saws be shielded before being placed on any city car.

That there be installed at the Gas City Junction a small hand-throw arm for the use of the Gas City cars when they are in Jonesboro.

That there be some small boxes made and hooked in front of water cans in which to put used cups; hooked up almost as high as the average person's eyes, so they cannot help seeing where to put these cups.

That electric light companies interchange notices of wire troubles, so that the company owning the wires can at once look after the trouble.

That the trolley wire in the train shed at Muncie be supported at sufficient distances, so that in case of a break it will not drop low enough to injure anything.

That a few shovels of coarse gravel or rock that are thrown off the grade be placed around the poles after cutting the grass to prevent the poles from taking fire from the grass.

That the out-bound track at Anderson Junction be not used by freight cars at the Anderson freight house without the sending of a flagman around the curve.

That siding signboards could be seen much more readily if they were lowered on the poles 10 ft.; they are now up near the mast arms and out of the line of vision on the Honey Bee division.

At the north end of Burr Cut siding on the east bank at a point where the steam shovel quit work there is a knoll of dirt which projects and obscures the view of the curve at this point. The dirt could be moved at little expense and it could be used to good advantage on the Blue River fill where the grade is narrow. This would give the motormen at least 1000 ft. more of view.

That the company have an emergency call on the telephone in order that all stations may be called at one time.

That the automatic air valve on the steel cars be changed to a different position, as it can now be easily closed accidentally.

Open Letter from President Henry

Reasons for the Amendments to the Constitution Adopted in Chicago—Associations with Which Representatives of Manufacturing Companies May Affiliate—Help Which the Manufacturers Have Given in the Past and Can Give in the Future—Work to be Done

THE passage at the Chicago convention last week of the amendments to the constitution of the American Electric Railway Association permitting manufacturing companies to become members of the association on the same basis as railway companies makes the following letter from President Henry to the members of the two associations of especial interest.

INDIANAPOLIS, IND., Feb. 7, 1916.

To Members of the

*American Electric Railway Association
and of the*

American Electric Railway Manufacturers' Association:

It is proper and, I think, desirable that I should say a word on the amendments made to the constitution and by-laws of the American Electric Railway Association at the recent mid-year meeting of the association at Chicago.

Although the consideration of these amendments had been pending since the San Francisco convention, in October last, it was evident at the mid-year meeting that much misunderstanding existed in regard to them.

Briefly stated, the amendments cover only one thing and that is, provision for companies engaged in the manufacture or sale of electric railway material to become members of the American Electric Railway Association upon exactly the same basis and with exactly the same rights and privileges and charged with the same duties and obligations as electric railway company members. The fees for such membership are based upon the gross receipts of such companies growing out of the manufacture or sale of electric railway material, covering the same range as the dues paid by railway company members, but classified in fewer and larger groups so that the statement of such a company regarding the dues which it should pay will only show the large group in which it stands, and thus not disclose the amount of its annual business. The amendments are so worded as to permit publishers of the technical press and engineering companies also to become members.

THE REASONS FOR THE AMENDMENTS

These amendments were felt to be desirable and necessary in order that the industry in which we are all alike interested should have the united support of one compact organization, composed not only of railway companies but also of companies making and selling electric railway material. Although the manufacturers and salesmen have, in the past, in many ways constantly shown their willingness and desire to aid in the work of the association, it has not been possible to have the full benefit of their help and co-operation because they were not members of the association, took no part in the meetings of the association, were not authorized to act on the committees of the association, and were, in fact, only outside friends of the association, willing to aid whenever they could. Under the amendments made, the manufacturing and selling company becomes a full-fledged member of the association the same as a railway company, and as such its representatives are entitled to membership in any of the affiliated associations—the Claims Association, the En-

gineering Association, the Accountants' Association or the Transportation & Traffic Association—and will be assigned to the same on request. The executive officials of the company will, however, be entitled to membership in all of these affiliated associations, without a special assignment. Moreover, at any time the manufacturing and selling company members deem it desirable they may, upon application to the executive committee, have organized a new affiliated association in which they may consider not only general affairs of the American Association, but also such special matters as they, as manufacturers and salesmen, may be interested in, and to such an affiliated association there would no doubt be referred, from time to time, the control, management and handling of such affairs of the American Association as could be better handled by a group of manufacturing and selling members than by a group of electric railway members. The president of such affiliated association would by virtue of such office become a member of the executive committee of the American Association.

MANUFACTURERS NEEDED AS CO-WORKERS

These amendments are in no way a reflection upon the manufacturers and salesmen, or upon their present organization under the name of the American Electric Railway Manufacturers' Association. They have, through that organization, carried forward a very useful and necessary work, providing for and managing exhibits at the conventions held by the American Association, and adding much to the interest and pleasure of the occasions by looking after the entertainment features. Moreover, they have, in addition, given all the aid they could as outsiders to the work of the parent association. The time has come, however, when the parent association must have not the outside help of the manufacturers and salesmen, but must have them as members in and co-workers of the association itself. The industry needs the active, energetic and enthusiastic support of all persons interested in it, whether they manufacture and sell the material for the railways, or whether they are engaged in the operation of the railways themselves. The work to be accomplished is a work of education, a struggle for rights and an effort to secure a stable and lasting basis upon which our business may rest to the benefit not only of the owners, but also of the communities which they serve.

We want, of course, the help that will come from the increased funds with which to carry on our work, for this the association badly needs in order properly to carry forward the various phases of the work before us, but most of all we need and want the additional help and influence in the presentation of our cause which will come from the hearty support of the solid business interests which the manufacturers and salesmen of railway material represent, and we want their advice and help in all of the councils of the association.

Duplication of effort means waste, expense and often lack of harmony. United effort in a common cause must mean success, if success is possible of accomplishment. For this reason the association has opened up its doors and invited into full membership the com-

panies engaged in the manufacture and sale of electric railway material; they will no longer be allies but will be a part of the association in full fellowship, and co-workers in every respect with the railway members.

CHANGES ARE NO CRITICISM OF PRESENT MANUFACTURERS' ASSOCIATION

As stated, the changes made are in no way a criticism of the present American Electric Railway Manufacturers' Association, and from a legal point of view they in no way affect that association. It would, in fact, not be inconsistent, under the amendments, for that association to be continued and even to carry forward exactly the same work which it has heretofore carried forward, but it may, after due consideration, be found that this work can be as well or better performed under and by an affiliated association organized especially for manufacturers and salesmen, at the same time saving a duplication of labor and expense. The closer and more harmonious the union between all of the interested companies and persons can be made, the greater will be the benefits to the parent association and all of the affiliated associations.

THE WORK OF THE FUTURE

Already a number of manufacturers have made application for membership under the amendments enacted, and from indications this will be quite promptly and generally followed, so that it seems probable that in the very near future the American Electric Railway Association will embrace within its membership a very large proportion of the companies engaged in the manufacture and sale of electric railway material, and the ranks of the association, being thus greatly strengthened, will be strong to resist the attacks of our opponents and strong to carry forward the work which the association is organized for in the upbuilding of our industry and the securing to those who have made investments in that industry a reasonable return upon the capital invested.

APPROVAL EXPRESSED BY MANY

I cannot close this statement without expressing my thanks to the many representatives of the manufacturing and selling industry, as well as the electric railway men, for their kindly expressions of a desire to aid in bringing about the results sought in the making of the amendments to the fundamental law of our association. Almost unanimously they have said to me that this is exactly the thing that ought to be brought about and that they are ready, willing and anxious to give their assistance therein.

CHARLES L. HENRY,

President American Electric Railway Association.

Enormous Turbo Unit Ordered

The Interborough Rapid Transit Company of New York has ordered from the Westinghouse Electric & Manufacturing Company a 70,000-kw. turbo unit for its Seventy-fourth Street power station. The unit will be in three sections, one high pressure and two low pressure and on light load it will be capable of operation at high economy with the high-pressure and one low-pressure cylinder. The three electric generators of the unit will be of equal size and at about 60,000 kw. will divide the load equally. The steam pressure to be used will be about 225 lb. and the superheat approximately 150 deg. Fahr.

According to the bureau of foreign and domestic commerce, an American consular officer in Brazil writes that a man in his district is in the market for a gasoline motor car to be used on a track having a gage of 60 cm.

AMERICAN ASSOCIATION NEWS

Meeting of Joint Committee on Block Signals

The committee on block signals met in Cleveland on Feb. 1 and 2 to consider the work of the sub-committees appointed at the Newark meeting. The members present were J. M. Waldron, New York, chairman; G. N. Brown, Syracuse, N. Y., who acted as secretary; J. J. Doyle, Baltimore, Md.; John Leisenring, Springfield, Ill., and J. B. Stewart, Jr., Youngstown, Ohio. By invitation there were also present S. M. Day, Rochester, N. Y., and H. W. Griffin, New York, representing the signal manufacturers.

The revision of existing standards was first taken up and the advisability of eliminating marker lights on adopted standards for signal aspects was discussed. It was decided that a footnote on this matter should be prepared and it will be taken up again at the March meeting. The sub-committee on revision was also requested to rewrite the recommendations appearing in the Manual in regard to continuous track circuits.

On the design on block signal apparatus it was decided to consider simple parts of mechanical interlocking work, with a view to adopting them as standard and referring to the same numbers of plates and drawings as are used by the Railway Signal Association. Specifications will also be prepared on mechanical interlocking, signal numbering, switch stands and markers to be placed in advance of signals.

On the subject of clearance diagrams for semaphore signals which had been considered jointly by representatives of this committee and the power distribution committee, it was agreed that a separate diagram should be prepared to take care of lines where steam road equipment is operated and where trainmen are allowed to climb to the top of cars. A few minor changes were made in the clearance diagram shown in the 1915 report, consisting of the lowering of the bracket arm to conform with the power distribution committee's minimum of 19 ft. A minimum clearance between the edge of the illuminated roundel and the face of the pole will also be shown with a note explaining that this requires a 9-in. rake in 24 ft. in place of the standard 6-in. rake. This is to apply to all poles within 300 ft. in advance of signals and where the minimum height of signal blade and pole setting are used.

In the study of block signal operation it was recommended that a maintenance cost data sheet be sent to all member companies to secure information on both track circuit and trolley contact signals. A proposed monthly signal report form was also considered and a decision reached to send copies to all companies to secure data on operating efficiency. These two forms will go out from the secretary's office at once.

The sub-committee on highway crossing protection is about to communicate with the automobile associations of the country and with the civic authorities in the several states to obtain information as to the protection advocated by these bodies. Drawbridge protection will also be studied.

A rough draft of a form of contract for signal installations was prepared during the course of the meeting by a sub-committee after reviewing the forms of contract used by the signal companies. This will be considered further at the next meeting of the full committee.

The next meeting of the joint committee will be held in Chicago about the middle of March.

COMMUNICATIONS

Steel Wheels and Rail Corrugation

BROOKLYN RAPID TRANSIT COMPANY

BROOKLYN, N. Y., Jan. 31, 1916.

To the Editors:

I note upon page 216 of the issue of the *ELECTRIC RAILWAY JOURNAL* for Jan. 22 under "Communications," that my very good friend T. F. Mullaney, chief engineer of the Third Avenue Railway, has made certain assertions that would tend toward the indictment of the forged or rolled steel wheel as the cause of rail corrugations. Of course, I am sure that Mr. Mullaney, like the writer and all the rest of us, would be very glad to know the facts and the real answer; but as far as the relation of the steel wheel to rail corrugations is concerned, the writer through twenty years of experience upon three street railway systems knows to a certainty that rail corrugation not only goes back that far, but has continued throughout that period. In fact, it was especially bad on certain systems wherein no thought was ever given to using other than a cast-iron wheel.

There are those to-day who assert that a cast-iron wheel causes rail corrugation, just as the statement is made that the use of steel wheels is responsible for corrugation. In my judgment neither can be directly indicted as the cause, and perhaps it is true that one is no more responsible than the other.

The steel wheel in city surface operation has become as firmly fixed as regards safety, the elimination of flat wheels and of chipped flanges, and even for its direct economy, as air brakes upon heavy cars heretofore operated with hand brakes only.

Incidentally, and speaking as one who was considerably interested in track construction from 1896 to 1899, I believe that this subject, a matter of universal discussion and wherein but few definite conclusions have been drawn, can well afford to be treated in a very broad manner and without any attempt to point out the answer in advance. As far as steel wheels versus cast-iron wheels are concerned, argument can doubtless be had in the same manner as when the country school teacher upon being asked by the local board of education as to whether he taught that the earth was round or flat, promptly replied that he could teach either way and which did they prefer.

W. G. GOVE,

Superintendent of Equipment.

Cause of Rail Corrugation Elusive

THE METROPOLITAN STREET RAILWAY COMPANY

KANSAS CITY, Mo., Feb. 3, 1916.

To the Editors:

The writer has noted, with a great deal of interest, the recently published articles concerning the causes of rail corrugation. Everyone is agreed that the proper remedy is not the grinding of the rails, but that the causes of the corrugation should be determined, if possible, and eliminated.

Fortunately Kansas City has not been annoyed with a large amount of corrugated rail, there being only several isolated cases. There is no theory as to the cause of these that will fit absolutely in each case. The corrugation occurs in sections of rail rolled many years ago, and in the rails rolled in recent years. It also existed before steel wheels were in use on any of our cars, and it has occurred since practically all of these wheels have been removed. We have instances of the latter on practically new track laid on rigid

foundations. Some of our worst cases of corrugation occur upon loose rail or on resilient foundations.

Various theories have been advanced in attempts to determine the causes of corrugation, but none will stand the test of absolutely all conditions. That the quality of the rail, its method of rolling, or its chemical composition has anything to do with this phenomenon has not been demonstrated. As has been stated in many articles, steel experts have tried heavier sections of rail and metal of varying quality without obtaining the desired results.

One theory that has found much favor was that a rigid foundation would tend to produce corrugation. This, also, has been demonstrated as having no bearing on the case. Corrugations have occurred alike in track laid with solid concrete and track laid upon timber, and in other cases within the knowledge of the writer there was practically nothing under the track but mud.

That steel wheels are the cause of this trouble is one of the recent theories. This, also, is probably doomed to be cast into the discard. Corrugations occurred before steel wheels were in general use, and on lines where they were never used. The advancement of the theory that corrugations are produced by the bearing of the wheel tread at a point near the edge of the rail has been ingeniously demonstrated in a theoretical way, but I fear it is not borne out by facts.

Corrugations have occurred in rails that have been worn off and the head of the rail made to conform to the contour of the wheels which were running over it. Surely in cases of this kind corrugation could not be charged to irregular bearing, or the peening of the metal on the edge of the head. While these matters may have some connection with corrugation, they are the results of it, rather than the cause. The theory as advanced will not fit every case, and the true source of corrugations will not be determined, except when the theory fits each and every case. The other causes that have been brought forward may have some bearing upon the case, but should be considered rather as contributory and not as initial sources of the trouble.

It is conceded, of course, that the corrugations are produced by some force acting upon the rail through the tread of the wheel. In the use of the wheel, the ideal theoretical condition would be that of a perfect cylinder rolling upon a perfect plane. Such conditions would not produce corrugations where the pressures are limited to what the material in the contact surfaces could reasonably be expected to bear, therefore the corrugations must be produced by some unusual movement or action of the wheels.

Our experience would indicate that corrugations generally occur at such points as the car is being accelerated or retarded. Possibly the direct cause is due to what might be described as a "chattering" of the wheel. In the acceleration of the car this might be traceable to conditions existing in the bearings, the truck, the gears, and, possibly, in the motor itself. In the retarding of the car, it would be traceable to conditions under which the brakeshoe was working. The metal of the shoe might hold constantly, or be a rapid series of alternations from a perfect grip upon the metal to a condition of slipping. This condition might be brought about either by the nature of the metals in contact or by the details of the brake rigging. Local conditions of grades, curvature, general conditions of track, etc., in combination with the conditions that exist in the car itself, would tend to localize the corrugations so that they might exist in one part of the track and not in another.

While there is no question but that rail of certain quality might lend itself more readily to the action of the wheels and tend to corrugate and while there is no

question but that, to some extent, the shape of the rail head and its contact with the wheel may have some bearing on the difficulty, the use, for many years, of both rail and wheels when corrugation did not occur would tend to demonstrate that its cause lies in something that has been introduced into the operation of cars in recent years.

As has been previously suggested in your columns, rail corrugation is undoubtedly due to a combination of circumstances. As there is no theory which would place the cause for this either in the wheel or in the rail, or in any one local condition, we must look further for the initial cause. It is the opinion of the writer that the investigation as to the primary cause of corrugation should be transferred from the examination of the rail and the wheels to the operation of the brakes and the motors.

A. E. HARVEY, Chief Engineer.

Causes of Rail Corrugation

SPRINGFIELD, MASS., Feb. 1, 1916.

To the Editors:

In your issue of Jan. 15, George L. Fowler referred to an article published in your columns several years ago on rail corrugation, which attributed corrugation to excessive wheel pressures. If the article which Mr. Fowler had in mind was the one written by me, to which I called attention in your issue of Jan. 8, excessive wheel pressures were given as only one of three important factors in rail corrugation. Two others mentioned in the article as having an even greater bearing on the occurrence were: Non-uniformity of pressure and point of application of pressure. As my article on rail corrugation, written in 1911, pointed out, excessive wheel pressures, if uniform, will not cause corrugation but a cold flowing of the metal, a condition which is often found on steam roads. Where these excessive pressures are non-uniform, rail corrugation will be found on steam roads as well as on electric roads. My observation has shown that wherever rail corrugations appear they are due to pressures exceeding the elastic limit of the metal, but in addition to this the pressures are non-uniform.

There are, of course, a number of conditions which may produce non-uniform pressures on rail head of sufficient intensity to exceed the elastic limit of ordinary steel rails, but, I repeat, chief among these is the variation of the area of contact between the wheel and surfaces of the rail and the shifting of the point of application of the pressure from the center of the rail to the edges. The chief advantage of the rounded head, as already stated, is that it is possible under operating conditions to obtain a uniform area of contact between the wheel and rail, but a further advantage is that it also keeps the point of application of the pressure away from the edge of the rail where the elastic limit of the metal is reduced from its cubical value to its linear value, a point which does not seem to have been clearly brought out in the recent articles published but which, undoubtedly, explains why rail corrugation is not "rampant" on steam railways. With rails with flat heads, if it were possible at all times to maintain the surface of the rail in such a position that a line contact would be obtained between the wheel tread and the rail, it is probable that little or no difficulty would be experienced with rail corrugation. But where such rails are embedded in concrete and crowded inwardly and outwardly by the expansion of pavement, it is obvious that it will be a practical impossibility to maintain the rail surface in such condition, and it is due to this very fact that rail corrugation appears more frequently on rails of this kind.

