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REGULATION VERSUS MANAGEMENT

The exact dividing line between the regulation of public utilities and the management of such enterprises seems to be difficult of location, and in most cases of doubt the tendency has been to broaden rather than narrow the regulatory field. One commission, however, has set forth in no uncertain terms its conception of its duties and limitations in one phase of regulation—the control over security issues. Pending the settlement of the Bay State Street Railway fare case before the Massachusetts Public Service Commission, opponents of the company have been attacking on various grounds a petition to issue about \$1,500,000 of new preferred stock and bonds for necessary purposes. As noted elsewhere in this issue, however, the commission has refused to interfere with the legitimate financing of the company, and in particular it holds that it has no authority to refuse approval to a new security issue because better terms might be secured later or to a combined issue of both stock and bonds, if in the opinion of the management that plan offered a wider investment field. The board can well check up the reasonableness of the expenditures to be capitalized, and naturally in rate and service cases it feels that it must prevent the public from being injured by any financial mismanagement at the expense of the stockholders, but in general the exact methods of financing to be followed in particular instances are a matter upon which the management should decide. We wish that more commissions showed as clear an understanding of the scope of their work.

JUDGING SIGNALS BY RESULTS

Recently there has come to our attention a bit of the history of the signaling of a short but busy line which serves as a rather striking example of an unfortunate characteristic of railway operation. In this case the signals, after the usual initial period of adjustment and elimination of minor troubles, began to operate on a basis of 100 per cent perfection. In fact, they went for four consecutive months without a single interruption. The management, conceiving the brilliant idea that the absence of failures indicated a corresponding absence of need for repair work, laid off the signal maintainer, and within a few months a complete break-down of the signals necessitated calling the manufacturers to the rescue. Just why such superficial thinking should be done by railway officials is not easily understood, but it is by no means uncommon, and the evil results appear in every branch of operation. The signal department may, perhaps, be most suscept-

ible to it, with the result that signal maintainers are not infrequently anxious to avoid clean records for the signals in their districts. It may not be that they fear actually being laid off when things run too smoothly, but it is apparently a common understanding among signal repair men that the avoidance of trouble means the imposition of additional work to keep them busy beyond any possibility of doubt. This viewpoint may not be creditable to the signaling fraternity, but its existence is still less creditable to the managements whose lack of common sense permits them to judge employees otherwise than by results.

INDUSTRIAL MOBILIZATION PROGRAM

The program for organizing the nation's industries so that they may be made promptly available for supplying munitions in case of war, as outlined in detail at the recent New Orleans meeting of the American Society of Mechanical Engineers, and mentioned also in a communication this week, is primarily intended for the manufacturer rather than for the electric railway company. At the same time, we believe that the repair shops of at least the larger companies, with their machine shops and wood mills, could easily be converted into manufacturing units of no insignificant value. This fact should not be overlooked by the new engineering board. Experience in the present conflict abroad has shown that the demands in the way of supplies are of infinite variety. While guns and ammunition may still form the bulk of the material that must be furnished to an army in the field, there is just as vital a need for other articles of a less directly warlike character. These latter range from the most complicated gasoline-engine parts to the simplest kind of dinky cars and even wooden cases for holding projectiles. It is the latter class of miscellaneous supplies that the larger electric railway shops might well undertake to furnish. Without either the organization or an extended equipment of automatic machines necessary for efficient routine production, few repair shops could turn out such material as fuses or shells in quantities that would warrant the undertaking. Yet for the supply of miscellaneous munitions a number of the electric railways can lend a hand in the general movement toward affording the country at least a chance of protecting itself, and their shop equipments should be listed on the data blanks to be sent out in connection with the industrial mobilization plan, even though the use to which the machinery may finally be put is not immediately apparent. This, of course, is in addition to the transportation service which they can render in the

mobilization of troops, a subject which we suggested last November and which has since been taken up by the General Staff.

CAN RAILWAY VOLTAGES BE STANDARDIZED?

High-voltage d.c. railway practice was the subject of discussion at the A. I. E. E. meeting in New York last week, and a number of the men who have had much to do with its development expressed themselves frankly concerning it. This subject is of vital interest to executives as well as to equipment men, as, on the one hand, the technical advances in the business open up new fields for electrical transportation, while, on the other hand, each advance renders some equipment obsolescent.

At the meeting referred to one speaker advocated the selection of a definite voltage as standard for inter-urban and heavy traction, not arbitrarily, exactly, but on the basis of present tendencies. His idea was that 5000 volts seems to be the limit which is being approached by the process of natural selection. Another speaker deprecated this plan as being contrary to the method by which effective standards are produced. In view of the existence of these two points of view, and of the savings undoubtedly to be secured by standardization, the query which heads this article is worthy of careful consideration.

Two things may be taken for granted as a basis for argument, namely, that standard apparatus is cheaper in first cost and maintenance, and that standards somewhat hamper progress. If we could unerringly determine where unhampered progress would lead, and could select standards accordingly, the ideal conditions would obtain. Obviously with our limited prescience this is impossible. Taking conditions as they are, what is the safest, most economical and wisest course in view of the unsettled condition of long-distance traction? Is it not to standardize first those elements which seem most nearly to have reached stability? In view of the difficulties found by the standards committee of our own association in spreading the use of standards in physical equipment, which is in a sense uniform for all lines, one can understand the enormously greater difficulty of standardizing voltage or system because from an engineering standpoint economic conditions would dictate the use of various voltages and different systems to suit different conditions.

For city work 600 volts can almost be considered standard, so that voltages of 500 or 700 seem abnormal. A combination of conditions of motor design, overhead mechanical construction, transmission economy, accident and fire hazard, etc., has brought this about. So firmly established has this standard become that it has naturally been selected as a unit for determining the higher voltages, 1200, 2400 and 3000. In this connection the analagous situation with regard to the incandescent lamp comes to mind. The carbon lamp began commercially around 50 volts, but soon 80, 100 to 110, and 200 to 220 were tried. Combined manufacturing and operating requirements finally established 110 volts as the practical standard, so much so that voltages of 110, 220 and 440 came logically for motors, and even

6600 and 11,000 are familiar in power work where lighting is incidental. The city car motor and the incandescent lamp occupy corresponding places in their respective fields to-day.