It must not be assumed that corrugation never will appear on track laid with rails having rounded heads because the normal wear of the rail will tend to flatten the head, and if the rail is anchored to these foundations so rigidly that it may not assume the position under load where the point of contact between the wheel and rail will fall at some distance from the edge of the rail and also obtain a uniform area of contact, corrugation will appear on T-rails as well as on any other type. The same condition will hold true wherever non-uniform pressures exceed the elastic limit of the steel, and I might note that these conditions would probably be found in the New York subways, particularly near stations where acceleration of trains, both positive and negative, produce non-uniform pressures on rail head. Similar conditions will be found on curves, due to the flanges relieving to a certain extent the pressure on the top of the rail head and transferring it to the side, reducing the area of contact to a point and producing corrugation on the side of the rail head. It is hardly necessary to add that similar conditions will result from a non-homogeneous structure of the metal because here, even though the area of contact, its point of application and its intensity remain constant, if the resistance to these pressures is variable the result will be the same as if the resistance were constant and the pressure variable. This point may perhaps be best illustrated by referring to the action of a billet in a rolling mill. If the pressure on the rolls were altered rhythmically, a wave would be produced in the resulting bar, and, conversely, if the bar, hot in certain portions and cold in others (giving various degrees of resistance to rolling), were run through rolls having constant pressure, the hot portions would be made thinner than the cold portions.

There are a great many conditions which arise in street operations which may bring about the conditions which are essential for the production of corrugation, namely, pressure exceeding the elastic limit of the metal and application of the pressures at or close to the edge of the rail where the elastic limit is reduced from its cubical value to its linear value, the intensity of pressure, of course, varying according to the area of contact.

I have also read with interest Mr. Mullaney's letter in your issue of Jan. 29 but do not quite understand his process of reasoning. In attributing corrugation to the use of steel wheels (I assume, of course, that when he attributes corrugation to steel wheels he is referring to the material and not to the shape of the wheel) it is not surprising that corrugation would appear on track which had been in service some years and which had never shown much evidence of corrugation. If such a change were made in the shape of the wheel tread as to shift the point of contact from the center of the wheel to the edges, it would cause at the same time a variation in the area of contact between the wheel and the rail. When a certain type of wheel is used exclusively on one section of track, the latter becomes worn in time to conform to the wheels which pass over it. If suddenly a change is made to a different type of wheel, it is obvious that unless considerable care is taken in designing the wheel tread the new wheels will not make contact where the old ones did, and I venture to say that Mr. Mullaney would have noted the same results if a corresponding change had been made from steel to iron wheels. To the writer, the importance of grinding the wheels after turning in order to remove any signs of chattering of the tool is not as great as the turning of the wheels to the proper shape so that they will make contact with the rail somewhere near its center. The effect of non-homogeneous rails due to chattering of the rolls was explained in my previous letter.

G. E. PELLISSIER, Consulting Engineer.

EQUIPMENT AND ITS MAINTENANCE

Short Descriptions of Labor, Mechanical and Electrical Practices
in Every Department of Electric Railroading

Contributions from the Men in the Field Are Solicited and Will Be Paid for at Special Rates.

A Satisfactory Equipment for Air-Brake Instruction

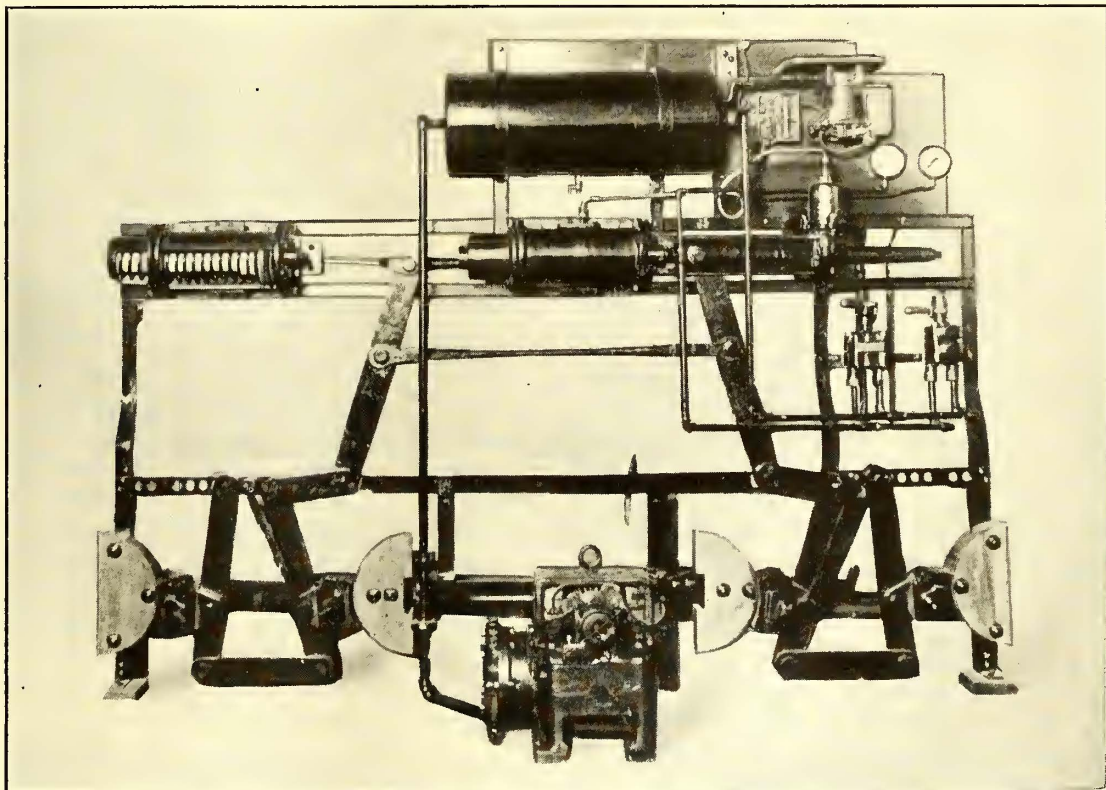
BY GEORGE OLIVER SMITH

Supervisor of Safety Doherty Organization

Instructing platform employees of street railway companies in the proper operation of the equipment in their charge has a direct bearing on the prevention of accidents and a consequent reduction in claim department costs.

Usually, the motorman is given a good deal of detailed instruction in the use of the electrical equipment and particularly in the proper operation of his controller. The writer has noticed many times that a motorman while operating his controller correctly appeared to be quite ignorant of the proper use of his air

brakes. The subject was brought to the attention of the safety department of the company, and after consideration was referred to the central safety department of the parent organization, of which the local company was a part, for recommendations. After much thought and study the remedy appeared to be to provide for proper instruction in braking and the general use of air brakes. There was only a moderate amount of money available for the instruction school of the company, but from this a reasonable amount was appropriated for an air-brake instruction layout. Something had to be designed which would illustrate to a motorman just what the instructor was telling him and allow the student to follow by actual practice the course of the



AIR-BRAKE INSTRUCTION EQUIPMENT

brakes and was paving the way for an accident, which in addition to involving property damage had a chance to cause personal injury.

The study of methods of preventing street railway accidents should cover car operation, and the motorman should be taught how to handle his air brakes. He should also be convinced that he can do a great deal toward applying the principle of "safety first" and assisting the claim department in its efforts to reduce accidents in which cars are involved.

An analysis of many accidents occurring over a period of several years in a city of about 300,000 population where the street railway company was operating nearly 300 cars showed that many of those classed as "col-

lisions with vehicles, pedestrians, other cars, etc.," could have been prevented by proper handling of the air brakes. The subject was brought to the attention of the safety department of the company, and after consideration was referred to the central safety department of the parent organization, of which the local company was a part, for recommendations. After much thought and study the remedy appeared to be to provide for proper instruction in braking and the general use of air brakes. There was only a moderate amount of money available for the instruction school of the company, but from this a reasonable amount was appropriated for an air-brake instruction layout. Something had to be designed which would illustrate to a motorman just what the instructor was telling him and allow the student to follow by actual practice the course of the

instructor's teaching. After consultation with the master mechanic it was found that only a few parts of the apparatus needed to be bought and that the balance could be taken from spare equipment on hand. The photograph shown herewith illustrates the simple apparatus as it was finally installed. Each part of the regular car equipment was faithfully reproduced on a small scale. The regular cylinder was hooked in tandem with a sectional cylinder on one side and a slack adjuster on the other; the various equalizer and pull rods were also installed as shown, and quickly interchangeable miniature brakeshoes were put on to illustrate how brakeshoe troubles occur and why automatic slack adjusters are necessary. A small-sized compressor

and a baby reservoir were installed and gages provided to show cylinder as well as reservoir pressure. The governor was mounted so that its operation could be explained and its function illustrated. Two types of motormen's valves were provided, and these are both connected up, in fact, the whole apparatus is made to operate so that actual service conditions may be shown the student as he is permitted to practise with the model. Standard air pressures are used, and every effort is made to duplicate a regular layout. The actual space occupied by the instruction model is very little compared with many elaborate air-brake instruction layouts, and the cost of the outfit complete was very reasonable.

The outfit is located in the instruction school of the electric railway in question. Practically all men on regular runs and on the extra list, in addition to student motormen, have received this course in air-brake operation. As the apparatus has been in use only about eight months, there are as yet no figures available, but so far indications are that braking has materially improved and that there has been a lessening of accidents directly traceable to this cause.

Sanitary Covers Preserve Car Seat Backs

BY F. E. FISHER

General Superintendent Chicago, Ottawa & Peoria Railway, Ottawa, Ill.

The use of green covers for the seat backs of cars in regular daily service and white covers for the seat backs of special cars has improved the appearance of the interurban coach interiors on the Chicago, Ottawa &



VIEW OF C. O. & P. CAR WITH SEAT COVERS

Peoria Railway, Ottawa, Ill. This feature is much appreciated by the patrons of the road. The washable canvas covers appeal to the public because of their hygienic value and, at the same time, they preserve the plush upholstery on seat backs, which otherwise would soon become soiled by passengers resting their heads against them. The improved appearance of the coach interiors is shown herewith. The company has found the use of these covers very satisfactory. The covers in white canvas cost 31 cents each, and in dark green canvas 36 cents. The dark green covers, used in the regular service, are changed every two weeks and are

washed at a cost of 5 cents each, and the white covers, used exclusively for special parties, are washed after being in service for three trips. It is evident, therefore, that the expense of providing the sanitary covers is small in comparison with the satisfaction to the public which they afford.

Repairing Electric Locomotive Resistance Grids

BY THOMAS B. RAY

Electric Locomotive Repairman Pennsylvania Railroad, Sunnyside Engine House, Long Island City, N. Y.

There is a great deal of printed matter available which deals with arc welding both by the Bernardos method, using a carbon electrode, and the Slavianoff method, using a metal electrode. In very few articles are details taken up and the statements made are of a general nature. Having recently had some interesting experience in welding, both with acetylene and the electric arc, I shall describe the results, particularly with reference to the welding of cast iron.

After the electric locomotives on this road had been in operation for some time we had trouble with the resistance grids, on which the contact surfaces were burned badly. Following is a description of the method used in reconstructing the grids which were no longer fit for service due to burning. After removal from the locomotive the individual grids that were burned badly were scrapped. On an average eight grids were scrapped each time a set was rebuilt. Those which were slightly burned were ground on an emery wheel until all of the burned iron was cleaned off and the contact surfaces were lined up.

The repaired grids were then assembled temporarily on the bench so that the workman assembling the grids could see how the contact surfaces lined up. After a full set was assembled the grids were numbered, taken down and reassembled in permanent position on the locomotive. Now it is almost impossible for a man rebuilding a set of grids to see when the grids are lined up properly. The only way in which it can be done is to look up under the grids at the contact surfaces after assembly, and then only the lower edges of these contact surfaces can be seen. In sliding the grids on the insulated rods small particles of mica insulation can get between the contact surfaces, and such bits of mica cannot be seen from the bottom of the grids. These bits of mica cause poor contact and consequent burning of the surfaces. The average life of the grids after rebuilding as above is about ten months.

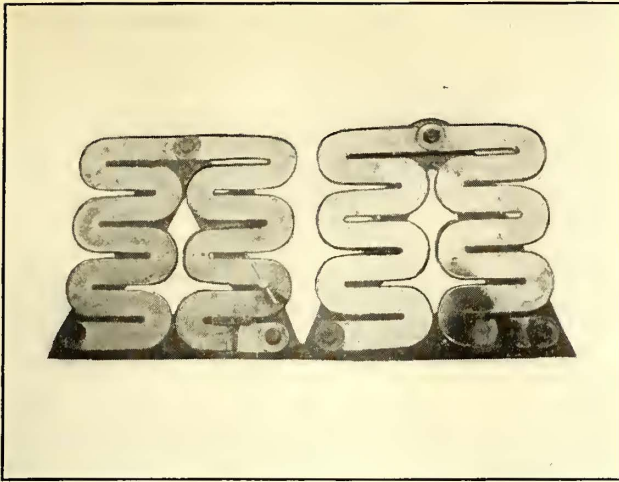
Table I shows the average cost of rebuilding one of these sets of grids on the locomotive.

TABLE I.

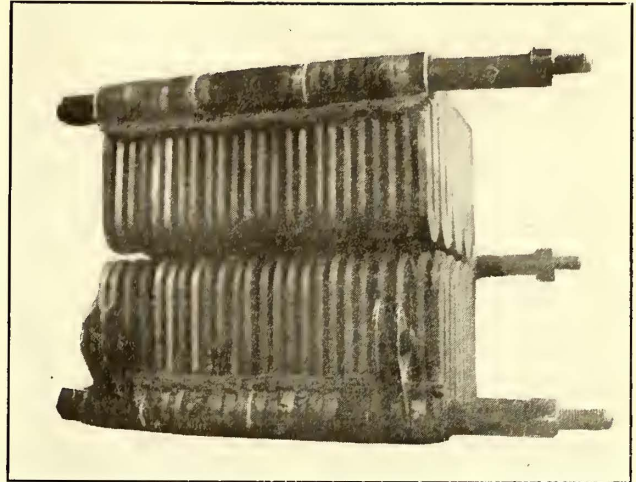
Removing burnt grids from locomotives, two men, two hours, at 50 cents per hour.....	\$1.00
Cost of burned grids scrapped, average eight grids at \$1.05 each	8.40
Grinding and cleaning contact surfaces, two men six hours and two men four hours, at 50 cents per hour.....	5.00
Total	\$14.40

As a result of unsatisfactory experience with the maintenance of resistance grids by the method described it was decided to look into the matter of welding. Several sets of grids were welded by means of acetylene and they stood up well. For our conditions this method proved expensive and necessitated considerable delay in repair. While electric welding proved cheaper, it should be understood that I am not attempting to compare the two excellent methods but simply to give the results of the practice in these shops.

After a preliminary study of the subject we developed a routine of electrically welding the grids, details of



REPAIRING GRIDS—JIGS WITH GRIDS MOUNTED FOR WELDING (LEFT) AND WELDED (RIGHT)



REPAIRING GRIDS—GRIDS WITH FIRE CLAY BACKING IN PLACE

which are given later in this article, and as a result the cost has been cut down to the amount which is shown in Table II.

TABLE II.

Removing burnt grids from locomotive, two men two hours, at 50 cents per hour.....	\$1.00
Grinding, cleaning and repairing grids, one man two hours, at 34 cents per hour.....	.68
Assembling grids for welding, one man, one hour, at 34 cents per hour.....	.34
Welding grids, one man three hours, at 34 cents per hour..	1.02
Assembling grids on locomotive, two men three hours, at 50 cents per hour.....	1.50
Cost of electrical energy, 33 kw.-hr., at 1 cent per kilowatt-hour33
Total	\$5.87

In comparing Tables I and II it will be noted that there are savings with the electric welding due to the elimination of scrap and to reduction in labor. Out of fifty-six sets of grids welded between March 1 and Nov. 1, 1915, there was an average saving of \$8.53 per set as shown by the tables, or a total saving of \$477.68 in seven months.

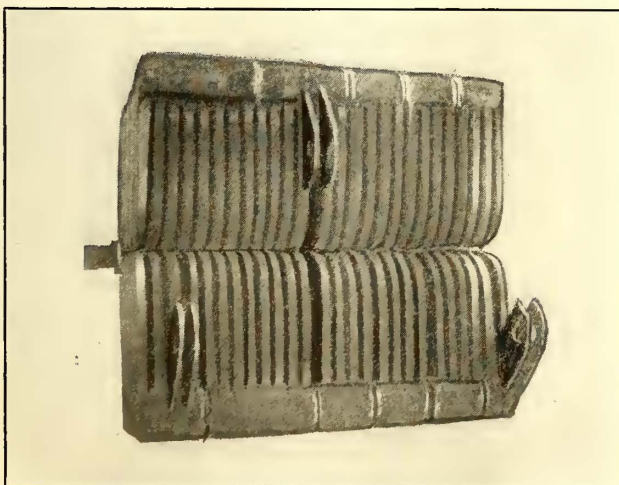
The procedure in connection with the repair of sets of grids in these shops is now as follows: After removal from the locomotive they are taken to the welding room and the grids are separated into four classes: good, slightly burned, badly burned, and broken or with contact surfaces burned off. The good grids are, of course, set aside for reassembling. The slightly burned ones are ground on a specially-designed emery wheel. The badly burned ones are ground until the contact surfaces are true and are used at the insulated joints, when

the surfaces are separated by mica. The remainder of the grids are repaired no matter what their condition.

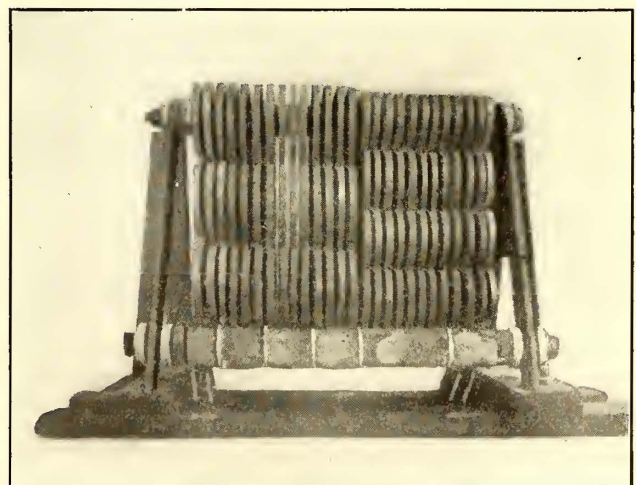
For repairing, the broken grids are mounted on jigs, made of 1/2-in. x 3-in. flat iron formed in triangular shape, bent on the flat, with three 1-in. studs to fit the holes in the grids. When the grid is placed on the jig there is a 3/8-in. clearance between the two. This space is allowed for the building of a mold around the break in the grid, the mold being made of old carbon brushes. After the grid has been lined on the jig the crack is forced open 1/16 in. and the grid is clamped to the jig with a screw clamp, to provide for contraction in cooling. After the weld has been made and the cast iron has cooled to a dull red heat the clamp is removed to prevent breakage by contraction.

An accompanying illustration shows two jigs with grids mounted on them; that on the left side having the grid lined up ready for welding, with the carbon mold and the screw clamp in place. The crack has been "V'd" out to permit puddling at the bottom and to save time. The jig on the right side contains a grid with the crack welded. The cross-section of the weld is slightly greater than that of the unwelded part. The average cost of this operation is 10 cents as compared with \$1.05 for a new grid.

After repair and cleaning of contact surfaces the grids are assembled on temporary steel rods for welding. These rods are of high manganese steel, very hard and not affected by high temperature. In welding if cast iron is puddled through the rod holes it will not weld



REPAIRING GRIDS—GRIDS AFTER WELDING, WITH TEMPORARY RODS REMOVED



REPAIRING GRIDS—GRIDS MOUNTED ON SKIDS FOR CONVENIENCE IN HANDLING

to the rods. If any burns are left on the inside of the holes after welding the rods will break them off, leaving a smooth surface in the holes. Other material has been used experimentally for the rods but with less success.

After the grids have been assembled for welding a fire clay backing is made for one side of the bottom surfaces, as shown in the second illustration. This prevents the melted iron from flowing down between the grids. The bottom and side edges of the contact surfaces are then welded and the rods are removed, as shown in the third illustration.

The grids are then assembled on the insulated rods with mica washers between the joints and the A-frames are put in place. After the grids have been lined up, a pair of skids are bolted to the set for convenience in handling around the shop. The insulation is then tested with 1000 volts alternating current.

Some of the results of our experience with electric welding may be of interest to the readers of the *ELECTRIC RAILWAY JOURNAL*. We find three obstacles to successful welding, as follows: sand holes, blow holes and slag piles.

Sand holes contain sand, carbon and burnt iron. Most of them can be distinguished by small, rugged holes or small cracks on the grid surface. They can only be removed by confining the arc to each hole until the impurities burn into a slag, which can be chipped out on cooling. The hole can then be filled in.

Blow holes are formed at cracks or joints in any cast-iron welding jobs and are due to failure to properly clean and line up the cracks or joints. Gas blows up through the weld leaving small pin holes, very difficult to get rid of. We find that dry borax can be used to form a slag over the holes while the cracks are being welded. The slag can then be chipped off and the holes filled.

Slag piles are formed by the slag given off by burned cast iron. The slag follows the arc and with skill it can be pulled out of the arc without breaking the latter. Such slag should not be overlooked as it produces large flat holes in the joint surfaces. As slag is brighter than the molten metal it can always be distinguished and it should be removed before the joint becomes too cool. Reheating joints to remove slag is bad as the weld may be fractured due to expansion and contraction.

In general it may be said that a good grade of cast iron can be welded if the section is not too large, with a resulting soft weld easily machined. For good results with cast iron the work must be clamped tightly and a heavy mold which can be preheated and which will hold the heat after welding must be built up. Chilling makes a weld hard and brittle.

Aside from the welding of cast iron to cast iron we have had interesting results with cast iron and copper. In welding the copper lugs to the grids we found at first that the welds were brittle. By shortening the arc to $\frac{1}{2}$ in. with 150 amp., confining the arc to the iron until it reached a melting temperature and then bringing the arc in contact with copper and iron together we got good results. Both temperature of fusion and conductivity of the metals must be considered in this work. Copper oxide gas and copper slag are sources of trouble as the gas is heavy and masks the weld, and the slag, while slightly darker than the molten copper, is difficult to distinguish from it.

The University of Kansas has issued an engineering bulletin, No. 6, which contains three papers on Kansas fuels, the subjects of which are as follows: "Values and Proximate Analysis of Coal," "Discussion of Sulphur Contents of Bituminous Coal" and "Economic Effect of Washing Coal from the State Mine."

Locating and Wiring Crossovers

BY G. H. M'KELWAY

Line Engineer Brooklyn (N. Y.) Rapid Transit System

Very often when a crossover is to be installed, its location is taken up with the heads of the track and transportation departments only and nothing is said to anyone in the electrical department until it is desired to have the crossover wired. The result of such procedure is that the linemen find that the frogs in the trolley wire will have to be placed where they cannot be well supported, coming near the middle of sections instead of at or near the span wires. Then either additional poles must be put in or the old ones shifted so as to bring them to the proper locations, and both of these operations are expensive. In most cases there would have been no objection to placing the special work a short distance to one side or the other, where the frogs could be properly supported and the pull-offs brought to the poles; therefore the expense for new poles or shifting old ones could have been avoided.

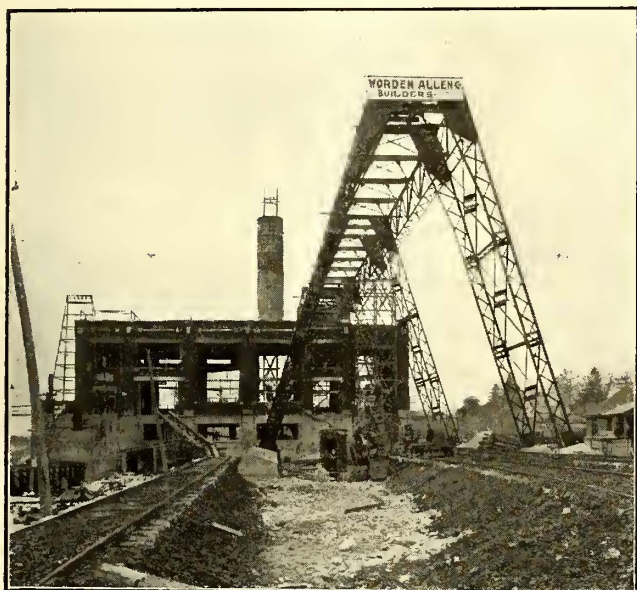
All that the transportation department cares about is that there should be sufficient room behind the crossover to enable a car to run in and be reversed. Distances of 10 ft., 20 ft. or even 50 ft. would make no appreciable difference to that department but it will make a decided difference to the electrical department.

The most provoking and inexcusable location for a crossover is just at the junction of two feeder sections where, if no change should be made in the electrical layout, one side of the crossover would be fed from one section and the other from another, therefore necessitating that both sections be alive if cars are to be operated over the crossover, and preventing the turning back of cars at the crossover if one section should have to be killed on account of fire or for any other reason. While such instances rarely occur, the writer has known of several of them. When they do occur the only thing to do is to shift the section insulators down a section or two and cut in splicing ears where they have been.

It may be said that there is no necessity for wiring crossovers. Several companies avoid doing so wherever possible, claiming that overhead frogs are nuisances and costly to maintain, therefore they should not be installed except where absolutely necessary. On the other hand, whenever there is a need for a permanent crossover (it is seldom worth while wiring a temporary one) it will be found advisable to wire it. If the crossovers are not wired the cars must coast over them at a comparatively high rate of speed with the resultant liability of their jumping the track or splitting the switch and so tying up the line for a while. Even if no such accidents happen there is usually a short delay to each car due to the time taken by the conductor in putting the pole on the second wire after pulling it down from the first one. Even if this can generally be done without stopping the car the pole will very often strike and hammer the span wire or hangers before it is put on the wire, calling for more or less maintenance on the overhead material. In all cases it will be found that the wire over the track on which the car operates just before taking the crossover will be worn quite thin by the grinding on it of the trolley wheels, because the conductors will keep the pole on the wire until the last possible moment. By this time but little more than the flanges of the wheel will be touching the wire. This causes rapid wearing away of the wire and danger of breaks in it unless it is renewed quite frequently, so that when all is taken into consideration the maintenance of the overhead work will be but little more if the crossover is wired than if it is left without wire, while accidents and delays will be avoided.

Two Large New Power Plants

Two power plants for generating wholesale energy, one by steam and the other by water power, are being built by the Ohio State Power Company within 1 mile of Freemont, Ohio, on the Sandusky River. A substantial part of the output of both plants is under contract to the Lake Shore Electric Railway and the American Gas & Electric Company's Ohio property, the Ohio Light & Power Company. The latter has contracted to use a minimum of 8,000,000 kw.-hr. a year, distributing it to Fostoria, Freemont, Tiffin and other neighboring cities, and the railway has contracted to use at least 17,000,000 kw.-hr. annually. Transmission circuits for light and power will be operated at 60 cycles, 66,000 volts, and the railway transmission will be at 60 cycles, 19,100 volts. The latter is rather an unusual potential but was adopted to permit the use of the substation apparatus formerly operated on an 18,000-volt, 25-cycle system.



STEAM PLANT OF OHIO STATE POWER COMPANY UNDER CONSTRUCTION

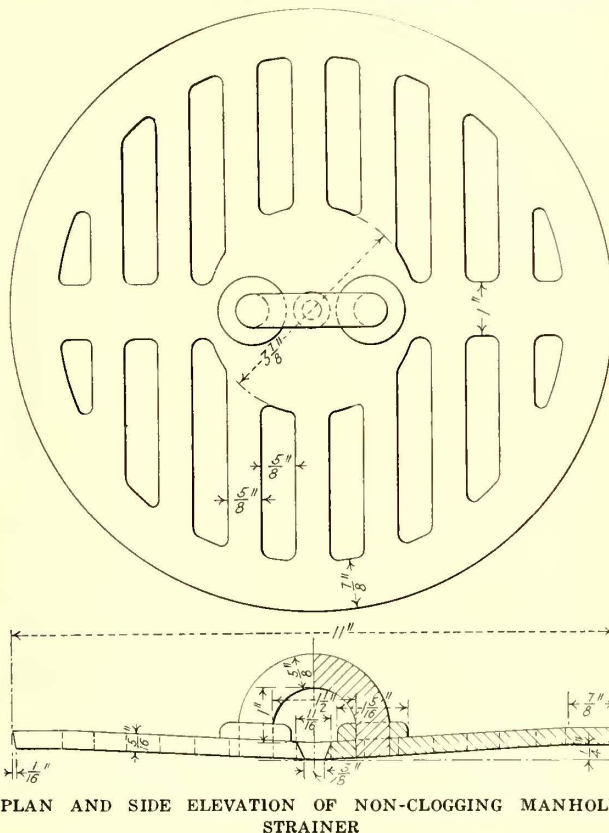
The steam plant equipment includes three 6250-kva., 3600-r.p.m., 4000-volt, horizontal Allis-Chalmers turbo-generators with direct-connected exciters, four 750-hp. Babcock & Wilcox boilers operated at 250-lb. pressure and 125-deg. superheat, and equipped with a special type of underfeed stoker. The steam plant will contain transformer and switching apparatus sufficient to handle the entire output of both stations. The coal-handling facilities consist of a grab bucket operated from a Pawling & Harnischfeger monorail crane, which will take coal from cars or from a 2000-ton outdoor storage area and convey it to bunkers supported over the firing aisle. Ashes will be handled by the same crane. The ratio of maximum kilowatt-hours output to square feet of floor area in this plant will be as 1 is to 0.54, which is considered low for a plant of this size.

The water-power plant equipment includes three 1000-kva., 257-r.p.m., 4000-volt, water-wheel-driven generators with direct-connected exciters. The water wheels are of the Leffel horizontal type and operate under a 40-ft. head with water supplied through a 14-ft. steel penstock 3000 ft. long. The steam plant is located at a monolithic concrete dam which was constructed to supply water power for the hydroelectric plant being built 3000 ft. down-stream. Unusual features in these plants include the special underfeed stokers and the Allis-Chalmers reaction type turbine

which is used to drive auxiliary pumps. This turbine is said to be the first of its type to be built in America. These two plants were designed and are being constructed by Woodmansee & Davidson, engineers and contractors, Chicago, Ill.

Non-Clogging Manhole Strainer

In the ordinary strainers supplied with sewer traps for manholes the holes are approximately $\frac{5}{8}$ in. diameter, so that they rapidly fill with mud, and within a short time the holes are filled with surface water. To overcome this trouble a malleable-iron strainer with a wrought-iron eye cast in it has been designed, so that the strainer can be easily removed from the street with a hook, and water rapidly exhausted from the manhole. A sketch showing the details of the strainer is given



PLAN AND SIDE ELEVATION OF NON-CLOGGING MANHOLE STRAINER

herewith. Slots $\frac{5}{8}$ in. wide have been provided in the strainer instead of round holes, so that the tendency to clog is largely eliminated.

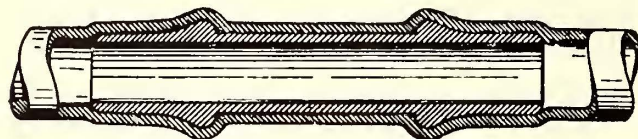
In attempting to remove strainers of the old type many of them were broken by bars, and the bells would often fall on top of the clay sewer pipes and cause obstruction. Again, often the strainer and bell were thrown away, so that sewer gas was liberated.

The saving which it is claimed will be effected by the use of the new strainers is considerable, as a cleaning gang will not be required to use a pump, and after heavy rainstorms, should any of the holes be filled with water, the strainers can easily be removed. By the time the cleaning gang reaches the last hole on a section, it can return to the starting place and remove the mud from the manholes. These strainers cost approximately 35 cents each.

The Liverpool (England) Corporation Tramways have had between 600 and 700 women applicants for positions as conductors. In spite of the recent numerous enlistments the tramway service is kept going without inconvenience.

Repair Couplings for Old Hose

A repair coupling, shown in the illustration, for reclaiming and restoring to service scrap rubber hose has been invented by Ralph W. Ledbetter, Birmingham, Ala., and its use is now effecting a considerable saving for the Birmingham Railway, Light & Power Company, Birmingham, Ala. The repair coupling, it is said, makes this scrap hose as good as new so far as pertains to further service, since all that is necessary to reclaim



REPAIR COUPLING FOR AIR HOSE

the hose is to cut it in two at the place where it failed or parted, and to unite the two ends by inserting a repair coupling in the same manner as applying couplings and nipples to new hose.

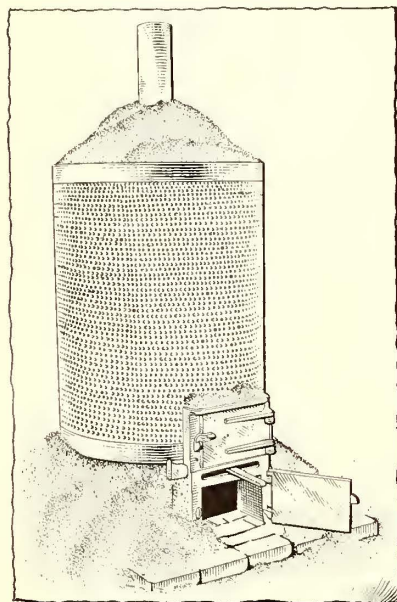
Last summer the Birmingham Railway, Light & Power Company applied several repair couplings to its equipment as a test. The couplings proved so satisfactory that on Sept. 11, 1915, this company officially adopted it for use in reclaiming old rubber hose in lieu of applying new rubber air hose, with the following results:

274 3/4-in. air hose reclaimed, 3-ft. length, total 822 ft.	
822 ft. 3/4-in. air hose at \$28.40 per 100 ft.	\$233.45
274 repair couplings, 137 lb., at \$1.75 cwt.	2.40

Total amount saved in four months.....\$231.05

An Economical Sand Dryer

The sand dryer of the Martin Brick Machine Manufacturing Company, Lancaster, Pa., has been adopted by quite a number of electric railways. Its constructional and operating features are indicated by the accompanying



CONTINUOUSLY-OPERATING SAND DRYER

illustration and the following paragraphs. This dryer is moderate in cost and is adapted to drying from ten to twenty tons daily.

The dome of the dryer is of very heavy metal, so arranged that it will not be readily burned out by the hot sand lying against the outside and the fire within. The green sand is placed around the dome, or heater, inside the steel jacket; the arrangement of the dome being such that the heat is thoroughly circulated through the body of the sand, removing all the moisture

and drying out the vegetable matter. The company has equipped its latest type of dryer with a heavy cast-iron pipe above the dome, allowing much sand to be put into the dryer at one time, thus materially increasing the drying capacity.

As the sand dries it falls out through the meshes of

the screen and over the bevel ledge at the bottom, thus providing room for additional sand to be added and making the operation of the dryer continuous. It is said that this process will dry sand faster than one man can charge the drying bin and take away and screen the dry sand. Furthermore, the drier will not clog up, because wherever the sand dries, it is free to flow away from the drying bin. The fire chamber is large and provides for furnishing the greatest possible amount of heat for the fuel consumed. Any kind of fuel can be used, either anthracite or bituminous coal, or wood. A vibrating grate is also provided, so that the firebox can be readily cleaned.

Pacific Electric Railway Adopts the Coasting Recorder

The Pacific Electric Railway, the leading interurban system on the Pacific Coast, which operates 611 miles of single track with some 600 motor cars and about fifty electric freight locomotives, has begun to equip all its rolling stock with the Rico coasting recorder. These recorders will be used over the widest possible range of service—from high-speed interurban trains to local city operation.

Following the practice of other users of the coasting recorder, the Pacific Electric Railway has formed an efficiency department to analyze the records and to do all work necessary to raise and maintain the efficiency of the motormen. This department will be under the direct supervision of J. McMillan, general manager, with G. H. Grace as efficiency engineer. The order for this equipment was placed by Paul Shoup, president Pacific Electric Railway, with Alphonse A. Wigmore, Pacific Coast representative of the Railway Improvement Company.

Electrification of Railway Terminals

In a paper read before the Pan-American Congress N. W. Storer referred to the harmful effect of legislation on steam railroad electrification, stating that several cities had recently considered legislative compulsion for electric operation of railway terminals but that thus far none of them had required it and it was to be hoped that it would not be done. The electrification of the steam railways in a large city means much more than a mere change of motive power in order to secure the greatest possible advantages from it, and action compelling the change should not be taken hastily or ill-advisedly. The cost under such conditions might well require either confiscation of railway property or increased passenger and freight rates to pay the interest on the investment. It should be recognized as a principle that railways should not be forced to electrify their lines until they can see their way clear to justify the expense. When that time comes few of them will wait to be forced.

Bow Collectors Improve Service in Switzerland

Bow collectors are to be substituted for the trolley collectors on all cars of the Zürich (Switzerland) Tramways. For some time past the cars on one route have been operated with bow collectors, and according to the *Neue Züricher Zeitung* the delays due to the trolley wheels jumping off the wire and the repair and renewal costs have been so much reduced that the management has decided to change over all the cars to bow collectors before the end of next March.

NEWS OF ELECTRIC RAILWAYS

BEMIS DALLAS REPORT EXPECTED SOON

City Commissioners Outline Their Ideas With Respect to Proposed Report and Consolidation of Railway and Electric Properties

Mayor Henry D. Lindsley of Dallas, Tex., has issued a statement on the attitude of the Board of City Commissioners to the entire street railway question, and what it proposes to do in the matter of franchises if the report to be presented by Edward W. Bemis, who is now engaged in an inquiry, offers a logical solution of the various problems. Mr. Lindsley said in part:

"The Board of Commissioners expects the reports of Edward W. Bemis, on both the traction and electric lighting problems, to be completed and in the hands of the administration during the early days of February. *

"The attitude of the city administration with regard to the electric lighting and traction problems is this: From Mr. Bemis' investigations we expect to know for the first time, from an independent, authoritative source, the facts with regard to these utilities. And we expect to have applied to these facts the judgment of a man who stands out conspicuously among public utility experts in the United States. The result should be a clear understanding of the matters, and a righteous conclusion with regard to them.