To return again to the starting point, there are compelling reasons for the upward tendency in railway voltage, all having to do with power-distribution economy. Opposing these are considerations of increased costs of equipment and maintenance elsewhere than in those elements affected favorably by reduction in current. These opposing forces are by no means in stable equilibrium at present. Why is not the proper plan that by which the American Electric Railway Engineering Association approaches the subject of standards? This association makes a distinction between standards and recommended practices. The former is the higher grade. A recommended design or method is one which represents good present practice, but which, because of the formative state of the art and the likelihood of changes, does not admit of adoption as a standard. It seems to us that among the higher d.c. voltages both 2400 and 3000 might be accepted as recommended, until perhaps one of these should prove so superior to the other as to be selected as a standard. Five thousand volts logically would be another higher step, but it can yet hardly be considered even a recommended voltage in view of the limited experience with it.

ECONOMY OF REDUCED INTERCHANGE TIME

In an article published on another page of this issue, D. D. Ewing seems to have established with reasonable definiteness that, for the cars in any given city, the arrangement of entrance and exit facilities is a major factor in the time spent at each stop by boarding and alighting passengers. There is thus raised the point that there may be cases wherein the expenditures necessary for rebuilding old cars so as to provide the best entrance and exit facilities may bring returns that are ample warrant for the investment.

Mr. Ewing's investigation leads to the conclusion that a three-second interchange time may be reduced through improved facilities by about three-fourths of a second in the particular city to which the data apply, because a line that was favorably situated as regards activity of passengers showed one second saving per passenger, and one less favorably situated, about half of this, when improved facilities were provided. However, since records of interchange time as low as one and a half seconds per passenger have been published, it is permissible, for the sake of using round numbers, to assume that an even second may be saved by a change from the worst arrangement to the best. Then, if the average extent of the interchange is two and a half passengers per stop—a conservative estimate in the light of experience in a number of cities—the time saving would be two and a half seconds per stop, and with eight stops per mile, the total saving would become twenty seconds per mile.

Since a schedule averaging eight stops per mile would probably permit a speed of 9 m.p.h., whereby 1 mile would be covered in 400 seconds, the result of cutting

the passenger interchange time by one second, or saving twenty seconds per mile, would permit an increase of 5 per cent in schedule speed. In a small city this saving might not be noticeable, because, theoretically, there would have to be twenty or more cars on a line to permit the release of one car subsequent to an increase of 5 per cent in speed, and so many cars as this would hardly be found on a single line except in the larger communities. Expressed in another way, a line with a round-trip length of 9 miles would be covered in sixty minutes at 9 m.p.h., and 5 per cent saving would cut three minutes off the schedule for the round trip. Then if the headway was three minutes, one car could be taken off without changing the headway or reducing the number of seat miles that were furnished, but if the headway was more than three minutes no car could be taken off without either changing the headway or else permitting a gap to occur every sixty minutes, the seat-miles being reduced in either case.

However, in large cities normal conditions would frequently permit full advantage to be taken of increases in speed still smaller than this. Even in the smaller towns, occasional individual lines may be found where there is sufficient density of service to utilize faster schedules, and in any event, there is always the possibility of combining time savings from other sources with the one under consideration, thus making an aggregate reduction in schedule time sufficient to effect a direct improvement in operation.

Under such circumstances, if full advantage is taken of a 5 per cent increase in speed, there should be saved the equivalent of some 3.5 per cent of the operating expenses. If there is taken as a basis the average figures from the last electric railway census, where the annual operating expense is \$3,960 per car, the annual saving would thus become \$135. Such a return, capitalized at 20 per cent, would warrant an investment of \$685, generally more than enough to lengthen platforms and provide front exits, fare boxes, wide passageways and other features commonly considered essential to rapid handling of passengers.

THE NEW ROCHESTER CAR

Two features of the new car that has been built for Rochester, N. Y., as described on another page of this issue, stand out with particular prominence. First of these is the arrangement of facilities for fare collection, whereby the space between the entrance door and the conductor is reduced to the absolute minimum. The arrangement in the car now in operation provides room at the most for three passengers to board the car before payment of their fares, and the transportation department of the company seems to want even less space than this for future cars of the same type that may be built.

The theory on which the design is based is consistent enough, provided the people generally can be educated up to the point where they will invariably be ready to pay fare before entering a street car. The plan adopted also follows more or less the experience of some ten years ago, which showed that the abnormally large plat-

forms on prepayment cars were not altogether desirable, as these have been replaced in more recent designs by platforms of moderate size. In any case, the scheme, as applied to center-entrance cars, has the distinct advantage of providing additional seating space within the car and thus adds definitely to the revenue-producing ability of the unit of transportation.

The second radical feature found in the new design is the use of "low-floor" motors with maximum traction trucks, giving a total of only 70 rated horsepower for the car. The test figures that have been obtained seem to demonstrate with reasonable certainty that the small capacity motors are going to be sufficient, at least under the grade and traffic conditions that exist in Rochester, and it is to be hoped that the operating records will prove to be as satisfactory after a long period of service. Certainly, the experiment is of very distinct importance to the industry, not only because it will demonstrate whether or not the advantages of low floors may be combined with those accompanying two-motor equipments, but also because it will throw some light upon the question on which there has been considerable debate, regarding the necessity for over-motoring surface cars.