"The administration does not take the position that it is 'trading' with Stone & Webster, or the interests which that firm represents. That in the conclusion of this matter it is not a question of 'give and take.' That, on the contrary, the administration, with the help of Mr. Bemis, of our citizens and of every other factor available, should reach a conclusion of what is a just and fair settlement for the people of Dallas of the electric lighting and traction matters.

"When the administration has reached a conclusion as to a just and righteous settlement of the traction and electric lighting problems, from the standpoint of the people of Dallas, it will expect the Stone & Webster interests to accept such fair and just conclusion. If Stone & Webster are not willing to make an adjustment fair and just to the people of Dallas, then this administration will so state to our citizens, and will advise that no new contracts of any kind be made with the Stone & Webster interests. The administration is committed:

"1. To an ascertainment of the true facts.

"2. To an attempt, in the light of these facts, as the representatives of the citizens of Dallas, to adjust the traction and electric lighting matters in a fair and correct way.

"3. To acquaint the citizens of Dallas fully with that fact in the event a fair and correct adjustment cannot so be made.

"In this connection the administration wishes it understood that Stone & Webster have furnished to Mr. Bemis, and to his assistants, every facility for carrying on his investigations, have withheld nothing from his scrutiny, and have fully co-operated with the administration in its efforts to ascertain all of the facts relating to the traction and electric lighting matters.

"The administration is not willing that there shall be a consolidation of the electric lighting and street railway properties. The reason advanced for such consolidation have been carefully weighed, and the conclusion has been reached that it is not to the interest of the people of Dallas for these two distinct utilities to be merged into one.

"If, based on Mr. Bemis' report, a conclusion is reached, in so far as the administration is concerned, with the Stone & Webster interests, then a charter amendment will be submitted by the administration to the voters of Dallas at the election of April 4 of this year. At the same time there will be presented to the people of Dallas the franchise proposed to be passed with regard to the traction and electric lighting properties, in event the people of Dallas pass the proposed charter amendment."

INQUIRY INTO RAPID TRANSIT PAYMENTS

New York Investigating Committee Reviews Negotiations Preceding the Subway Awards—Railway Officers Testify

The inquiry by the Thompson legislative committee has been directed since last week into the details of the awards under the dual system contracts, to the terms of the financing of the proposed new construction and to the expenditures made for counsel. The principal witness on Feb. 2 was George W. Young, formerly a director of the Interborough Rapid Transit Company. Interrogated about the elevated railway reconstruction and third-tracking contracts Mr. Young said that he, Gardiner M. Lane and William A. Read strongly opposed the proposal advanced by Theodore P. Shonts, president of the company, to award the contracts to John F. Stevens. The estimated cost of this work was \$20,000,000, all to be paid by the Interborough Rapid Transit Company, and Mr. Stevens was to be paid a 10 per cent commission, and was to have the right to sublet the work. Mr. Lane appealed from this proposal to J. P. Morgan, Jr. Finally a committee of five directors was appointed to inquire into the matter. The contract was not let to Mr. Stevens, as proposed, but subsequently a contract was made with the T. A. Gillespie Company for merely the third-tracking. Later Mr. Young, Mr. Lane and Mr. Read resigned as directors of the Interborough. Mr. Young's memorandum of what took place at the meeting of the directors at which the Stevens proposal was made, was read into the record.

The witnesses on Feb. 4 included H. M. Fisher, secretary of the company, and John H. Campbell, treasurer. Mr. Campbell testified that up to August, 1912, Mr. Shonts received a salary of \$75,000 a year. The amount was then increased to \$100,000. In 1913 the directors voted a lump sum to him of \$125,000 and in 1914 he was voted \$25,000 more. The minute books showed that these payments were for "services of an extraordinary character and great value to the company." Richard Reid Rogers, attorney for the company, also received \$50,000 extra compensation in 1913 and E. F. J. Gaynor, auditor, received \$10,000 in 1913 by special direction of the board.

On Feb. 7 Mr. Fisher testified in regard to the negotiations between the company and J. P. Morgan & Company, under which the latter stood ready at any time as syndicate managers to furnish the company \$100,000,000 for rapid transit work. The payment agreed to for this service was \$500,000, of which \$250,000 was to be made to Morgan & Company and \$250,000 to the other members of the syndicate. Mr. Fisher said that he was not familiar with the details of payment aggregating \$63,128 in fees to members of two law firms representing a realty company which had opposed certain subway extensions.

Francis Lynde Stetson, to whom \$50,079 was paid for legal services, said in discussing the payment made to him, that this was remuneration for drawing the new mortgage covering the elevated properties under which the Guaranty Trust Company was trustee. He explained that this was a voluminous document and said that if he had the work to do over again he would charge more. Mr. Shonts was excused from testifying until the return from Europe of his personal counsel, De Lancey Nicoll, who was familiar with all the rapid transit negotiations.

During the testimony on Feb. 8 it was brought out that two payments of \$250,000 each had been made to J. P. Morgan & Company. The first one was under a syndicate agreement by which Morgan & Company pledged themselves up to a certain date to act as syndicate managers. The contracts for construction and operation were not concluded by the date fixed and a new agreement was concluded under which the financing is now being done. This requires Morgan & Company as syndicate managers to

furnish about \$70,000,000 more than was contemplated in the original underwriting. In this connection Harry P. Davison of Morgan & Company was quoted by the New York Times in part as follows:

"In 1910, I think, an agreement was executed with the Interborough. This firm agreed to supply \$105,000,000, of which \$30,000,000 was to provide for third tracking the elevated and \$75,000,000 for new subways. The money could be had at any time; we had to stand ready to deliver it, regardless of conditions. At the end of two years the negotiations fell through and all the work was gone.

"There had been no provision for payment in such a case, and we submitted to the Interborough that we considered ourselves entitled to payment for our services. The company agreed that we were, and the sum was fixed at \$250,000. We also asked that we be paid for our two-year commitment to supply \$105,000,000 for construction. It is not customary to offer a call on \$100,000,000 for nothing. I do not know anyone who can get such a call without paying for it. We were paid another \$250,000 for that, and this money was divided among the syndicate. Had we supplied the money and taken bonds the \$500,000 would have been deducted from our commissions.

"The new negotiations for the subways now building were taken up on a more comprehensive scale. We did something that had never been done before in this country, and which is not likely to be done again. That is, we formed a syndicate that was bound for five years to supply a total of \$160,000,000. No matter what happened—regardless of whether there was a market for bonds, a war, a panic, 20 per cent money—we were obligated under the agreement to take a certain amount of bonds each year and to turn the money over to the company. We paid 93½ net; the syndicate paid 96; the public offering price was 98. I do not see now how the thing was accomplished; I know it could not be done again.

"Now that the transaction is nearly over—I believe there remains only \$15,000,000 of the \$160,000,000 to be taken—we are getting out from under the strain. It has been a painful experience, for we took bonds and paid 93½ for them when they were selling at 91. We paid 2½ per cent on the money left with us by the Interborough. At times that arrangement was advantageous to us; at others it was not. Call money has been bringing 1½ and 1¾ per cent for a long time, so the Interborough has done well to get 2½ per cent. The bonds were turned over to the syndicate members, who have had to carry them. If we could have kept them and received 5 per cent in interest, we would have made 2½ per cent over the interest we paid on the money. Whenever the opportunity offered the dealers have sold some of the bonds, always taking care not to crowd the market."

On Feb. 8 Mr. Fisher said that J. L. Quackenbush was general counsel of the company and that the legal department employed sixty attorneys and a total office force of about 200 persons. Mr. Quackenbush said he received \$36,000 a year from the Interborough Rapid Transit Company. This, with the payments which he received from the New York Railways, with \$6,600 from the Third Avenue Railway and \$2,400 from two Long Island roads, made his total income for the year \$45,000. The annual legal expense account of the Interborough Rapid Transit Company amounted to between \$275,000 and \$300,000.

PLAN FOR TRAFFIC RELIEF IN DETROIT

To relieve the street railway congestion in the heart of the city as much as possible the Detroit Street Railway Commission has recommended to the Common Council a plan of curve connections, special work and some straight track construction in the downtown district. The recommendations are based upon the traffic survey made for the commission by Barclay Parsons & Klapp, engineers, New York City. The commission states in its recommendation that the plan does not propose to eliminate the operation of through east and west cars across Woodward Avenue unless thought desirable, although the lay-out of tracks if the recommendations are carried out would be such that all east and west cars could be looped. Traffic officials of the company have contended for years that something must be done in the way of loops to relieve the congestion

caused by having practically 90 per cent of all the cars operated run past the city hall on every half trip. Under the present arrangement all east and west cars cross Woodward Avenue with the natural result that operation on all lines is slow and congested in the downtown district. The recommendations have been referred to the committee on public utilities.

WARNING TO RAILROADS

New York Commission Suggests That Railroads Consider Self-Propelled Cars to Meet Electric Railway and Bus Competition

The Public Service Commission for the Second District of New York, on Feb. 3 sounded a warning to the railroads of the State that they must find some more convenient and economical means for handling local passenger business to meet the competition of the electric railway and the automobile unless they want to see a continuance of the falling off in local passenger revenue that has marked the last few years. The commission urges the railroads to study the possibilities of the gasoline-driven railroad car. Commissioner Irvine said:

"The familiar local train, composed of locomotive, baggage and express car, and two or three coaches, is in a state of obsolescence. Such trains carry only those who have no other available means of transportation. Some cheaper, faster and more comfortable method of transporting local passengers must be adopted or else the railroads must continue to transport them at a loss in spite of wise economies and in spite of reasonable curtailments of service."

The opinion was rendered upon the denial by the commission of the complaint of Ralph Harter and other residents of Cortland, and points between there and Auburn on the Lehigh Valley Railroad, asking for earlier morning and later evening service into and out of Auburn. The case, says Commissioner Irvine, is typical of scores through that part of the State, gridironed by main and branch lines of railroad. As in many other cases, it has been shown that public convenience would be served by additional trains; yet the railroad has been able to show that even if the cost of this service could be barely met, it would be at the expense of revenue now being derived from the present trains, which are barely paying, and would result in a generally unprofitable operation.

Pointing to the fact that almost every village in the State can now be reached by an improved highway at all seasons of the year, and to the tremendous growth of the automobile, Commissioner Irvine said of the latter:

"A few years ago the summer toy of the rich man, it has now become the convenient passenger and freight vehicle of almost all classes. It is safe to assume that its use will not diminish."

The gasoline-driven railroad car is suggested by Commissioner Irvine as the solution of this problem of local railroad service, though he says that it has not yet been so thoroughly demonstrated under the topographical and climatic conditions of New York State as to warrant the commission in prescribing its use in this and other cases. Continuing he said:

"There is evidence in the record that gasoline cars have been operated on the Central New York Southern between Auburn and Ithaca at an expense of less than 29 cents per mile. This operation has not continued long enough, however, to determine the important factor of depreciation. If the solution does not lie in gasoline it must be found elsewhere, and it is high time that this and other railroads should seek it.

"It is not altogether creditable to the enterprise of the carriers that experience is so limited. The stretches of road we have been considering are not unfavorable to experimentation of this character. It is possible that the Lehigh Valley Railroad might not only meet the convenience of the complainants in this case, but aid materially in affording a solution of the local passenger problem if it should by actual experiment determine whether or not the solution lies in the direction indicated."

The local case involves two divisions of the road. One runs from Sayre, Pa., through Freeville to Auburn, and

the other from Elmira through Freeville and Cortland to Canastota. Through the connection at Freeville there are now two trains each way between Cortland and Auburn, the earliest arriving in Auburn at 10.58 a. m., and the latest leaving Auburn at 4.50 p. m. The commission finds that to change these schedules would result in far greater inconvenience to patrons all along the lines, and at many connections with other lines, than could be gained for the complainants. It also finds that on the showing of revenues and expenses put in by the railroad an order involving an extra train to meet this complaint would not be equitable and would not stand a court review. The railroad showed that its actual out-of-pocket cost per train-mile for this service was 54 cents, with revenues per train-mile of 57 cents, thus leaving only 3 cents for overhead charges.

CLEVELAND RAILWAY SEEKING TO BUILD 24 MILES OF TRACK AT COST OF \$905,427

At the regular meeting of the City Council of Cleveland, Ohio, on the evening of Feb. 7 the Cleveland Railway requested the approval of its plan to build 24 miles of new track at an estimated cost of \$905,427. Permission was also asked to sell the old carhouse property at Superior Avenue and East 105th Street for \$200,000. The Superior & East 105th Street Realty Company recently leased the property for a period of ninety-nine years, with the privilege of purchasing it after ten years for \$210,000.

The street railway committee approved Councilman Schwartz's request to the street railway commissioner to investigate and report on the feasibility of giving the various lines distinctive numbers.

The Cleveland Railway and the officials of East Cleveland are again in a dispute over the paving question on Euclid Avenue. Because the franchise has only a few more years to run, the company does not want to lay a new pavement between its tracks unless an extension of the franchise is granted. Under the present franchise 3-cent fares are in force in East Cleveland, but the company refuses to consider a renewal at that rate. It is said that nothing but a 5-cent fare between points in East Cleveland and points within the city will be considered by the company. A portion of the city lying east of East Cleveland is served by the Euclid Avenue line, but after leaving the East Cleveland limits an extra fare of 5 cents is collected. This was the rate before the territory was taken into the city.

J. E. Smith, chairman of the committee on light of the City Council, has suggested that the Cleveland municipal light plant be enlarged and that power from it be sold to the Cleveland Railway instead of giving the company permission to replace equipment in the Cedar Avenue power house. He has suggested that \$1,000,000 of bonds be issued to provide funds to enlarge the municipal plant sufficiently for this purpose.

FURTHER MOVES IN CANADIAN HYDRO-ELECTRIC PLANS

The Ontario Power Union and the Provincial Hydro-Radial Union will meet in Toronto, Ont., during the second week of the session of the Ontario Legislature, and Mayor Church says that the application for a subsidy from both Governments will be renewed. The Mayor stated that no money would be required while the war was on, and the municipalities would be satisfied with a guarantee.

The Toronto City Council on Jan. 24 heard on final reading the bill to authorize the ratification of an agreement between the city and other municipalities with the Provincial Hydro-Electric Commission for the construction of an electric railway from Toronto to London. The bill was indorsed by the ratepayers on Jan. 1.

A conference of representatives of the Councils of the municipalities along the Grand Trunk Railway branches between Berlin and Galt and between Berlin and Elmira was set for Feb. 5 in Berlin, at which Sir Adam Beck, chairman of the Hydro-Electric Power Commission, was to submit a proposition to secure the running rights over these lines to be used as feeders of the proposed radial main line between Toronto and London. Sir Adam Beck has notified the Berlin authorities that the Dominion Railway Commission will not consent to the construction of the Hydro lines

parallel to existing branch lines, but he is confident that running rights will be granted over these branches. It is proposed to electrify these branches.

SEATTLE SNOWBOUND

For the first time in the history of street railway operation in Seattle, practically the entire service of the Puget Sound Traction, Light & Power Company, as well as the Seattle, Renton & Southern Railway and the municipal lines, was completely paralyzed by a snowstorm which continued for thirty-six hours. Aside from an intermittent service on the cable lines traversing Madison and James Streets and Yesler Way, virtually all the cars in Seattle ceased operation at midnight on Feb. 1. On Feb. 2 the cable lines were forced to suspend operation. So heavy was the snowfall that the efforts of five snowplows, a crew of 500 men with shovels and several improvised cars equipped for clearing the tracks, were unable to remove the accumulation of snow to permit operation of cars on the local Seattle lines. The Seattle, Renton & Southern Railway operated until midnight on Feb. 1, but despite the efforts of extra gangs of men service had to be gradually discontinued. Division "A" of the municipal line ceased operations at 10 o'clock on the night of Feb. 1, but the Lake Burien line, Division "C," continued to operate all day on Feb. 2 and well into the night.

Interurban traffic, controlled by the Puget Sound Traction, Light & Power Company, was completely suspended on Feb. 2. On the Seattle-Tacoma division service ceased about 11 p. m. on Feb. 2. Operation over the Seattle-Everett branch of the Puget Sound company's interurban system was discontinued on Feb. 2 and had not been resumed up to the time that this account was dispatched from Seattle on Feb. 4 by the resident correspondent of the ELECTRIC RAILWAY JOURNAL.

The Oregon-Washington Railroad & Navigation Company, on Feb. 2 and 3, ran four special steam trains for the accommodation of the residents of Georgetown, a suburb of Seattle, and those employed in Georgetown who live in Seattle. J. L. Brass, assistant general manager of the railroad, stated that the operation of these special trains would depend upon the weather and the ability of the Puget Sound Traction, Light & Power Company to move its cars to and from Georgetown.

The topography of the city of Seattle, with its many hills and dangerous grades, added infinitely to the difficulties which confronted the railway officials.

According to reports received in Seattle from other large cities in the State, troubles similar to those experienced in Seattle were confronting the railway managers in those cities. Walla Walla reported 30 in. of snow and traffic completely demoralized. Tacoma, Bellingham, Olympia, Aberdeen, Hoquiam and other places reported the suspension of railway service.

FURTHERING CINCINNATI'S RAPID TRANSIT PLANS

C. C. Harris, representing the Cincinnati, Milford & Loveland Traction Company, reported to the Cincinnati Rapid Transit Commission on Feb. 2 that a plan had been adopted for connecting this line with the rapid transit loop in the city. He said that the connecting line would pass through Ault Park and give rapid transit not only to the park but to Madisonville, Mount Lookout and Hyde Park East. It was proposed, after bringing the line in from Madisonville, the present terminus of the Cincinnati, Milford & Loveland Traction Company, to form a junction with the Cincinnati, Georgetown & Portsmouth Railroad and two lines of the Interurban Railway & Terminal Company. On the following day, however, the city park board refused to entertain a request for a right-of-way through Ault Park on the ground that it was donated to the city on the condition that it be used for park purposes only and that an electric line through the ravine, as proposed, would spoil one of the most beautiful portions of the ground.

Mr. Harris announced to the park board that if the loop is built and his road secures a proper connection, it will be extended to Columbus, Ohio, to provide a fast freight system. He said that the passenger business was on the

wane, as evidenced by the fact that the company's earnings from passenger traffic in 1912 were \$72,000, while in last year they were \$48,000.

The Interurban Railway & Terminal Company and the Cincinnati, Georgetown & Portsmouth Railroad have planned to form a junction and connect with the proposed loop by means of one double-track line. This plan was reported to the Rapid Transit Commission on Feb. 2.

HOLYOKE ARBITRATION HEARINGS

L. D. Pellissier, president of the Holyoke (Mass.) Street Railway, took the stand late during the week ended Feb. 5 in the wages arbitration hearings, now under way after an interim of several weeks. He reviewed the policies of the company, with particular reference to official salaries. Mr. Pellissier told the board that he had entered the employ of the road in 1892 as a conductor at a daily wage of \$1.75 for ten hours' service. He sketched the various steps in his advancement to president and general manager, in which capacities he receives an annual compensation of \$7,500. The number of officers in the company had lately been reduced, and the official salaries now totaled \$10,000 a year, compared with \$14,000 formerly. Mr. Pellissier knew of no company of comparable size with so few officers. His duties included the purchase of about \$100,000 in supplies yearly as well as close supervision of the company's other expenditures, amounting to about \$500,000 a year. He also has charge of the Northampton Street Railway, for which he received an additional salary. To look after that property required two to three hours a day of executive attention. When the present interests took over the Northampton Street Railway it was in poor physical and financial condition, but the former had been much improved under centralized management.

The witness said that he worked twelve hours a day and seven days a week. Mr. Pellissier said that he had informed the employees on the Holyoke road that he was willing to meet the Springfield Street Railway rate of wages, but that the Holyoke company had always paid its men by the hour and would continue to do so. The company recently declared a 3 per cent dividend instead of the former 4 per cent semi-annual rate, the reduction being due to losses in the strike of 1915. The witness denied that spare men were obliged to remain at the carhouse from 5.30 a. m. until midnight in order to obtain seven hours' work a day.

Chairman Cottor announced that the company and the union had agreed that any award which may be made will date back to June 1, 1915. The hearing was adjourned until Feb. 9, when it was expected that Prof. Albert S. Richey of the Worcester (Mass.) Polytechnic Institute would submit expert testimony on the cost of living in rebuttal to the evidence of Arthur Sturgis, Brookline, Mass.

New Virginia Line in Operation.—The new line of the Petersburg & Appomattox Railway has been placed in operation from Petersburg to Hopewell, 10½ miles.

Lectures on Military Engineering.—The course of seven free lectures on military engineering practice under the direction of Major-General Leonard Wood, referred to in the *ELECTRIC RAILWAY JOURNAL* of Feb. 5, page 285, will, through the co-operation of the United Engineering Society, be given in the auditorium of the Engineering Societies Building in New York.

Chicago Traction Experts Begin Work on Feb. 14.—The ordinance confirming the appointment of the Chicago traction commissioners has become a law, and the new commissioners, William Barclay Parsons, Robert Ridgway and Bion J. Arnold, plan to take up the work of investigating Chicago's transportation problem Feb. 14, 1916, with a view of making an early recommendation for improvements. Mr. Parsons was named chairman of the commission in the ordinance authorizing the appointments.

Wage Conferences in Detroit.—Officers of Division No. 26 of the Amalgamated Association of Street & Electric Railway Employees, have had some conferences with officials of the Detroit (Mich.) United Railway with reference to a request which the union is to present for an increase in wages. No public announcement has been made as yet by either company or men as to the extent of the increase de-

sired. The agreement between the company and the union calls for arbitration of wage matters provided an agreement cannot be reached.

Proposed Lockport Agreement Disapproved.—The proposed agreement between representatives of the city of Lockport, N. Y., and the International Railway, Buffalo, N. Y., whereby the former would withdraw its objection to the one-man car service in Lockport providing the railroad company would construct a new freight and passenger terminal for the Buffalo & Lockport; Lockport & Olcott, and Buffalo, Lockport & Rochester lines, was disapproved when submitted to the Lockport City Council. It is said that an effort will be made to require the International Railway to place two men on the Lockport city cars.

Electrification of Twin City Terminals Reported.—Newspapers of St. Paul and Minneapolis, Minn., report negotiations under way between the Northern States Consumers Power Company and the Minneapolis General Electric Company, and the Great Northern Railroad which contemplate the electrification of the Union Station of Minneapolis and the terminals leading into it. Concerning the conference between L. W. Hill, president of the Great Northern Railroad, and H. M. Bylesby, Ralph Budd, assistant to the president of the railroad, is reported to have said: "I cannot divulge the nature of our conference with Mr. Bylesby. Naturally, the electrification idea presents itself in connection with his visit here, and I can go no farther than to say that we are considering such a proposition." This has been taken to mean that Mr. Bylesby has presented a comprehensive scheme of terminal electrification which is being looked upon with favor by the railroad officials.

PROGRAM OF ASSOCIATION MEETING

Central Electric Railway Association

The program has been announced for the annual meeting of the Central Electric Railway Association on Feb. 24 and 25, in the banquet hall of the Miami Hotel at Dayton. The business session will be held at 9 a. m. on Feb. 24. Reports of committees will be presented on Feb. 24. The program of addresses and papers for that day is as follows:

Address by Charles L. Henry, president of the Central Electric Railway Association and president of the American Electric Railway Association.

Paper, "City Manager Government and Its Relation to Public Utility Companies," by Henry M. Waite, city manager of Dayton, Ohio.

Address by Luke C. Bradley, assistant district manager of Stone & Webster.

At the afternoon session the program will be as follows:

Paper, "Comments on Electrification Applying Especially to the Norfolk & Western Installation," by Q. W. Hershey, engineer with the Westinghouse Electric & Manufacturing Company.

Address by Beecher W. Waltermire, chairman of the Public Utilities Commission of Ohio.

The program of papers for Feb. 25 will be as follows:

Paper, "Gas-Weld Rail Bonding," by J. Rowland Brown, engineer of the Ohio Brass Company.

Report of the Central Electric Railway Accountants' Association, by F. T. Loftus, president.

Report of the Central Electric Traffic Association, by A. L. Neereamer, chairman.

The presentation of these reports will be followed by the reading of the annual report of the secretary and treasurer and by the election and installation of officers for the ensuing year. The executive committee will meet immediately after adjournment.

At 6.30 p. m. on Feb. 24, an informal dinner will be given at the Miami Hotel for the members of the association and invited guests. The price for the dinner will be \$2.50 per plate. The toastmaster will be Charles L. Henry. The address of welcome will be delivered by George W. Shroyer, Mayor of the city of Dayton. The speakers will include S. D. Hutchins of the Westinghouse Air Brake Company; Frederick H. Rike, president of the Greater Dayton Association; Arthur W. Brady, president of the Union Traction Company of Indiana, and ex-Governor James M. Cox, Dayton, Ohio. Those who plan to attend the dinner are requested to notify John F. Ohmer, Dayton, Ohio, of the number of plates they desire and to send check with their request.

Financial and Corporate

PHASES OF UTILITY ACCOUNTING

Division of Capitalization of Up-State New York Commission Points Out Its Practices Regarding Suspense Accounts and Security Issues for Replacements

The division of capitalization of the Public Service Commission for the Second District of New York in its report for the year ended Dec. 31, 1915, calls the attention of utilities to certain phases of accounting which will here be noted briefly. In the first place it is pointed out that steam railroads and to a less degree street railways have systematically subdivided their plant accounts, but for the majority of the remaining classes one or a very few plant accounts have sufficed. Now, however, many corporations are recognizing the shortcomings of too general records and are analyzing their plant accounts and thus making the commission's accounting rules retroactive. Charges improperly included in old undefined accounts are charged against surplus if such is large enough or with the commission's approval to a replacement suspense account to be amortized through income in accordance with a definite plan determined by the regulatory body.

In regard to depreciation the division except in security issuance cases has not passed upon the rules used by the utilities, but in such cases it has for each company considered the estimated accrued depreciation to date and recommended a definite rule to govern the establishment and maintenance of a reserve to cover the present deterioration and future accruals. When the sum of the accrued depreciation computed by the commission and the book value of the property retired but not written off exceeds the company's surplus and its reported depreciation reserve, the revised balance sheet would show a deficit, but the companies have been allowed to suspend such excess pending its elimination by annual income appropriations.

The division has recognized that the principle of equality between property investment and the securities against such is economically correct, but as a practical proposition it has believed that electrical corporations in particular should be allowed sufficient time, a period of years, in which to absorb early losses and in the meantime they could properly finance their development with additional stock or bonds. Hence companies have been allowed to issue securities for replacements, but they have been required to pay off such securities from earnings within a reasonable time or else acquire from earnings sufficient assets to make good their investment. It is said that this policy has enabled the utilities to continue service without interruptions from receiverships or reorganizations, to finance themselves at a minimum cost and to make them comparable to unregulated companies as far as the possibilities attendant upon external development are concerned.

RETURNS FOR RHODE ISLAND

In the preliminary annual report of the Rhode Island Public Utilities Commission for 1915 recently submitted to the Governor it was stated that the value of road and equipment reported by the street railway companies of the State was an increase of \$2,107,975 over the preceding year, of which amount \$640,812 was reported by the Rhode Island Company. The current assets reported by this company decreased, but the total assets increased \$257,242.

The railway operating revenues of the Rhode Island Company amounted to \$5,084,137, a decrease of \$295,011, and the railway operating expenses totaled \$3,438,274, a decrease of \$985. The net operating income was \$1,173,153, a decrease of \$309,196, and the gross income was \$1,294,909, which was a decrease of \$332,099 from the amount reported the preceding year. The deductions from gross income amounted to \$1,410,337, leaving a deficit of \$115,428.

The only company operating cars within the State which paid a dividend was the Bay State Street Railway, and this company's dividend was a decrease of \$564,223.

ANNUAL REPORT

Cleveland Railway

The statement of income, profit and loss of the Cleveland (Ohio) Railway for the year ended Dec. 31, 1915, follows:

I.—BASED ON ORDINANCE ALLOWANCES		Cents per Car Mile
Operating revenues:		
Revenue from transportation.....	\$8,386,801	
Revenue from operations other than transportation	81,680	
Total operating revenues.....	\$8,468,481	26.11
Expense allowances:		
Maintenance allowance	\$1,604,709	4.95
Operating expense allowance.....	4,035,065	12.44
Total expense allowances.....	\$5,639,774	17.39
Net operating revenue.....	\$2,828,707	8.72
Non-operating income.....	73,832	0.23
Gross income	\$2,902,539	8.95
Taxes	488,064	1.50
Net income	\$2,414,475	7.45
Interest	1,856,501	5.73
Surplus	\$557,974	1.72
Special allowances	284,000	0.87
Net surplus	\$273,974	0.85

II.—BASED ON DISBURSEMENTS

Operating revenue	\$8,468,481	26.11
Actual expenses:		
Maintenance of way and structures.....	\$902,108	2.79
Maintenance of equipment except power plant	714,632	2.20
Maintenance of power plant.....	90,972	0.28
Total maintenance	\$1,707,712	5.27
Power	\$738,580	2.28
Conducting transportation	2,526,961	7.79
Traffic	511	0.00
General and miscellaneous.....	808,950	2.49
Total operating expenses.....	\$4,075,002	12.56
Total maintenance and operating expenses..	\$5,782,714	17.83
Net operating revenue.....	\$2,685,767	8.28
Non-operating income.....	73,832	0.23
Gross income	\$2,759,599	8.51
Taxes	488,064	1.50
Net income	\$2,271,535	7.01
Interest	1,856,501	5.73
Surplus	\$415,034	1.28
Obsolete equipment	209,000	0.64
Net surplus	\$206,034	0.64

Of the above-stated total of \$8,386,801 for revenue from transportation, passenger revenue accounted for \$8,255,642. Exclusive of transfers the passenger revenue increased \$266,129 or 3.68 per cent, while including transfers it increased \$773,136 or 10.33 per cent. The gross income showed a gain of \$806,636 or 10.43 per cent. The increase in maintenance allowance was \$2,311 or 0.14 per cent, while the actual maintenance expenses decreased \$220,726 or 11.45 per cent. The operating expense allowance increased \$124,131 or 3.17 per cent, and the actual operating expenses gained \$123,764 or 3.13 per cent. Taxes rose \$21,068 or 4.51 per cent and interest \$154,241 or 9.06 per cent. The total increases in operating expenses, taxes and interest amounted to \$299,073 or 4.88 per cent, and the net increase in maintenance and operating expenses, taxes and interest was \$78,347 or 0.97 per cent.

During the year the total number of fares increased \$10,237,332 or 4.45 per cent, and rides 7,817,179 or 2.40 per cent, but transfers decreased 2,169,464 or 2.34 per cent. The ordinance car-miles (where the mileage of trail-cars is figured at 60 per cent of their actual mileage) increased 105,323 or 0.33 per cent, and the actual car-miles increased 393,597 or 1.17 per cent. The operating revenue per car-mile increased 2.31 cents, while the actual maintenance expenses per car-mile decreased 0.07 cent, and the actual operating expenses per car-mile increased 0.34 cent, taxes 0.06 cent and interest 0.46 cent.

During the first eight months of 1914 the rate of fare was "3 cents cash fare, 1 cent transfer and 1 cent rebate," but during the last four months of that year and in all of 1915 there was no rebate of the 1 cent charge for trans-

fers. Just what the effect of this change of fare was on the comparative figures is shown by the accompanying table of monthly totals:

MONTHLY PASSENGER REVENUE, PASSENGER REVENUE LESS TRANSFER RECEIPTS, AND FARES IN 1915, WITH INCREASES OVER 1914

Month	Passenger Revenue		Passenger Revenue Less Transfer Receipts		Fares	
	1915	% Inc.	1915	% Inc.	1915	% Inc.
January	\$635,853	8.57	\$578,408	0.95*	18,431,753	2.04*
February	587,867	11.01	534,307	1.18	17,052,978	0.04
March	672,839	12.55	611,925	2.66	19,527,042	2.23
April	669,967	10.61	609,049	0.86	19,391,440	0.49
May	707,024	9.26	641,214	0.56*	20,359,602	0.37*
June	700,575	12.38	635,284	2.23	20,455,054	4.11
July	715,337	11.01	648,963	1.04	20,820,989	2.99
August	711,069	12.33	645,261	2.28	20,669,652	4.41
September	690,185	6.31	626,267	6.05	20,145,282	7.60
October	736,559	9.01	669,241	8.79	21,570,476	10.19
November	704,033	11.55	640,685	11.40	20,673,166	12.96
December	724,334	9.78	660,116	9.59	21,289,105	10.91
Total	\$8,255,642	10.33	\$7,500,720	3.68	240,386,539	4.45

*Decrease.

It is evident that the increases in the first eight months of 1915 over the corresponding months of 1914 were to a large extent due to the increased fare in the later periods, and the increases in the last four months of 1915 are a better indication of the real gain and the showing to be expected in 1916. The columns showing the number of fares are the most accurate measure of the increasing traffic enjoyed by the company during 1915 and most clearly indicate the good progress being steadily made. During the last four months of 1915 the company enjoyed a marked increase in travel, and the penny transfer charge promises to wipe out the allowance deficits if the city allows its continuance for that purpose. It may be noted that for October the earnings of the company were the largest in its history.

The interest fund was increased by surplus earnings of \$45,546 in December, the balance in the fund at the end of the year being \$542,652. The average maintenance allowance for the year was substantially 5 cents per car-mile. The allowance for December was about 4 cents per car-mile, and the December surplus was therefore considerably larger than it would have been if the allowance for the month had been equal to the average for the year. The increases in the interest fund from month to month have led some to hope that there might be a decrease in the rate of fare within a comparatively short time, but it has been said that the over-expenditure of the maintenance reserve, amounting at the end of the year to \$593,149, ought first to be provided for from the interest fund.

During 1915 the company expended \$1,975,896 for betterments. It is said to be impossible now to state how many new cars and motors will be required in 1916, for the City Council has entire control of the service. As stated in the ELECTRIC RAILWAY JOURNAL of Jan. 29, however, the track department has recommended, among various things, the renewal of about 28 miles of track at an estimated cost of \$1,000,000 and the purchase of four automobile trucks, while the power department has recommended improvements totaling \$507,840.

GOOD RECORD FOR NORFOLK & WESTERN

In regard to the operating results of the Norfolk & Western Railroad for the last half of 1915, the *Wall Street Journal* gives some particulars which are of especial interest on account of the electric service maintained between Bluefield and Vivian. During the six months mentioned, the road operated at a ratio of 56.8 per cent, as compared to 65.9 per cent for the same period of 1914. The train load has been steadily increasing from 635 tons in 1910 to 841 tons in 1915, and a gain is expected during the current year. The financial journal mentioned attributes a large part of the steady increase in train load to liberal expenditures for improvements, including the electrified section mentioned. The cost of electrification for this 30-mile section is said to be \$3,600,000. Under electric operation one electric locomotive hauls the train with the aid of a pusher only on the steep grades, whereas, with steam, two Mallet type steam locomotives were used with a third as the pusher on the steep grades. The speed with the electric locomotives is practically double that of the steam operated train.

DES MOINES REFINANCING SETTLED

New Mortgage to Secure \$15,000,000 of 5 per Cent Bonds, \$3,483,000 to Be Now Issued—Old 5 Per Cent Bondholders Receive Favorable Preferential Offers

Under plans which have been completed for refinancing the Des Moines City Railway, which has accepted the new franchise described in the ELECTRIC RAILWAY JOURNAL of Jan. 29, page 205, a new mortgage will be made to secure a new issue of general and refunding mortgage 5 per cent twenty-year gold bonds. These will become first mortgage bonds upon the payment of the comparatively small amount of \$367,000 of underlying bonds which will remain outstanding, the longest maturing in 1921. Under this financial plan, a total of \$3,483,000 of bonds will be presently issued, and out of the proceeds of these the company is required to deposit \$500,000 in cash with the trustee of the new mortgage to be expended for improvements and extensions.

The bondholders' committee for the old 5 per cent refunding mortgage gold bonds has made a contract with the railway, under which the owners of the \$2,202,000 of bonds deposited with the committee are granted the opportunity to receive a full settlement in cash for their certificates of deposit, or the preferential right to purchase an amount of new bonds equal to the amount of their certificates of deposit at a lower price than that at which it is proposed the new bonds will be offered to the general public. The holders may exchange each \$1,000 of certificates of deposit for \$1,000 par value of new general and refunding mortgage bonds, bearing interest from Jan. 1, 1916, and receive a bonus of 5 per cent (\$50) in cash and, in addition, \$64.17 in cash, which is the amount of interest on the old bonds to Jan. 1, 1916, and interest on overdue interest to March 1, 1916. Or they may receive payment in full in cash for principal and interest and interest on overdue interest to March 1, 1916.

The committee, in so far as it personally owns or represents the owners of certificates of deposit, has elected to accept settlement in new bonds and cash, and recommends the same course to the other depositing bondholders. All holders of certificates of deposit are required to elect, prior to Feb. 26, 1916, whether they will accept part bonds and part cash or prefer to receive a full cash settlement. In view of the favorable terms, the committee, in so far as no preference is expressed prior to Feb. 26, will exchange the old bonds for new bonds and cash, and will hold such for delivery to the holders of certificates of deposit.