There is a third feature of novelty in the design which is at least of interest, although it may not be of great importance because of the limited possibility for general application. This consists in the location of the pony wheels in front of both of the maximum traction trucks. For single-end cars this is a thoroughly logical arrangement, and, as a matter of fact, it is somewhat surprising that advantage has not been taken before this of the opportunity thus provided to increase adhesion at starting. The principle is that, when the car is being accelerated, there is a tendency for both trucks to be tilted backward, throwing an increased proportion of the load upon the rear wheels of each truck. The phenomenon is common enough in the case of maximum traction trucks which have the driving wheels at the outer, or platform, side of each truck, because under such circumstances slipping invariably takes place at the front wheels, while the rear wheels almost always hold the rail.

For a double-end car, a symmetrical arrangement is necessary, and the best is that in which the driving wheels are placed at the inner side of each truck, so that the first and fourth pair of wheels for the car are idlers. Although this latter arrangement causes the rear truck to lose some of the weight on its driving wheels when it is tilted backward, it is also true that an increase of load is thrown upon the rear truck as a whole because of the tilting of the car body, and this tends to offset the effect of the tilted truck. This question is, of course, considered here only in regard to the effect of acceleration, but normally there are no other conditions that affect it, so that the principle is of general application with modern double-end cars. For single-end cars, however, the location of the drivers at the rear of each truck is obviously most advantageous, and this is the arrangement that has been adopted in the new Rochester design.

Low-Level Car for Rochester

A Single-End Car Equipped with Two Low-Floor Motors on Maximum-Traction Trucks Having 24-In. Driving Wheels Has Successfully Passed Through Extended Service Tests—The Weight Is 31,800 lb. and the Seating Capacity Sixty

SERVICE tests have recently been completed on a new car for the Rochester lines of the New York State Railways and the successful record of the equipment in the trials may well exert an appreciable influence upon future car design and equipment. The notable feature of the new car is the use of a 24-in. driving wheel for a maximum-traction truck, and the provision of only two "low-floor" motors as opposed to the four that have heretofore been considered necessary when this type of equipment, rating 30 hp. on 500 volts, has been used. The new arrangement provides the advantage of low maintenance cost inherent in a two-motor equipment, a point that has been raised effectively in the past against the use of the "low-floor" motor, and yet it permits the establishment of the low-level car floor so much desired at the present time. An incidental feature of importance in the new design is the installa-

a slightly raised section of the well floor on the exact center line of the car, having the fare box between him and the entering stream of passengers.

Contrary to the experience obtained in several other cities, this limitation of prepayment space has proved to be advantageous in Rochester. In fact, it is reported that tests have shown a minimum distance in front of the fare box to be more productive of rapid loading, when final results are considered, than a large loading space, the principle being that prospective passengers acquire the habit of having change ready before boarding, because they are hustled across the short loading space by other passengers wanting to board the car.

The arrangement has, incidentally, a distinct advantage in placing the conductor so near the door that a wide aisle is provided between him and the seats on the opposite side of the car. This permits movement of



ROCHESTER CAR—GENERAL VIEW OF CAR SHOWING ARRANGEMENT OF ENTRANCE AND EXITS DOORS

tion of the pony wheels at the front of each truck, the car being constructed for single-end operation, and it may be said that the designer has thus taken advantage of a much-neglected principle of inertia to improve adhesion at starting.

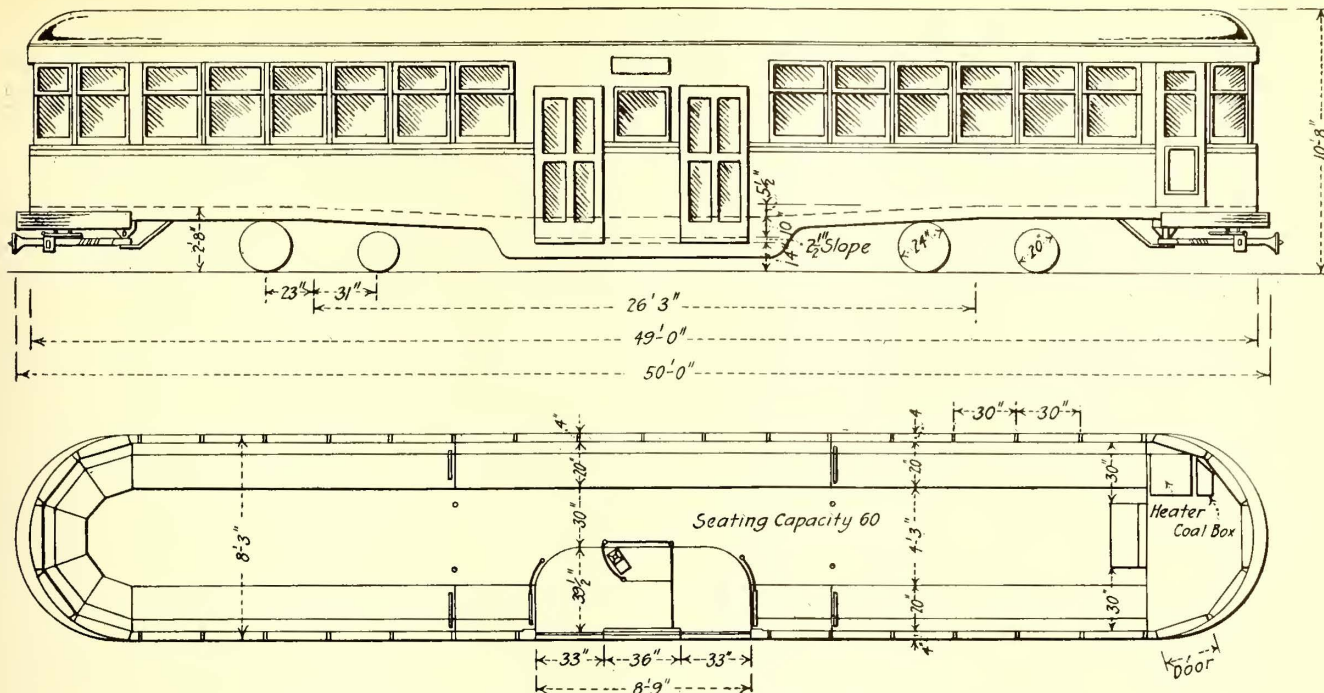
CAR-BODY CONSTRUCTION

Still another feature that is novel in the design is found in the entrance and exit facilities provided for the car body. A center-entrance arrangement has been adopted, the entrance and exit doors being individually operated by National Pneumatic Company's air-operated door engines and rather widely separated. The novelty consists in the extremely small prepayment space that has been provided for entering passengers, a distance of only about 3 ft. being provided between the door and the fare box. The fare box is located inside of a narrow well in front of the doors and the conductor stands on

passengers from the rear to the exit door without undue congestion as the conductor is passed. It has the advantage also of placing the conductor near to both doors, so that he can oversee their operation without difficulty.