The committee has consented to the discharge of the receiver of the railway and the dismissal of all suits against the city of Des Moines, entered on behalf of the bondholders, and the committee has waived all defaults under the mortgage securing the bonds.

All the \$2,202,000 now deposited under the control of the committee will be deposited as part of the security for the new issue, as will any additional underlying bonds which may be acquired. In case the amount of underlying bonds is reduced, there will be a corresponding increase in the amount of the new issue. The new bonds will be dated as of Jan. 1, 1916, will be due Jan. 1, 1936, and will be redeemable on any interest payment date at 105 and interest. The total authorized issue will be \$15,000,000, with the provision that bonds may be issued to refund the underlying bonds, and \$1,000,000 of additional bonds may be issued for the full cost of rehabilitation, extensions and additions. The remaining bonds, amounting to \$10,150,000, may be issued for 80 per cent of the cost of further extensions and additions, but no bonds in excess of the amount to be issued forthwith can be issued except when the net earnings for the preceding twelve months have been equal to at least one and three-quarters times the annual bond interest charge.

The Harris Trust & Savings Bank, Chicago, has contracted to purchase from the railway whatever bonds are not taken by the old bondholders, and later on expect to offer these to the general public at a price higher than the 95 and interest price at which the bonds are now offered to the old bondholders.

Columbus Railway, Power & Light Company, Columbus, Ohio.—E. W. Clark & Company, Philadelphia, Pa., and Kissel, Kinnicutt & Company, New York City, are offering at 97 and interest \$3,500,000 of first refunding and extension sinking-fund mortgage 5 per cent gold bonds of the

Columbus Railway, Power & Light Company, dated April 1, 1915, and due Oct. 1, 1940. The bonds are part of an authorized issue of \$25,000,000, of which \$3,500,000 will be outstanding upon the sale of the new bonds, \$41,900 in the treasury, \$6,654,700 are reserved to retire underlying liens, and the balance are reserved for additions and improvements at 85 per cent of the cash cost or fair valuation, whichever is less, but only when net earnings for the preceding twelve calendar months are twice the interest charges on all bonds outstanding, including those applied for. Of the present issue \$1,552,900 will be used to retire underlying bonds, \$1,439,000 for construction now completed, \$250,000 for future construction and \$300,000 for working capital.

Empire United Railways, Inc., Syracuse, N. Y.—The bondholder's protective committee, of which Arthur W. Loasby is chairman, has notified the holders of the Rochester, Syracuse & Eastern Railroad first mortgage 5 per cent bonds that \$3,544,000 in bonds have been deposited out of \$4,896,000 outstanding and that after Feb. 15 no bonds will be received for the protective agreement except by special permission.

Fostoria & Fremont Railway, Fostoria, Ohio.—Luce & Company, Boston, Mass., and Portland, Me., are offering at 93½ and interest \$200,000 of first mortgage 5 per cent gold bonds of the Fostoria & Fremont Railway of 1910, due on Oct. 1, 1930.

Gary & Interurban Railroad, Gary, Ind.—The Supreme Court of Indiana has affirmed the decision of the Circuit Court of La Porte County in the case of Ferdinand Raff et al. versus the officers and directors of the Gary & Interurban Railroad. The case was brought by Raff and others to restrain the directors from merging the Gary & Interurban Railroad with other interurban lines in Indiana. Judge Tuthill of the La Porte County Circuit Court decided against Mr. Raff and sustained the merger. The case was then appealed by Mr. Raff to the Supreme Court.

Interborough Rapid Transit Company, New York City.—The Manhattan Railway is offering for sale \$4,523,000, out of a total authorized issue of \$5,409,000, of its second mortgage 4 per cent gold bonds, due on June 1, 2013, secured by its second mortgage made to the Equitable Trust Company of New York, as trustee, dated June 1, 1913, interest payable June 1 and Dec. 1. This mortgage was consented to and the issuance of these bonds authorized by order of the Public Service Commission for the First District, dated Feb. 3, 1916. Sealed proposals for the purchase of the whole or any part of the bonds will be received on or before Feb. 17, 1916. The bonds are to be issued to reimburse the Interborough Rapid Transit Company, the lessee of the lines, for permanent improvements made to the elevated structure.

Lima & Honeoye Light & Railroad Company, Lima, N. Y.—The Buffalo House Wrecking & Salvage Company, Buffalo, N. Y., bought the physical property of the Lima & Honeoye Light & Railroad Company for \$14,380 at foreclosure sale held in Rochester, N. Y. The property includes two street cars, rails, ties, trolley and feeder wires, power house, engines, boilers and generators and the carhouse in Lima, N. Y. The latter is a frame structure 40 ft. x 60 ft. and the power house near Lima is a brick building 60 ft. x 100 ft. The road extends 4½ miles from Honeoye Falls to Lima. The right-of-way was sold for \$25 and the lighting system brought \$7,500. Isaac Joffe was referee.

Little Rock Railway & Electric Company, Little Rock, Ark.—J. R. Vinson, president of the Southern Trust Company, has been elected a director of the Little Rock Railway & Electric Company.

Northern Ohio Traction & Light Company, Akron, Ohio.—The Northern Ohio Traction & Light Company has applied to the Ohio Public Utilities Commission for authority to issue \$518,400 of 6 per cent preferred stock, to be sold at not less than 95, the proceeds to be used for extensions of the generating capacity of the company, and for additions and betterments to its properties. It is said that officials of the company are working on details of a general mortgage covering all properties of the company to provide for future refunding and financing of improvements and extensions. The company has been financing its requirements

by the issue of 6 per cent preferred stock, of the authorized amount of which \$1,500,000 remains unissued. When the full amount of this stock has been sold it is the intention of the company to do all future financing by the sale of general and refunding bonds. With the refunding of underlying bonds and the inclusion of property now covered by them into the corporate organization of the Northern Ohio Traction & Light Company the general mortgage will become a first lien.

Philadelphia (Pa.) Rapid Transit Company.—The holders of the voting trust certificates of the Philadelphia Rapid Transit Company have expressed a desire that the Stotesbury management shall be continued and the voting trust agreement extended for a further period of five years. Accordingly an agreement supplemental to the original voting trust agreement of Feb. 20, 1911, has been prepared and is on file at the office of the Fidelity Trust Company, Philadelphia, agent for the voting trustees. The present trustees are Arthur E. Newbold, George H. McFadden and William P. Gest, and they have agreed to continue to act in their present capacity, provided the holders representing a substantial majority of the voting trust certificates or shares of the stock consent to the extension. Under the original voting trust agreement \$22,853,900 of \$30,000,000 of capital stock of the company was pledged.

Pittsburgh (Pa.) Railways.—The United Traction Company has again failed to pay the semi-annual dividend of 2½ per cent on its \$3,000,000 of preferred stock. The protective committee which was formed in February, 1915, when the company first passed its dividend, has been reorganized with the addition of Howard A. Loeb and Charles Biddle, Philadelphia. Holders of the preferred stock are asked to deposit their stock with the Philadelphia Trust Company. All the \$17,000,000 of common stock of the United Traction Company is owned by the Pittsburgh Railways, which is controlled by the Philadelphia Company.

Schenectady (N. Y.) Railway.—The Schenectady Railway has called for redemption on March 1 the \$2,000,000 of outstanding first mortgage 4½ per cent forty-year gold bonds of Sept. 1, 1901, at 110 and accrued interest, to be paid at the Banker's Trust Company, New York City.

Seattle, Renton & Southern Railway, Seattle, Wash.—Judge Frater in the King County Superior Court has allowed a claim of \$140,000 held by the Puget Sound Traction, Light & Power Company against the Seattle, Renton & Southern Railway for power furnished. Judge Frater has denied the motion directing the receivers to appeal to the Supreme Court from the decision of Judge Ralph C. Kauffman, who found the Seattle, Renton & Southern Railway hopelessly insolvent.

Southern Iowa Railway & Light Company, Albia, Iowa.—The sale of the property of the Southern Iowa Railway & Light Company under foreclosure which was postponed from Dec. 18, 1915, was held on Jan. 20. The purchaser was Charles Smallwood, representing the eastern bondholders.

United Railroads, San Francisco, Cal.—In a statement which he issued on Jan. 31, Charles N. Black, vice-president and general manager of the United Railroads, said: "Our receipts for January, 1916, show an enormous decrease as compared with the same month for the last four years. Our maintenance charges have been reduced to a minimum, and the only possible saving in operating expenses lies in the curtailment of service. If this is found to be necessary it will be entirely due to the unregulated competition of the jitney buses. I desire to impress upon every man in the service of the company with all the force in my power the seriousness of the present situation, and I appeal to every one of you to help solve the problem."

United Railways & Electric Company, Baltimore, Md.—The directors of the United Railways & Electric Company have authorized an issue of \$2,750,000 of five-year 5 per cent notes subject to approval by the Public Service Commission. The proceeds of the issue are intended to take care of all the larger financing of the company for the next five years, including the payment and retirement of \$500,000 of Baltimore, Catonsville & Ellicott's Mills first mortgage 5 per cent bonds, due on July 1, 1916, and \$1,000,000 of two-year 5 per cent notes due on June 1, 1916. As the company has no floating debt the sale after payment of

Traffic and Transportation

NOT ALL BUS COMPETITION UNJUST

Commission Allows Motor Bus Operation for Through Routes—Cannot Carry Local Passengers Between City Points

The Public Service Commission for the Second District of New York on Feb. 4, upon an opinion by Commissioner Devoe P. Hodson, holds in effect that where a bus line operates partly within and partly without a city, the public convenience and necessity sought to be satisfied by such operation must be considered by the commission to include the territory outside the city as well as that inside, though the statute as it at present stands limits the authority of the commission over the operation of bus lines to cities.

LeRoy D. Becraft asked for approval of a bus route through the streets of Corning and continuing outside the city to the village of Painted Post. James F. Adams submitted a similar application for a route to the New York Central shops outside of Corning. The commission has approved both routes over the objection of the Corning & Painted Post Street Railroad, though it exacts the condition that neither line shall carry local passengers from point to point within the city.

These two cases were heard and decided together and Commissioner Hodson says that the convenience and necessity which are sought to be satisfied in these cases are not confined to the residents of Corning alone, but relate also to the public generally, in so far as the through routes of the petitioners are required for continuous transportation into and through the city, and that the limitation of the present law to the streets of the city does not preclude the consideration of proposed routes in their entirety. This is particularly so as in the present case, where it is made to appear that suburban travel over a part of the line is not properly accommodated unless the same can be continued over the city streets.

Of the objection of the electric railway that the granting of the certificate would interfere with its rights as an already established common carrier, Commissioner Hodson says that though it is the function of the commission to prevent to the full extent of its powers all unjust competition with, and unfair assaults upon, the business and invested capital of a public service corporation, yet this rule cannot be so extensive in its operation that all competition shall be considered unjust, or that for one to engage in a perfectly legitimate undertaking shall be considered as invading the vested rights of another public utility.

SEDALIA SOLICITS TRACTION BUSINESS

Gas and Electric Canvassing Methods Utilized to Increase Street Railway Usage

The City Light & Traction Company, Sedalia, Mo., operated by Henry L. Doherty & Company, has started a novel movement in soliciting street railway business by means of a house to house canvass. This practice has long been in use by gas and electric companies for the purpose of securing both good-will and additional business, but this is thought to be the first case of the kind where it has been used by a railway. Harry D. Frueauff, general manager, in a recent letter describes the plan as follows:

"We have started on a new stunt which we trust will produce results. It is a house to house canvass on the traction department. We have prepared some blotters giving the time-table of the cars as the calling card for our solicitor and as a means of opening up a conversation. His efforts will be devoted to finding out in what way the street car schedules or conditions do not meet the views of the patrons. He will also make a special effort among the laboring class to have them lay aside a certain amount each pay day to be invested in tickets. His time will be spent in outlying districts from which we get our travel.

the bonds and notes will leave the company with the proceeds of \$1,250,000 in notes to take care of improvements. The Safe Deposit & Trust Company will be the trustee, and the principle and interest of the notes will be payable at the banking house of Alexander Brown & Son, fiscal agents for the company. The notes will be dated Feb. 1, 1916, and will mature on Feb. 1, 1921, but will be redeemable in part or whole at any time upon thirty days' notice at 101 and interest. They will be in the denomination of \$1,000. M. Ernest Jenkins, Baltimore, has been elected a director of the company to succeed H. Crawford Black, resigned, and J. E. Aldred, who is chairman of the board of the Consolidated Gas, Electric Light & Power Company and the Pennsylvania Water & Power Company, has been elected a member of the executive committee to succeed Mr. Black.

DIVIDENDS DECLARED

Boston (Mass.) Elevated Railway, quarterly, 1½ per cent.
 Detroit (Mich.) United Railway, quarterly, 1½ per cent.
 Duluth-Superior Traction Company, Duluth, Minn., quarterly, 1 per cent, preferred.
 Pacific Gas & Electric Company, San Francisco, Cal., quarterly, 1½ per cent, original preferred; quarterly, 1½ per cent, first preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, ME.

Period	Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Dec., '15	\$67,306	*\$34,478	\$32,828	\$17,606	\$15,222
1 " " '14	65,509	*29,753	35,756	17,462	18,294
12 " " '15	788,832	*400,510	388,322	212,495	175,827
12 " " '14	777,752	*375,219	402,533	209,122	193,411

CHATTANOOGA RAILWAY & LIGHT COMPANY, CHATTANOOGA, TENN.

1m., Dec., '15	\$105,343	*\$63,836	\$41,507	\$29,784	\$11,723
1 " " '14	89,012	*66,141	22,871	29,337	†6,466
12 " " '15	1,087,344	*727,731	359,613	357,762	1,851
12 " " '14	1,085,096	*699,723	385,373	339,409	45,964

COLUMBUS RAILWAY, POWER & LIGHT COMPANY, COLUMBUS, OHIO

1m., Dec., '15	\$300,315	*\$164,527	\$135,788	\$41,189	\$94,599
1 " " '14	278,561	*151,427	127,134	40,048	87,086
12 " " '15	3,113,175	*1,846,437	1,266,738	476,281	790,457
12 " " '14	3,066,298	*1,886,746	1,179,552	479,460	700,092

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY, GRAND RAPIDS, MICH.

1m., Dec., '15	\$1,475,889	*\$760,857	\$715,032	\$405,890	\$309,142
1 " " '14	1,341,385	*666,266	675,119	372,263	302,856
12 " " '15	14,590,124	*7,788,455	6,801,669	4,506,082	2,295,587
12 " " '14	14,006,484	*7,549,898	6,456,586	4,212,852	2,243,734

CUMBERLAND COUNTY POWER & LIGHT COMPANY, PORTLAND, ME.

1m., Dec., '15	\$224,254	*\$139,223	\$85,031	\$65,706	\$19,325
1 " " '14	203,510	*124,269	79,241	62,523	16,718
12 " " '15	2,636,364	*1,505,787	1,130,577	792,414	338,163
12 " " '14	2,513,620	*1,457,020	1,056,600	758,859	297,741

EAST ST. LOUIS & SUBURBAN COMPANY, EAST ST. LOUIS, ILL.

1m., Dec., '15	\$238,667	*\$141,274	\$97,393	\$62,982	\$34,411
1 " " '14	215,997	*108,860	105,137	71,748	33,389
12 " " '15	2,466,969	*1,473,592	993,377	756,315	237,062
12 " " '14	2,623,827	*1,616,214	1,007,613	701,949	305,664

GRAND RAPIDS (MICH.) RAILWAY

1m., Dec., '15	\$112,010	*\$74,316	\$37,694	\$12,475	\$25,219
1 " " '14	125,913	*64,732	61,181	12,162	49,019
12 " " '15	1,176,450	*832,799	343,651	165,187	178,464
12 " " '14	1,286,568	*829,637	456,931	161,778	295,153

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY, LEWISTON, ME.

1m., Dec., '15	\$57,929	*\$40,889	\$17,040	\$15,942	\$1,098
1 " " '14	50,073	*38,657	11,416	15,634	†4,218
12 " " '15	737,850	*475,422	262,428	189,839	72,589
12 " " '14	676,922	*467,809	209,113	186,417	22,696

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.

1m., Dec., '15	\$204,364	*\$116,881	\$87,483	\$42,946	\$44,537
1 " " '14	197,278	*111,055	86,223	31,079	55,144
12 " " '15	2,143,903	*1,318,834	825,069	510,587	314,482
12 " " '14	2,240,308	*1,353,732	886,576	499,671	386,905

PORTLAND RAILWAY, LIGHT & POWER COMPANY, PORTLAND, ORE.

1m., Dec., '15	\$482,938	*\$255,280	\$227,658	\$182,824	\$44,834
1 " " '14	514,493	*255,483	259,010	182,974	76,036
12 " " '15	5,511,345	*3,073,628	2,437,717	2,208,356	229,361
12 " " '14	6,273,171	*3,263,883	3,009,288	2,172,678	836,610

*Includes taxes. †Deficit.

"I think the plan will work out satisfactorily, for I know we have always made friends and customers for the gas and electric departments by canvassing and finding out the causes of complaints and then showing patrons that we are interested in correcting them. I see no reason why this should not work out to advantage in the traction department. We have found that many laboring people buy a few tickets at pay day and when these are gone they walk. I am hopeful that we can get them to invest more by calling to their attention the saving to be made."

Accident in Ohio.—A collision between a passenger car and a freight car on the Youngstown & Southern Railway just south of Youngstown, on Feb. 3, resulted in the injury of about twenty people.

Bay State Fare Hearings Resumed.—The Massachusetts Public Service Commission gave a continued hearing in the Bay State Street Railway fare case on Feb. 8. The entire day was devoted to the presentation of financial and engineering evidence supplementing testimony already heard. A résumé of the proceedings, which included an exhaustive study of the cost of rush-hour service, will be printed in a later issue.

Skip-Stop Recommended for Dallas.—The use of the skip-stop system in the business district has been recommended by Prof. E. W. Bemis, employed by the city of Dallas, Tex., to report on means for relieving traffic congestion. The Dallas Consolidated Electric Street Railway and the Northern Texas Traction Company have both expressed their willingness to adopt this practice if the city officials approve it.

Hearing on One-Man Car Operation.—Bentley W. Warren, Boston, counsel for the Massachusetts Street Railway Association, appeared before the legislative committee on street railways, on Feb. 3, in support of a bill to allow street railways to operate one-man cars, subject to the approval of the Public Service Commission. Mr. Warren stated that operation in accordance with the provisions of the bill would reduce operating costs in sparsely settled districts.

Accident Fakers Indicted.—The grand jury of Jackson County, Mo., recently returned indictments against four persons on the charge of making fake claims against the Metropolitan Street Railway, Kansas City, for damages. Two of the indicted persons were women, who had alleged that they had been injured, and had settled with the claim agent. One of those indicted was the lawyer who worked up the case; the other a man who testified to the grand jury that he had seen the women while they were lying injured on the street after the accident.