The separation of the entering and exit doors by a panel 36 in. in width makes certain that the entering and leaving streams of passengers will be divided at all times. A front door has been provided in the motorman's vestibule, but this is used only by the motorman and not by the passengers, steps between the door sill and the street level having been omitted.

In the new car, also, advantage has been taken of the possibility of using ramps in the floor between the bolster centers and the doorways, and a drop of 5½ in. in this distance has been introduced in the main car floor. A ramp has been introduced also in the floor of the small loading well, a drop of 2½ in. existing between the inner edge of this space and the door sills.



ROCHESTER CAR—PLAN AND ELEVATION SHOWING GENERAL ARRANGEMENT

In consequence, the step heights are conveniently low. The rise from the rail to the door sill is 14 in. and that from the entrance well to the main car floor is 10 in.

Longitudinal seats have been installed throughout, and these are level, being set in tiers to make up for the effect of the ramps in the main floor. At the end of car the seat level is 17 in. above that of the floor, and over the central portion of the car the seat has been lowered 4 1/2 in., making the height 18 in.

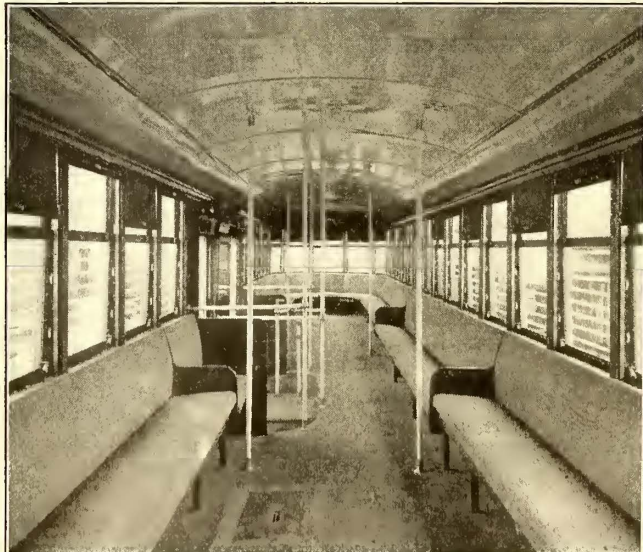
The car is somewhat longer than customary for city service, the over-all length being 50 ft. and the truck centers 26 ft. 3 in. The width is limited to 8 ft. 3 in. by the clearances in the city. Longitudinal seats have been used throughout, but notwithstanding this the high-seating capacity of sixty has been attained. The car is without bulkheads, and at the front end the motorman is separated from the rest of the car by horizontal railing and a cross-seat that serves two passengers, no one being allowed to ride in the motorman's section. In this section there is a Peter Smith heater and a coal box in addition to the controller and brake equipment.

The body is constructed with steel sheathing below the belt rail, but wooden posts, roof and letterboard are used. All carlines also are made of wood, but each alternate one has been reinforced with steel. The roof is of the plain-arch type, and headlining has been installed on account of cold weather that is experienced during winters in Rochester. The floor is built up of two 1/2-in. layers of wood with felt in between them.

The scale weight of the car complete and ready for operation, but without heaters, is 31,350 lb. Allowing 450 lb. for the heaters, ducts, stovepipe, fan-motor equipment and hand rails complete, the weight becomes 31,800, giving the astonishingly low figure of 530 lb. per seated passenger. The weight is divided as follows:

Body	17,490 lb.	Air brake equipment ..	770 lb.
Trucks	8,640 lb.	Heaters (estimated) ..	450 lb.
Motors	3,710 lb.		
Controller and electric equipment	740 lb.	Total	31,800 lb.

From this table it will be seen that the low weight has been effected by using light equipment rather than



ROCHESTER CAR—FRONT AND REAR VIEWS OF INTERIOR

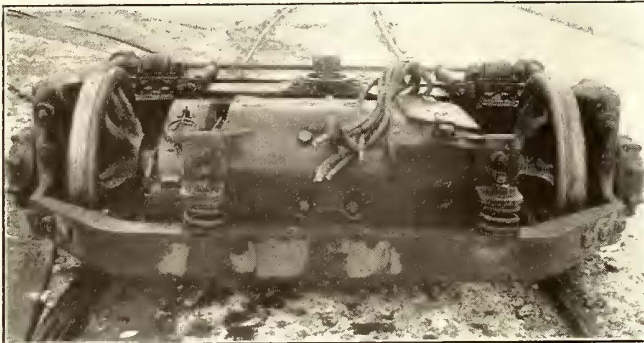
by cutting down the car body. The latter is of normal weight, at least, or, if anything, is a little higher than usual for a car of this type. For example, the New Orleans car of a year ago had a body 47 ft. 8 in. long, and this would weigh, after an allowance is made for heaters, 16,000 lb., or 4 per cent less than the car body of the Rochester car when reduced to the same length basis. The Chicago Railways car of two years ago was 48 ft. 5 in. long over all, and when compared on the same length basis the body would weigh 8½ per cent less than the body of the Rochester car. Nevertheless, both of these cars, complete and ready for operation, weigh some 3000 lb. more than the Rochester car (allowing for the fact that the latter has single-end control), thus giving an idea of the saving in weight made possible by the small motors on maximum-traction trucks.

In the Rochester car body, however, considerable attention has been devoted to the reduction of unnecessary weight, hydro metal and aero metal having been used for all fittings. A feature of the body equipment is the type of arm-guard that is used outside of the lower windows on both sides. This is made up from seamless steel tubing, and all of the rods except the two in the center are held in brackets that are hinged from the

springs are installed over each journal box, and a longitudinal leaf spring is hung from the side frame to carry the bolster, this having another coil spring in series with it between the leaf spring seat and the spring seat on the bolster end. The motors, of course, are outside, hung, and they have a bracket suspension in which large coil springs are introduced between the brackets and the truck end-frame.

The motors are of the General Electric No. 247 type, which has become variously known as the "low-floor" or "dachshund" design, because the vertical height is so limited that the motor can be used with a 24-in. wheel. The rating is 30 hp. at 500 volts, or 35 hp. at 600 volts, and since the total rating of the two motors installed is only 70 hp., even at the higher voltage, it would seem that the car establishes a record for being lightly motored.

However, the use of such a small motor horsepower has been made possible for two definite reasons: One of these is that the total weight of the car is only 31,800 lb., this being about 15 per cent lower than the weight that would ordinarily be expected on a car of this size. Incidentally it is worthy of note here that the greater part of this weight reduction has been obtained by the



ROCHESTER CAR—VIEWS OF MAXIMUM TRACTION TRUCKS WITH 24-IN. DRIVING WHEELS

center tubes so that they can be swung out of place without removing them from the car whenever it is desired to wash the outside of the windows. The car was built by the G. C. Kuhlman Company, Cleveland, O.

TRUCKS AND MOTORS

As before mentioned, the most striking feature of the car lies in the use of maximum-traction trucks with 24-in. driving wheels. The pony wheels are 20 in. in diameter, and both these and the drivers are equipped with ball-bearings. On both trucks the pony wheels are the leading ones, and since the car is designed for a single-end operation, the location of the driving wheels at the rear of each truck provides the advantage of increased adhesive weight when the car starts, thus reducing the tendency to slip the driving wheels at starting. The principle here involved is that when acceleration takes place the point of application of the external force producing the acceleration is at the level of the rail. The greater part of the weight that is being accelerated, however, is supported at the level of the truck bolsters, and therefore, whenever the car starts, a couple is set up which tends to tilt each truck backward and throws a larger proportion of the weight upon the rear wheel of each truck. Since the rear truck wheel in this case is the driving wheel, the added pressure upon the rear wheel tends to keep it from beginning to slip, and thus eliminates, in part at least, a characteristic of two-motor equipments that has frequently been found objectionable in the past.

The truck frames are of the well-known Brill type, and they are liberally provided with springs. Coil

removal of one pair of motors, thus lending support to the saying that a considerable part of the work of a motor consists in hauling its own weight. The second reason for the small motor equipment lies in the use of anti-friction bearings on the main journals. This feature is estimated by G. M. Cameron, master mechanic New York State Railways, Rochester Lines, who is sponsor for the new arrangement, to effect a saving of 15 per cent in power consumption, and where the rate of acceleration is moderate it is believed that the anti-friction bearing should reduce the work done by the motor by at least that much. With a voltage that is maintained close to 600, the small motors would thus become the equivalent of motors of 48 hp. installed on a heavier car with plain bearings, and this equivalent rating is at least an approximation of a motor size that is common with maximum-traction trucks and two-motor equipments.

TESTS

As an indication of the manner in which the motors are performing their work the accompanying table is published, this being made up from an all-day test that was recently made upon the new car. The information contained therein is largely self-explanatory, the temperatures in various parts of the motors that are shown having been taken at the conclusion of the day's run, and indicating that the motors were far from being overloaded. The service on the run in question, as indicated in the table, is not especially severe, since the number of stops per mile is 6.3 while the speed is 8.4 m.p.h., and although there are some grades, none of

ENERGY CONSUMPTION TEST ON LIGHT-WEIGHT CAR, NEW YORK STATE RAILWAYS, ROCHESTER LINES

February 24, 1916.

Weather—Cold, some rain.

Track—Fair.

Brake—Fair on high pressure and poor on low pressure.

Weight of car—15.9 tons.

Equipment—Two GE.-247 motors—One K-36 controller—S. K. F. ball-bearing journals. Gear ratio—15:58. Time start—6.52 a. m. Time finish—6.25 p. m. Elapsed time—11 hours 20 minutes.

Trip No.	Passengers Carried	Stops	Miles	Watt Hours Car-Mile	Watt Hours Ton-Mile	Remarks
1		5	0.90	1,722	108	Motorman 362—Rail fair
2	65	28	4.92	2,235	123	
3	89	37	4.92	2,335	123	Rail good
4	35	37	4.92	2,245	126	Weather fair and cold
5	46	39	6.78	1,948	111	
6	51	45	6.78	2,380	135	One and one-half minutes late
7	43	36	6.78	2,010	115	Rail slippery—On time
8	51	43	6.78	2,230	126	
9	84	42	6.78	2,235	119	
10	91	55	6.78	2,735	143	Motorman 1094—Rail good
11	55	54	6.78	2,300	129	Six minutes late
12	42	15	4.53	2,330	134	Raining—Rail good
13	51	22	3.20	2,420	137	
14	44	28	4.92	2,380	137	
15	73	42	6.78	2,250	122	
16	72	38	6.78	2,030	110	
17	116	31	4.92	2,030	102	
18	3	3	0.90	2,275	143	
Totals	1,014	600	95.15			
Averages	6.3 per mile	8.4 miles per hour		2,249	124.0	

Motor Temperatures—Centigrade Degrees

	Motor No. 1	Motor No. 2
Armature	45	42
Main field	40	34
Interpole field	32	37
Commutator	39	40
Pole tip	32	..