Portland Jitney Ordinance Enforceable.—The new jitney ordinance in Portland, Ore., is now enforceable. The mandate of the Supreme Court, in which the jitney ordinance was held valid, has been filed in the Circuit Court, and the judgment of the upper court has been made the judgment of the lower court and enforcement has been started. It is reported that up to Jan. 21 ninety-six jitney drivers appeared before Jitney Inspector Gill for permits. Of this number, forty machines were found safe and the drivers capable. The others will be re-examined as soon as certain defects are corrected.

Strip Ticket Order in Trenton Affirmed.—Judge Buffington has filed an opinion in the United States Appellate Court affirming the decision of the New Jersey District Court, which refused to grant the application of the Trenton & Mercer County Traction Corporation, Trenton, N. J., for a preliminary injunction to restrain the Board of Public Utility Commissioners from enforcing an order for the continued sale of the six tickets for 25 cents. The case will again be before the court on final hearing. The history of this case was reviewed briefly in the *ELECTRIC RAILWAY JOURNAL* of Dec. 18, 1915, page 1236, and Dec. 25, 1915, page 1258.

One-Man Cars Likely in Seattle.—The Puget Sound Traction, Light & Power Company, Seattle, Wash., has addressed a communication to the Public Service Commission relative to the establishment of one-man cars on some of the lines in Seattle. Commission members have not stated what their attitude will be in the matter, but have inti-

imated that a thorough investigation will be made at an early date. The establishment of a one-man car service on one of the lines in Olympia was followed by a formal complaint to the commission. The result was that two men were placed back on the cars, pending an investigation.

Fifteen Per Cent Increase in Speed in Cleveland With Skip Stop.—In its pamphlet report for the year ended Dec. 31, 1915, the Cleveland (Ohio) Railway said in regard to the skip stop: "With the co-operation of Mr. Witt—indeed, on his initiative—a so-called skip-stop system has been put into effect on substantially all the lines of the company. Its adoption has resulted in a very material decrease in operating cost per car-mile. The average speed of our cars in 1911 was 9.6 miles in the base-table hours, 9.6 miles in the rush hours and 9.6 miles at night. In 1915 the average speed was 11 miles in the base-table hours, 10.2 miles in the rush hours and 11.5 miles at night. This is an increase of nearly 15 per cent." Mr. Witt was street railway commissioner of Cleveland, but relinquished his office on Dec. 31.

Petitions for 6-Cent Fare in Rhode Island.—A petition has been filed with the Rhode Island Public Utilities Board by the Bay State Street Railway, Boston, Mass., asking for authority to increase fares to 6 cents on all the lines of the road in the former State. In its petition the company states that its financial condition demands an increase in fares, and in the general lines of reasoning the company's request follows the petition now before the Massachusetts Public Service Commission. It is proposed to readjust all existing fares and to nullify all reduced-rate tickets other than those sold to school children. The principal city affected will be Newport, the interurban fare from Newport to Fall River being increased from 25 cents to 30 cents by the proposed tariff. The company desires to place the new rates in effect on March 6, 1916, but a number of public hearings will be required before that time.

Longport Demands Cars or Jitneys from Atlantic City.—The City Commissioners of Atlantic City, N. J., a pro-jitney body, disposed of one phase of Atlantic City's trolley-jitney problem when they refused to bond, route and otherwise regulate the licensed jitneys in that city to afford the Atlantic City & Shore Railway some form of serious protection. Disconcerting evidence of that developed recently when Longport at the lower end of the Island, appealed to the City Commission to do something to save that resort from disastrous consequences of Atlantic City's pro-jitney policy. Longport's board of rulers sent to the Atlantic City Commission resolutions charging that the failure of the latter to regulate there has forced the Atlantic City & Shore Railway to limit and curtail its service to Ventnor, Margate and Longport, greatly inconveniencing inhabitants. The Longport authorities ask that Atlantic City take immediate steps whereby the electric railway may be able to maintain adequate service to the lower beach.

Further Advertising of Louisville's Suburban Lines.—By means of display advertisements and reading notices inserted in the Louisville newspapers, the Louisville & Southern Indiana Railway and the Louisville & Northern Railway & Light Company are endeavoring to stimulate incidental or tourist travel in the winter months. "Loop the Loop for Sight-Seeing" is one of the catchy phrases used, while the companies' standing slogan, "Take the Big Red Car," is also in evidence. As noted some time ago, when the Ohio River was at flood stage, the companies carried such advertising. Now, however, the scenic possibilities of the loop trip are emphasized in the reading notices also. These refer to the view from the top of Silver Hills, to the new waterworks under construction, to the Howard ship yards where oxen are still used in moving timbers, to the Government's quartermaster's depot and to the various manufacturing plants and points of interest which are to be reached readily from the lines of the companies. In each case directions are given as to taking the cars and the time of leaving the station.

Mayor Cited for Contempt in Jitney Case.—Counsel for the jitney men of Houston, Tex., have filed a petition with Judge William Masterson of the Fifty-fifth District Court asking that Mayor Ben Campbell and the City Commissioners be cited for contempt of court for alleged violation of the court's orders in the original jitney suit. Judge Mas-

terson, in the suit of Steve McCormack, et al., vs. Mayor Ben Campbell et al., in the spring of 1915, held that the city ordinance then in force, requiring a \$10,000 bond, was unconstitutional, as jitneys could not be made insurers of passengers. At that time the city agreed to change the ordinance to eliminate this feature. Now by requiring a \$2,500 bond in the latest ordinance counsel for the jitney-men declare the city is violating the letter of Judge Masterson's order. The court is asked to enter the judgment "now for then," in which case the bond feature of the present ordinance would be eliminated, meanwhile the temporary injunction granted in the case of G. W. Beardsley et al., against the city still stands, pending a decision of the Supreme Court in the San Antonio jitney case.

Louisville "Jim Crow" Measure Reported.—The "Jim Crow" bill, fathered by Senator Knight of Louisville, has been favorably reported by committees to both House and Senate of the Legislature, amended, however, so as to make it apply only to Louisville, "cities of the first class." Since the introduction of the measure conductors of the Louisville Railway have been taking a census of their passengers. The reports show that there is no uniformity of ratio in the travel, the same cars at different stages of their routes being occupied first by a majority of one and then by a majority of the other race. There is equal diversity of proportions at various hours of the day. This promises, it is stated, to make the provision of the bill requiring the conductor to change the dividing line to separate the whites and blacks, as conditions require, a constant cause of friction. There is much opposition to the bill in Louisville.

Springfield Service Improvements.—C. V. Wood, president of the Springfield (Mass.) Street Railway, has announced that before March 1 a number of important changes in car routeing will be placed in effect in the business district to relieve congestion on Main Street and provide additional facilities for rapid transit. Five routes will be diverted from Main to Dwight Street, a parallel thoroughfare to the eastward, and in the evening rush hour forty extra cars will be run via Dwight Street, besides fifty-seven extras on Main Street. At present ninety-seven extra cars are operated on Main Street in this period, only five extras being run through Dwight Street. Between 5 and 6 p. m. at present 130 regular cars are operated through Main Street and twelve through Dwight Street. Under the new schedule 110 regular cars will be operated through Main Street and forty through Dwight, making an increase of eight regular cars on the two streets. Other minor changes in routeing will be adopted. Prof. Albert S. Richey of the Worcester Polytechnic Institute has been in consultation with the company's officials relative to the redistribution of traffic. A new type of transfer designed by Robert E. Cosgrove, freight and passenger agent, will shortly be placed in use at Springfield.

Modification of Car Flash Signal.—The Public Service Commission of the Second District of New York, after a long test of an experimental signal system prescribed to it for the Schenectady-Albany cars in response to the complaint of the Colonie Improvement Association and others, has agreed to the modification of the system. A year ago, upon complaint of residents of Colonie that the Schenectady cars would pass persons desirous of boarding them at stations, the commission ordered the company to equip part of its line with a signal light which could be operated by the prospective passenger from the station and which would show some distance up the track. It also ordered that the lighting facilities at the stations be improved. The operatives of the railway, under the supervision of the commission's experts, now report that the signal light and the lights for illumination at the station have proved confusing. They assert that the new lights for illumination at the stations are of sufficient brilliance readily to reveal persons waiting for the cars, and that furthermore these lights have been equipped with a switch, accessible to the person waiting, with which the lights can be turned on and off to signal a car to stop. In view of all these circumstances the commission has permitted the railway to discontinue its experiments with the signal lights ordered last spring, as it considers the facilities now installed ample to assure the stopping of any car at any station.

Personal Mention

Mr. C. W. Blackington has been appointed general foreman of the Memphis (Tenn.) Street Railway.

Mr. George W. Wilson, treasurer of the International Railway, Buffalo, N. Y., has been elected secretary of the company, to succeed Mr. John A. McKenna, resigned.

Mr. F. T. Leversuch has resigned as general manager of the London & Port Stanley Railway, the London-owned hydro-radial line running between London and Port Stanley, Ont.

Mr. John A. McKenna, secretary of the International Railway, Buffalo, N. Y., has resigned to accept the position of secretary of the United Gas & Electric Corporation, New York City.

Mr. Charles D. Bell has resigned as secretary, superintendent and chief engineer of the Arkansas Valley Interurban Railway, Wichita, Kan., to engage in business for himself in that city.

Mr. D. P. Abercrombie, Jr., who has been secretary and treasurer of the Connecticut Valley Street Railway, Greenfield, Mass., has been elected vice-president and general manager of the company.

Mr. A. D. McWhorter, master mechanic of the Memphis (Tenn.) Street Railway, has also been made superintendent of overhead lines, taking over in part the work of E. D. Martinez, electrical engineer, deceased.

Mr. C. Elmer Bown has been selected by the finance committee of the City Council of Pittsburgh, Pa., as street railway expert to assist in deliberating upon the transit situation in that city. Mr. Bown is a lawyer by profession.

Mr. J. J. Dempsey, superintendent of transportation of the New York Consolidated Railroad, Brooklyn Rapid Transit System, and president of the New York Electric Railway Association, has been elected a director of the company.

Mr. Charles W. Hazelton has been elected president of the Connecticut Valley Street Railway, Greenfield, Mass., to succeed Gen. F. E. Pierce, resigned. Mr. Hazelton is a director of the Turners Falls Power Company and the Crocker National Bank, Turners Falls, and is at the head of a manufacturing business in Montague City.

Mr. J. E. Aldred, chairman of the boards of Consolidated Gas, Electric Light & Power Company and Pennsylvania Water & Power Company, has been elected a member of the executive committee of the United Railways & Electric Company, Baltimore, Md., to succeed Mr. H. Crawford Black, who recently resigned as a director of the company.

Mr. Ralph M. Henderson, until recently manager of the Albuquerque (N. M.) Traction Company, has assumed the position of general manager for the New Mexican Company, succeeding Mr. R. P. March. Previous to his recent position in Albuquerque Mr. Henderson was for years connected with newspapers in Albuquerque, El Paso and other cities in the Southwest.

Mr. Allan F. Edwards, vice-president in charge of purchases of the Detroit (Mich.) United Railway, to which position he was appointed in 1913 by the management, was formally elected vice-president of the company by the board of directors at the recent annual meeting. His duties as treasurer and head of the purchasing department have not been changed, but his title now is vice-president and treasurer. A portrait and a biography of Mr. Edwards were published in the *ELECTRIC RAILWAY JOURNAL* of Oct. 25, 1913.

Gen. F. E. Pierce has resigned as president of the Connecticut Valley Street Railway, Greenfield, Mass. General Pierce has long been prominent in public life. He was connected with the First National Bank, Greenfield, for eleven years, and was postmaster of Greenfield for twenty years. He had been president of the Connecticut Valley Street Railway since its organization. He served in the Massa-

chusetts Militia for more than twenty-five years, retiring about two years ago with the rank of Major-General. During the Spanish-American War he commanded Company L, of the Second Regiment, and participated in the battles of El Caney, San Juan and Santiago de Cuba.

Mr. Travis H. Whitney, secretary of the Public Service Commission for the First District of New York and just appointed by Governor Whitman to be a member of the commission, was tendered a complimentary luncheon on Feb. 3. Fourteen of a party sat down at table, and Chairman Oscar S. Straus attended. The toastmaster was Mr. George S. Coleman, counsel of the commission. Chairman Straus made a short address, in which he spoke most highly of Mr. Whitney's ability and character, and said he was glad to welcome him to the commissionership. Mr. Whitney was addressed by each of the guests in turn, all of whom have been closely associated with him in his work. At the close he expressed his appreciation in a few words.

Mr. A. J. Bemis, Chicago, will hereafter make his headquarters in St. Cloud, in charge of the A. G. Whitney interests, as general manager of the St. Cloud Public Service Company, the Union Power Company and the Light & Power Company of St. Cloud, Minn. The St. Cloud Public Service Company embraces the electric, gas and street railway enterprises in St. Cloud, Sauk Rapids and Waite Park. The other two companies operate in about twenty other towns, including Brainerd, Annandale, Paynesville, Cokato, Maple Lake, Dassel, Howard Lake, Eden Valley, Watkins, Kimball, Waverly, Rockville, St. Joseph, Richmond and Cold Springs. Additions to the hydroelectric plant of the company are contemplated, which may mean the construction of an additional power house on the Mississippi River. Mr. Bemis will retain his connection with the Vicksburg Light & Traction Company at Vicksburg, Miss., and the Mineral Point (Wis.) Public Service Company, and will continue to act as consulting engineer with the various banking interests with which he has been associated.

Mr. Philip J. Kealy, who has been serving as the company's representative on the board of control provided for by the new franchise granted to the Metropolitan Street Railway, Kansas City, Mo., has been elected president of the successor company, the Kansas City Railways, to succeed Mr. John M. Egan, who assumed the presidency of the company in 1910 with the understanding that he should be permitted to retire upon the completion of the rehabilitation. Mr. Kealy was born in Bloomington, Ill., on July 2, 1884. He was educated at the Lewis Institute and the University of Illinois, and was then engaged by the Board of Supervising Engineers, Chicago Traction, and in the capacity of field engineer made the survey for most of the crossings on the north and west sides of the city. From 1907 to 1914 he was in the service of Mr. Bion J. Arnold and took part in much of the important valuation work undertaken by Mr. Arnold, including the valuation of the property of the Chicago Consolidated Traction Company, and had a prominent part in the preparation of the Chicago traction report. He was assistant in charge of the valuation of the Seattle (Wash.) Electric Company, the International Traction Company, Buffalo, N. Y., the Chicago Suburban Railway, the Chicago (Ill.) Suburban Railway, the Toronto (Ont.) Railway, the Chicago Telephone Company, and the Metropolitan Street Railway, Kansas City. In 1912 he prepared in connection with the reorganization of the International Traction Company, Buffalo, N. Y., an analysis of the company's capital expenditures for the previous eleven years which was approved in toto by the Public Service Commission for the Second District of New York. His work as Mr. Arnold's assistant in the valuation of the property of the Metropolitan Street Railway, Kansas City, began in 1912 and upon its completion he was retained as engineering adviser to the receivers in the franchise negotiations that followed, being with Mr. L. R. Ash, city engineer of Kansas City, author of the Kealy-Ash plan of settlement. He was subsequently named as the company's representative on the board of control provided for in the new grant. The Metropolitan Street Railway operates 263 miles of line in Kansas City, Mo., and in Kansas City, Kan., and Mr. Kealy is the youngest president of

so extensive a property in the United States. It is announced that in addition to president of the company he will continue as its representative on the board of control. A portrait of Mr. Kealy was published in the *ELECTRIC RAILWAY JOURNAL* of Feb. 5, page 267, in connection with the address "What Constitutes Utility Values?" made at the mid-year meeting of the American Electric Railway Association in Chicago on Feb. 4.

Mr. William S. Twining has been appointed director of the department of city transit of Philadelphia, Pa., by Mayor Smith of that city to succeed Mr. A. Merritt Taylor,



Photo by Gilbert & Bacon
W. S. TWINING

resigned. Since 1910, when he resigned as chief engineer of the Philadelphia Rapid Transit Company, Mr. Twining has been connected with Ford, Bacon & Davis, New York City, on important work on heavy electric traction and power development in the neighborhood of large cities, and for more than two and one-half years he has been, through his connection with Ford, Bacon & Davis, consulting engineer to the department of city transit of Philadelphia. Mr. Twining was chief engineer of the Philadelphia Rapid Transit Company and of its predecessor, the Union Traction Company of Philadelphia, from the time of the organization of the latter company in 1895 until 1910, and is one of the best-known electrical and mechanical engineers in this country. It was under his direction and supervision that the Market Street subway and the elevated railway in Philadelphia were built. Mr. Twining was born on Feb. 20, 1865, and was graduated from Allegheny College with the degree of C. E. in 1887. He acted as instructor in physics and engineering in Allegheny College for three years following his graduation and then entered the employ of the railway engineering department of the Thomson-Houston Company, Boston, Mass., for which he had charge of electric railway construction in Indianapolis and Toledo. In the latter part of 1891 he assisted in equipping the Harlem Bridge, Morrisania & Fordham Railway, now a part of the Union Railway, New York City, with electricity, and in the following year was one of the engineers in charge of the electrical equipment of the Atlantic Avenue Railway, now a part of the Brooklyn (N. Y.) Rapid Transit System. In 1893 he was appointed assistant to the chief engineer of the People's Traction Company, Philadelphia, and while connected with that road was largely responsible for the design of the Delaware Avenue power station. Mr. Twining is a member of the American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers, Franklin Institute of Philadelphia and the American Electric Railway Association. Mayor Smith in commenting on the appointment said: "Mr. Twining has been engaged with Mr. Taylor in the present transit plans, and virtually is a part of the department of city transit. Mr. Taylor was among those who recommended Mr. Twining. I consider him the ablest man I could get for the place. So far as his politics is concerned, I do not know whether he is Republican, Democrat or mugwump."

OBITUARY

G. G. Sutherland, vice-president of the Arkansas Northwestern Railroad, is dead.

E. D. Martinez, electrical engineer of the Memphis (Tenn.) Street Railway, is dead.

Howard A. Foushee, vice-president and counsel and one of the organizers of the Durham (N. C.) Traction Company, operated by Henry L. Doherty & Company, died at his home in that city on Jan. 31. Mr. Foushee was born in Roxboro, N. C., forty-seven years ago, but has been a resident of Durham for twenty-three years. He was a well-known lawyer and for several years was a judge of the district bench.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

Citizens Railway Company, Clarksville, Tenn.—Incorporated in Tennessee to take over the Clarksville & Dunbar Cave Railway. Capital stock, \$5,000. Incorporators: M. L. Cross, W. E. Beach, W. A. Chambers, John J. Conroy and C. W. Bailey.

FRANCHISES

Martinez, Cal.—The Martinez & Concord Interurban Railway has asked the Council for a franchise to construct a line in Martinez in connection with its proposed line from Martinez to Concord. Bids for the franchise will be received by the Town Clerk until March 6. [Jan. 15, '16.]