Outside temperature 0 Deg.

them is very long and steep. For the run a gear ratio of 15:58 was used, and the acceleration and braking rates were approximately 1.5 m.p.h. per second.

No detailed tests were made to establish passenger loading records. However, the railway company's transportation department considers that the car is very satisfactory in respect to its ability to accelerate passenger interchange. This department, however, has made a request that in the future cars of this type the loading well is to be 1 ft. narrower than in the present cars. Thus there will be given additional space for passengers to pass by those who may be seated on the longitudinal seats opposite to the well when moving from the rear of the car to the front to get at the exit door. As before mentioned, the company believes that the small standing space for passengers who are about to pay their fares tends to accelerate the boarding rate, and since the company's patrons have become accustomed to the arrangement, it is usual for all of them to have their fares ready before the car arrives. However, if considerable space was provided within the car so that the passengers could stand inside while getting their fares ready for payment, nearly every passenger would plan to take advantage of this, with the result that there would be congestion within the car rather than an acceleration of boarding.

Bowling Trophy to Denver Tramway

The bowling league of the Denver (Col.) Tramway has received from the athletic association of the Public Service Railway, Newark, N. J., the trophy of victory in the tournament held during the winter by the bowling enthusiasts of the two companies. Last fall the employees of the Public Service Railway, and of the tramway company, arranged a bowling tournament, which was to consist of three evenings' play. The games were rolled on the evenings of Oct. 23, Nov. 20

and Dec. 4. The New Jersey five began rolling at 9 p. m. on their alleys in West Hoboken, and the tramway five began rolling at 7 p. m., each team telegraphing the score to the opposing five as soon as play was finished. The tramway won the tournament by 322 pins (total pins being the deciding factor), and won two of the three series played. The idea in arranging the contest was to lay the foundation for a firmer friendship and a better understanding between men engaged in the same occupation.

Accident Prevention in Seattle

Discussions with Employees of Preventive Methods and Bogey System Have Effected Reduction in Number of Accidents

THE Puget Sound Traction, Light & Power Company has established the custom of holding regular meetings at the several carhouses for the purpose of explaining to platform men, and inviting their discussion on, the problems which confront the company in preventing and handling accident cases. The schedule of meetings is arranged so that there are two each month during the winter, held at the several carhouses in rotation. The first series of meetings open at 8 p. m. and are attended by the men after coming off duty, while the second series opens at 2 p. m., and for these most of the men come to the depots an hour before their run is scheduled. The meetings are arranged by the head of the department of accident prevention, which is the successor of the claims department in this company, but the general superintendent is present to conduct the meeting, so that with the carhouse foreman and inspectors present there is an official tone about the gathering at the same time that it promotes a feeling of democracy among the men.

The theory is that by careful intensive training of the platform men the company can do more toward preventing the kind of accidents for which it is liable than could possibly be done by any popular educational campaign. The men are told just what certain recent accidents have cost the company, why the company was liable and what may be done to prevent the recurrence of similar liability. Illustrations are shown to facilitate discussion on the more common accidents, and the dangerous curves, crossings and congested districts of each division are analyzed and discussed.

Particular stress is placed on the desirability of as many addresses of witnesses to an accident as it is possible to get, and the peculiar danger to the company from the unreported accident is emphasized. It has been noted that since these meetings have been inaugurated the increase in the average number of witness addresses which the platform men turn in would, of itself, repay the company for holding the meetings. As an adjunct to the discussion of accident problems the bogey system of posting the accident records for each carhouse, described in the issue of this paper for Feb. 1, 1913, is followed. The bogey for each carhouse is determined by a committee and is based upon the accident record for that carhouse in the same month a year previous. The committee takes into consideration any unusual circumstances which may have influenced the earlier record, and decides what can be expected in the month to come. The men show a great deal of interest in these records, and there is keen rivalry to see which carhouse can turn in a record to beat its bogey by the greatest margin.

G. A. Richardson is the general superintendent of the Puget Sound Traction, Light & Power Company and F. M. Hamilton is in charge of the department of accident investigation.

Factors Affecting Duration of Stop

In This Discussion the Author Analyzes the More Important Factors Which Affect the Duration of the Stops Necessary for Handling the Passenger Traffic of a Street Railway System and Presents Some Data on the Subject

By D. D. EWING

Assistant Professor of Electrical Engineering, Purdue University

SINCE with a given track and equipment, the maximum schedule speed which can be maintained depends in part on the duration of stop, a knowledge of this duration is of importance to the electric railway operator and to the engineer whose duty it is to specify equipment.

The time necessary for stops may be divided into three parts: first, the interval between the instant of stop and the instant the first passenger steps on or off the car; second, the actual loading and unloading time (loading and unloading may be simultaneous) and third, the interval between the instant the last passenger steps on or off the car and the instant the car starts. For a given set of operating conditions the sum of the first and third of these intervals is practically constant. The time per passenger, however, decreases as the number of passengers "on" and "off" increases. When but one passenger is handled at a given stop this constant time may be quite comparable to the actual loading or unloading time, whereas when a large number of passengers are handled it is distributed and becomes almost negligible as compared with the loading and unloading time per passenger. The second interval obviously depends on the number of passengers handled.

FACTORS AFFECTING DURATION OF STOP

As regards their relation to the duration of stop, the following factors will be discussed in the order named: Type of car, method of fare collection, class of passengers, load in car, condition of landing at stops, weather, and vehicular and pedestrian traffic.