***Atlanta, Ga.**—The Federal Construction Company, Atlanta, will ask the Council for a franchise to build a line beginning on Williams Street at the city limits to Merritts Avenue, on Merritts Avenue to Orme Street, on Orme Street to West Cain Street, on West Cain Street to Bartow Street, on Bartow Street to Nassau Street, on Nassau Street to Spring Street and on Spring Street to either Walton or Marietta Streets, Atlanta. The company proposes to build a line from Atlanta to Creighton, via Roswell, Alpharetta and Cumming, 50 miles. It is the purpose of the Federal Construction Company to assign and transfer its franchise to the Atlanta & North Georgia Railroad, which was chartered two years ago, and which is now being organized.

Brooklyn, N. Y.—Mayor Mitchel has approved the franchises requested by the Brooklyn Rapid Transit Company for its proposed Metropolitan Avenue line, the Fresh Pond Road extension and the Eighth Avenue line. The franchise for the Atlantic Avenue line has not as yet been approved.

Buffalo, N. Y.—Attorneys Adolph Rebadow and Carleton E. Ladd have asked the Public Service Commission for the Second District of New York for its approval of the transfer of the franchises owned by the defunct Buffalo & Susquehanna Railroad to the Wellsville & Buffalo Railroad. The attorneys represent C. A. Finnegan, who purchased the Buffalo & Susquehanna Railroad. [Dec. 18, '15.]

Little Falls, N. Y.—The Little Falls & Johnstown Electric Railway has asked the Legislature for a five-year extension of time on its franchise to construct its proposed line from Little Falls to Johnstown.

New York City.—The Hudson & Manhattan Railroad has asked the Public Service Commission for the First District of New York for permission to abandon that part of its franchise which calls upon it to construct a spur from its main tracks to connect with the Interborough subway at Ninth Street. The company has also asked for an extension of two years on its franchise to extend its line from Thirty-sixth Street up Sixth Avenue and under Forty-second Street to the Grand Central Station.

***San Angelo, Tex.**—It is reported that the Interstate Electric Company of New York has asked the Council for a franchise to construct a line in San Angelo, and that such a franchise will soon be submitted to the voters. E. A. Fitkin, president.

TRACK AND ROADWAY

Birmingham Railway, Light & Power Company, Birmingham, Ala.—A tentative proposition has been made to the city of Birmingham by J. S. Pevear, president of the Birmingham Railway, Light & Power Company, to construct a line from Birmingham to Warrior River, about 20 miles. Such a line is being advocated by M. W. Brush, president of the Chamber of Commerce, and others. It is estimated that the line would cost about \$300,000.

Pacific Electric Railway, Los Angeles, Cal.—Recent flood waters near Newport washed out over 1000 ft. of track of the Southern Pacific Company and the Pacific Electric Railway. The damage is estimated at from \$15,000 to \$20,000. A railroad bridge was also washed out, the loss being from \$10,000 to \$20,000.

***San Francisco, Cal.**—A suggestion that the city consider a plan for an electric line to the Union Iron Works and the Hunters Point district has been made to the engineering department by Alexander Russell and J. M. Kepner, representing the Chamber of Commerce.

Capital Traction Company, Washington, D. C.—With a view to establishing a more flexible service over its Pennsylvania Avenue and Fourteenth Street lines the Capital Traction Company has applied to the Public Utilities Commission for authority to construct a terminal loop around G. A. R. statue, at the intersection of Seventh Street, Louisiana Avenue and C Street Northwest. Certain cars moving east over Pennsylvania Avenue would use this point as a terminal, and the arrangement, it is stated, probably could be utilized for speeding up the headway during rush hours if necessary.

Jacksonville (Fla.) Traction Company.—A committee of three has been appointed by the Board of County Commissioners to co-operate with the City Commissioners relative to the construction of an extension by the Jacksonville Traction Company of its line from the present terminus at Ortega to the camp grounds at Black Point.

Macon & Birmingham Railway, Macon, Ga.—Double daily electric passenger train service between Macon and Lagrange has been inaugurated by this company, trains departing from and arriving at the Macon Union Station.

Lewiston-Clarkston Transit Company, Lewiston, Idaho.—Officials of this company have announced that the construction of the East Lewiston extension will be begun about Feb. 15. The company plans to extend the line to Delsol Park and the Fair Grounds, and, if possible, service to the park will be provided before summer. It is stated that arrangements are being made for new cars to be used on the extension as soon as it is built.

Tri-City Railway Company, Moline, Ill.—The Greater Moline committee will ask this company to build a line from Fourth Street, Moline, Ill., across the proposed Fifteenth Street bridge to the Rock Island arsenal.

Wichita Railroad & Light Company, Wichita, Kan.—This company has agreed to double track its line from the Douglas Avenue bridge west to Seneca Street and pave the tracks.

Cumberland & Manchester Railroad, Barbourville, Ky.—It is reported that this company, which is constructing a line between Barbourville and Manchester, may extend the line to Beattyville. M. E. S. Posey, Barbourville, chief engineer. [Dec. 25, '15.]

Idlewyde Park Railway, Baltimore, Md.—About two-thirds of this company's line from York Road to Idlewyde Park has been completed and it is expected that operation will be begun by March 1. [Sept. 18, '15.]

St. Paul Southern Electric Railway, St. Paul, Minn.—This company will soon issue \$1,200,000 in bonds to finance the construction of an extension to Rochester.

Kansas City & Tiffany Springs Railway, Kansas City, Mo.—A hearing has been set by the Public Utilities Commission of Missouri on the application of the Kansas City & Tiffany Springs Railway, which is planning to build northward from Kansas City. It is likely that the matter of authority to purchase a small piece of track of the Quincy, Omaha & Kansas City Railway, between Gower and Trimble, may be taken up, although no definite negotiations for such purchase are in progress. If this piece is bought, it is said that the company may use it as part of an electric road to continue northward to Albany, and perhaps later to the Iowa line, through a very rich farming district. These plans do not involve entering St. Joseph.

Missouri & Kansas Interurban Railway, Kansas City, Mo.—Plans are being perfected by this company for the construction of a line from Olathe to Ottawa, 26 miles. The proposed extension has been under advisement for the past two years.

United Railways, St. Louis, Mo.—A trolley line, connecting with the Laclede Avenue line of this company at Laclede Avenue and Kings Highway and carrying passengers to and from the art museum, bird cage, the lakes and lagoons and the baseball, tennis and golf grounds in Forest Park is one of several proposed park lines for which plans and specifications are being prepared by President Kinsey of the Board of Public Service. The estimated cost of the line is \$229,000. Mr. Kinsey is preparing a report giving the estimated cost of each of the proposed lines which he expects to submit to a committee appointed by Mayor Kiel within the next two weeks. It is stated that the United Railways is willing to construct the proposed line and operate cars without charging an extra fare. A transfer would be given passengers from the Laclede Avenue line.

Public Service Railway, Newark, N. J.—It is reported that this company plans to build an extension of its line to Port Newark Terminal. The company has been considering two routes, one an extension of the tracks in South Street and the other a line from the Lincoln Highway to Avenue R.

International Railway, Buffalo, N. Y.—This company has purchased the ground in the Payne hill in North Tonawanda and will use the earth to construct the fill for the new four-track trolley line to be built between Buffalo and Niagara Falls. It is estimated the company will get 395,000 cu. yd. of gravel and earth from the cut. The company has also entered into an agreement with the State authorities for permission to use all the dirt taken from the Erie barge canal enlargement through Tonawanda and North Tonawanda.

Long Island Railroad, New York City.—The Public Service Commission for the First District of New York has ordered the elimination of eight dangerous grade crossings on the Far Rockaway branch of this company's line. It is estimated that the cost of the improvements will be about \$1,150,000, of which one-half will be paid by the company and one-quarter each by the State and city.

***Canton, Ohio.**—Business men of Osnaburg and residents on the road between Canton and Osnaburg are contemplating organizing and incorporating for the purpose of securing franchises and eventually operating either a trackless trolley system or an electric interurban line between the two cities.

Lake Erie & Northern Railway, Brantford, Ont.—Operation has been begun by this company between Galt and Brantford. The line connects with the Canadian Pacific Railway main line at Galt. Work will be continued on the overhead equipment from Brantford to Port Dover. The track has been completed and it is expected trains will be operating by spring.

Philadelphia, Pa.—The contract for the construction of foundations for the elevated railway on Frankford Avenue from Unity to Dyre Streets has been awarded by the department of city transit to Edwin H. Vare, Philadelphia, at \$23,870. The contract for the steel superstructure and appurtenant work on Frankford Avenue from Unity to Dyre Streets has been awarded to the American Bridge Company, Philadelphia, at \$257,475. Awards on these contracts have been delayed awaiting approval of plans by the Public Service Commission of Pennsylvania. Bids for this work were opened Dec. 7 and Dec. 14, respectively.

Schuylkill Electric Railway, Pottsville, Pa.—The work on this company's line between Pottsville and Frackville is progressing rapidly. At St. Clair a subway is being constructed for the new road where it will pass under the Reading Railway. Track has been laid from Frackville to New Castle.

Houston, Richmond & Western Traction Company, Houston, Tex.—Construction will be begun on Feb. 20 between San Antonio and Seguin, the first section of this company's proposed line from San Antonio to Houston. Electric power for operating the line will be developed by hydroelectric plants to be constructed on the Guadalupe River. E. Kennedy, president. [Jan. 15, '16.]

Laredo Electric & Railway Company, Laredo, Tex.—Work has been begun by this company relocating its track in Laredo. The track will penetrate the business section of the city hereafter instead of passing down side streets.

Petersburg & Appomattox Railway, Petersburg, Va.—Operation has been begun on this company's line from Petersburg to Hopewell, 10¼ miles. T. M. Wortham, Richmond, president. [Nov. 13, '15.]

Radford-Willis-Southern Railway, Radford, Va.—At a recent meeting of the stockholders of this company, held in Radford, the directors were instructed to have the charter of the road amended to allow the extension of the line from Willis to Mount Airy, N. C. The road, with the addition, will extend from Radford through Montgomery, Pulaski, Floyd, Carroll and Patrick Counties, Va., and Surry County, N. C., to Mount Airy. No definite plans have been made as yet for the building of the extension, and no right-of-way has been secured. If the extension is built the line will have a total length of about 75 miles. Three miles of the road have been graded near Snowville. Williams Brothers, Roanoke, are the contractors for the first section of the road. At the same meeting the stockholders authorized the issue of \$300,000 in bonds to complete the first section of the line. No provision has been made for the extension. John L. Vaughan, Shawsville, president. [Aug. 21, '15.]

Green Bay & Eastern Railway, Manitowoc, Wis.—The engineering contract for this company's proposed line from Green Bay to Sheboygan via Manitowoc has been awarded to the Western Engineering & Construction Company of Milwaukee. [Jan. 15, '16.]

Sheboygan Railway & Electric Company, Sheboygan, Wis.—Plans are being considered by this company for the construction of an extension of its line from Elkhart through Kiel and New Holstein to Chilton, 19 miles.

SHOPS AND BUILDINGS

Louisville (Ky.) Railway.—The company has put a large piece of property at Seventeenth and Walnut Streets, formerly the company's shops, on the market. There are several brick buildings and half of the block is covered.

POWER HOUSES AND SUBSTATIONS

Interborough Rapid Transit Company, New York City.—The Public Service Commission for the First District of New York has requested the Interborough Rapid Transit Company to make provision for supplying electric current to the New York Municipal Railway Corporation for the operation of its lines under the dual system contracts. These contracts allow the New York Municipal Corporation to purchase power for ten years after the new system is placed in operation. The Interborough Rapid Transit Company will have power-house capacity to produce much more current than it will need for the operation of its own system, and the commission therefore suggests that it will be a saving both to the companies and to the city if it should allow the New York Municipal Railway Corporation to purchase the needed power. In this connection the New York Municipal Railway Corporation recently submitted a proposal to the commission to purchase power from the Transit Development Company at a flat rate of 1 cent per kilowatt-hour. The commission disapproved this proposal on the ground that the flat rate was too high. No reply has been received up to the present time from the Interborough Company.

Columbus Railway, Power & Light Company, Columbus, Ohio.—This company has purchased a 6500-kw. turbo-generator of the Curtis type which will generate at 4150 volts and will be installed in the Columbus power station. The company will also build a new power line to South Columbus which will cost approximately \$70,000. This will be a three-phase, part underground and part overhead, 13,300-volt line, designed for a 5000-kw. load capacity. A new railway substation is also being constructed in West Columbus which will contain a 500-kw. rotary converter, and is designed to serve also as a switching station for the power and light service. When this new substation is put in service an old steam station will be shut down and dismantled.

Lehigh Valley Transit Company, Allentown, Pa.—A contract has been placed by this company with the Westinghouse Electric & Manufacturing Company for one 10,000-kw., three-phase, 60-cycle, 13,200-volt steam turbine to be installed in its Front Street generating station.

Manufactures and Supplies

ROLLING STOCK

Albany Southern Railroad, Rensselaer, N. Y., has ordered two express cars.

Johnstown (Pa.) Passenger Railway will order shortly ten new double-track cars.

Virginia Railway & Power Company, Richmond, Va., has ordered four cars from the Southern Car Company.

Piedmont Railway & Electric Company, Burlington, N. C., has ordered two cars from the Southern Car Company.

Corning & Painted Post Railway, Corning, N. Y., has ordered four cars from the Southern Car Company.

Consolidated Street Railway, Cottonwood Falls, Kan., expects to purchase a gasoline or electric car during 1916.

New York State Railways (Syracuse Lines), Syracuse, N. Y., are considering the purchase of fifteen or twenty-five new steel cars.

Cumberland & Westernport Electric Railway, Cumberland, Md., is reported as expecting to purchase three interurban cars.

Manhattan & Queens Traction Corporation, New York City, noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 15, 1915, as expecting to purchase additional cars, has ordered through H. L. Doherty & Company, New York, seven cars from the Cincinnati Car Company. The order was placed with the W. R. Kerschner Company, Eastern sales agent for the carbuilder.

TRADE NOTES

Edmund F. Saxton has opened offices to conduct a general consulting engineering practice at the Pennsylvania Building, Philadelphia, Pa.

H. K. Porter, Southern sales agent for the U. S. Metal & Manufacturing Company, Hurt Building, Atlanta, Ga., has resigned to accept a position with the Hyatt Roller Bearing Company, Newark, N. J.

H. S. Norris, special sales agent for the U. S. Metal & Manufacturing Company, New York City, has resigned from that position, effective Feb. 15, to become manager of railway sales for the C. A. Willey Company, railway paint specialties, Long Island City, N. Y.

Midvale Steel & Ordnance Company, Philadelphia, Pa., has made an agreement to purchase the entire capital stock of the Cambria Steel Company for a cash price of \$81 a share. Par value of the stock is \$50 a share. As the Cambria company has 900,000 shares outstanding, the purchase will involve \$72,900,000 in cash.

Trussed Concrete Steel Company, Detroit, Mich., on Jan. 25-28 held the first annual convention of its branch managers at the main plant at Youngstown, Ohio. Representatives gathered from every section of the country and also from far distant countries, including Japan, Hawaii, South America and Porto Rico, to co-operate in forming improved methods which would render greater service to the clients of the company. The general program of the convention included business questions every morning and afternoon. The opening address of Julius Kahn, president, was followed by a number of other addresses.

ADVERTISING LITERATURE

General Electric Company, Schenectady, N. Y., has issued bulletins listing its types of wires and cords.

Brown Hoisting Machinery Company, Cleveland, Ohio, has issued catalog D, 1916, which describes and illustrates its overhead tramrail systems, trolleys and electric hoists. The Brownhoist monorail man-trolley is used for transporting various kinds of materials from and to cars, boats, storage yards and buildings, and the different floors of the buildings. It may be adapted for transporting coal and ashes in power houses. The trolley travels on the lower flange of an I-beam track and is operated by one man who rides in the trolley cab. The trolley is enabled to reach the different

points in the yards and buildings by the use of switches, turntables and transfer cranes in connection with the I-beam tracks. It can be equipped with grab bucket or with one, two or four hooks.

SEATTLE MAYOR ON MUNICIPAL OWNERSHIP

H. C. Gill, Mayor of Seattle, Wash., in his annual message to the City Council recommended the adoption by the Council of some plan for the extension or abandonment of municipal operation of street cars and the submission of the plan to the voters at the general election in November. Mayor Gill said:

"The situation with reference to the city's car lines remains practically unchanged from that of a year ago, except that the City Council has dismissed the matter of the purchase of the Seattle, Renton & Southern Railway. This makes Division 'A,' if possible, a little more of an outcast and orphan than it was then. Possible sale of the Seattle, Renton & Southern Railway will place us in a position where this line can be utilized as was originally contemplated. By next October the bridges across the Lake Washington Government Canal will be completed and the question of extending Division 'A' into Ballard will come before you. We cannot afford, merely as a matter of pride, to operate Division 'A' at a large loss daily to the taxpayers any longer than is necessary to a final solution of the whole question. I have only to suggest that if the plan of extending this line to Ballard is finally submitted it must also be extended either by common user or otherwise to the south.

"A plan by which patrons of the Ballard line would be dumped at Stewart Street, the downtown terminus of Division 'A,' would be unfair and unworkable. Division 'C' bids fair in time to be a profitable suburban line, although, in my opinion, all street car transportation is about to give way to some sort of automobile, and this should cause the most serious reflection on any proposed large expenditure of money. Having in view that uncertainty, and the financial risks involved, I believe that when it comes you should find some solution of the whole matter and submit it to the people for a vote, at the time of the State elections next fall."

NO INTERFERENCE IN PITTSBURGH SUBWAY MATTER BY COMMISSION

The Public Service Commission of Pennsylvania has dismissed the request of the Pittsburgh (Pa.) Subway Company that it suggest a form of ordinance for passage in the City Council, which would enable the company to construct a subway in Pittsburgh. The opinion dismissing the petition was prepared by Chairman Ainey and was concurred in by the other members of the commission. It is in part as follows:

"The city of Pittsburgh and the Pittsburgh Subway Company are not in accord on this project. No agreement has been reached, either actually or tentatively, and confessedly the purpose of this application is to persuade the municipality into making an agreement with the petitioner.

"This undertaking when realized will burden for many years the future of the city of Pittsburgh and the responsibility of seeing that the project is financially balanced and that the plans are adequate to secure the desired relief, rest very properly upon the city authorities and we are not disposed in this proceeding to interfere with or assume that responsibility.

"For this commission to approve the form contract submitted by petitioner would mean to approve a mere husk. For us to attempt to supply the real meat would be to act without sufficient evidence and without the consent of essential parties.

"It is evident that the Legislature had in mind a case where there was a proposed 'contract or agreement' concerning which the municipality and public service company were in substantial accord. To relieve them of the uncertainty as to whether the commission would approve 'such contract or agreement' the public service company might, in advance of the formal passage of the ordinance covering such agreement, apply to this commission to ascertain if the terms were acceptable and what, if any, conditions would be imposed."