The location of the car entrances and exits, types of steps and doors and convenience of the entrances affect the first part of the stop interval. Narrow, inconvenient steps and doors tend to increase the interval, as also do step-folding and door-closing devices. Number of entrances and exits and their condition as regards whether they are properly separated or not, height of car floor above the street, and the arrangement of the seats and aisles affect the second part of the stop interval. The third part is affected by the type of doors, brakes and control used. A low-deck car without bulkheads, with ample and segregated passageways, permits rapid handling of passengers. While of very great value from the standpoint of safety, folding steps and doors increase the duration of stop because they increase the first and third parts of the stop interval. The method of fare collection affects the second and third parts of the stop interval. Collection at the car entrance decreases the speed of loading, thereby increasing the second part of the stop interval. The use of a fare box slightly facilitates loading. The third part of the stop interval is usually decreased because the conductor is in position to give the starting signal the moment the last passenger clears the steps.

The class of passengers handled has considerable influence on the first and second parts of the stop interval. Elderly people, shoppers, business men, office workers and clerks usually require a greater total time per pas-

senger than do workmen and young people on an excursion trip, because the latter classes are more active and more likely to have their fares ready if entrance collection of fares is used, and if it is not used they will tumble aboard without very much ceremony. For example, a group of college students can get aboard a car in a phenomenally short time if the spirit moves them to do so.

The load already in the car principally affects the second part of the stop interval. The first part, however, may be affected where only a few passengers are to be unloaded from a crowded car because they are unable to reach the exits quickly. When a number of passengers board a car which is already fairly well loaded, the loading time per passenger usually increases because the incoming passengers cannot clear the entrances and passageways rapidly enough.

Muddy, snowy or icy crossings, and bad weather which makes the use of umbrellas necessary or coats the car steps with ice, generally increase the first and third parts of the stop interval.

Congested vehicular or pedestrian traffic prevents passengers from getting to the entrances and away from the exits quickly, thereby increasing the first and third parts of the stop interval. Of course, such traffic conditions cause stops which are not necessary for the convenience of passengers, but a discussion of such stops is beyond the limits of this article.

ANALYSIS OF STOP DURATION ON SPECIFIED LINES

The curves presented herewith were plotted from data taken in some traffic studies made under the writer's direction on the local lines of the Fort Wayne & Northern Indiana Traction Company at Lafayette, Ind. A city population of about 25,000 is served by these lines. The data were taken by observers stationed in the cars, the actual duration of stop being measured with a stop watch and the passengers "on" and "off" at each stop counted. All of the studies were made in the winter and early spring.

The curves in Figs. 1, 2, 3 and 4 show the relation between the time per passenger in seconds, and the number of passengers handled per stop. The ordinate of each of the points in Figs. 1, 2 and 3 is the average time per passenger for all observed stops where that particular number of passengers, represented by the abscissa of the point, was handled. For small numbers of passengers the ordinate is the average of a large number of observations. For example, for one passenger the time as read on the curve in Fig. 1 is 2.2 seconds. This time is the average for 781 observations. The ordinates for the larger numbers of passengers are averages of fewer observations and for that reason the points are more scattered. The curve is drawn to average the points as nearly as possible.

It will be noted that the time per passenger decreases rapidly at first but soon becomes practically constant. This is because for more than four passengers, Fig. 1, the first and third parts of the stop interval become practically negligible as compared with

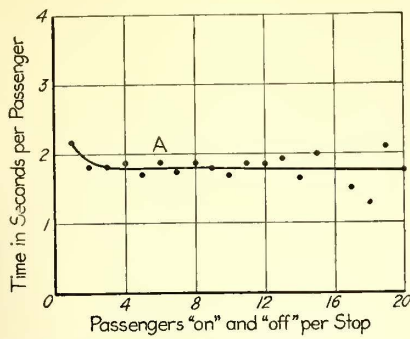


Fig. 1—Near-side, pay-as-you-enter thirty-two-passenger cars, equipped with fare boxes. Normal class of passengers.

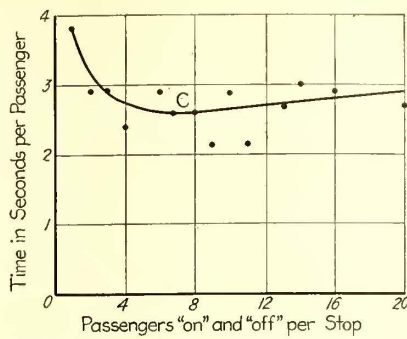


Fig. 3—Interurban line frequented by passengers to Soldiers' Home. No entrance fare collection.

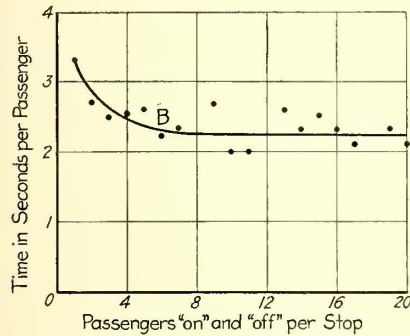


Fig. 2—Old double-end, longitudinal seat, twenty-six-passenger cars. Fares collected at entrance by conductor. University community.

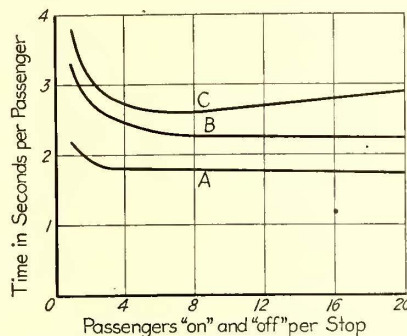


Fig. 4—Comparison of Curves A, B and C.

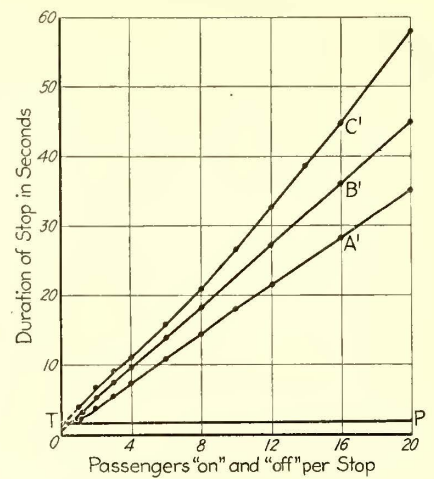


Fig. 5—Relation between duration of stop and number of passengers handled per stop.

FACTORS AFFECTING DURATION OF STOP
—STOP DATA SECURED ON LINES OF
FORT WAYNE & NORTHERN INDIANA
TRACTION COMPANY

the second part. The time does not increase as the number of passengers increases because the car passageways are ample and the cars are rarely crowded. The traffic studies showed that on the line on which the data for Fig. 1 were taken the cars were loaded above their seating capacity on less than 7 per cent of the trips. This line carries the class of passengers which might be expected on any average line in a city of the above population. Pay-as-you-enter, near-side cars seating thirty-two passengers carry the traffic. In the collection of fares a fare box was used. The curve shows that for more than four passengers the time per passenger is approximately 1.8 seconds. For the entire number of stops observed in the traffic study on this line the average duration of all stops was 4.8 seconds.

Curve B, Fig. 2, is plotted from data taken on a second line which runs through the university community. Old style, double-end cars with longitudinal seats for twenty-six passengers were used. The fares were collected at the entrance by the conductor. All loading and unloading was done through the vestibule door at the rear. On about 10 per cent of the trips the cars were loaded above their seating capacity. One-third of the passengers were students. The average duration of stop for all stops observed was 7.9 seconds. The curve indicates that for more than eight passengers handled the time per passenger is approximately 2.25 seconds.

The data for Curve C, Fig. 3, were taken on a short interurban line, 7.3 miles long, connecting Lafayette and Battle Ground, a small town located on the site of the old Tippecanoe battlefield. The major part of the traffic is between Lafayette and the Indiana State Soldiers' Home, which is about 4 miles from Lafayette. The passengers are mostly inmates of, and visitors to, the home. The cars used were of the same type as were used on the second line described. On 20 per cent of the trips the cars were loaded slightly above their

seating capacity. The fares were collected by the conductor going through the car, but as the runs were usually long he ordinarily had plenty of time to get back to the rear end of the car before the next stop was made. The passengers were loaded and unloaded from the rear end only. The average duration of all stops observed was 9.25 seconds. As fewer observations were made on this line than on the others the points plotted in Fig. 3 are more scattered.

To facilitate comparison the three curves have been replotted in Fig. 4.

For all three lines the vehicular and pedestrian traffic, condition of crossings at stops, and weather conditions were quite similar. The differences in the curves were therefore produced by variations in other factors. Curves A and B have the same general shape, the ordinates of each curve at first decreasing rapidly and finally becoming approximately constant in length as the number of passengers handled per stop increases. Curve A is considerably lower than curve B however and becomes horizontal sooner than does B. In each case the prepayment method of fare collection was used. Type of car is evidently the factor which causes the main difference between the curves. The near-side car, with its ample and segregated passageways, permitted much more rapid handling of passengers than did the type of car used on the other lines.

Curve C differs from curves A and B in that for a certain number of passengers handled the time per passenger is a minimum and after this number is passed the time per passenger gradually increases. Comparing Curves B and C it will be remembered that the same type of car was used on both lines. Prepayment fare collection was used on the second line but not on the third. However, the distance between stops on the third line overcame all the advantages as far as duration of stop is concerned that are offered by the prepayment system. The factors which are left to account

for the difference between the two curves are: Class of passengers and load on car. On the second line a large percentage of the passengers were young people and on the third line a majority of them were elderly people often pretty well laden with bundles. Overloads were handled on a much higher percentage of the trips on the third line than on the second. The entrance of a number of elderly people into a car which is already fairly well filled would certainly not permit a stop of minimum time per passenger handled, and this is probably the reason why the ordinates of the curve increase after passing a minimum point.

It may be mentioned here that hand brakes and Type K control were used on all of the cars mentioned and that the near-side cars were equipped with folding steps and door-closing devices.

It is of interest, also, to plot the relation between the duration of stop and the number of passengers handled per stop. Such curves are plotted in Fig. 5. These curves were derived from Curves A, B and C in Fig. 4, although they also could have been plotted from the original data. Except near the origin, A' is a straight line. B' is practically straight throughout and C' is convex downward. By extending the curves until they intersect the time axis the sum of the first and third parts of the stop interval can be obtained. The intercept on the time axis represents that portion of the stop interval which is independent of the number of passengers handled and therefore, as was pointed out earlier in the discussion, is the sum of the first and third parts of the stop interval. The intercept of A', OT, is larger than the intercepts of the other curves. The door-closing and step-folding devices account for this. The line PT drawn horizontally through T divides the ordinates of the Curve A' into two parts. The lower part of each ordinate represents the constant portion of the stop interval and the upper part, that portion of the stop interval which varies with the number of passengers handled.

GENERAL CONCLUSIONS

From the data and discussion here presented the following conclusions may be drawn:

The relation between number of passengers handled per stop and duration of stop is quite clearly defined, and for a given road operated with a given equipment admits of fairly accurate analysis.

The duration of stop may be materially affected by the type of car used, the class of passengers handled and the load already in the car.

Of these factors the first admits of control, and the curves show very clearly the saving in time that can be made with a well-designed car.

It is not claimed that the curves here presented are of general application, but rather that they represent the results of the analysis of a particular set of conditions.

The writer wishes to acknowledge his indebtedness to L. E. Stibbe, E. W. Middleton, L. G. Hallawell and D. C. Pyke, graduates of the School of Electrical Engineering, Purdue University, from whose graduation theses the above data were abstracted, and especially to Jack Abbott, superintendent of the Lafayette division of the Fort Wayne & Northern Indiana Traction Company, through whose co-operation the traffic studies were made possible.

The Birmingham (England) Tramways are inquiring into the use of trail cars on the London tramways with a view to their possible introduction in Birmingham because of the shortage of motormen which has been occasioned by the war.

Accounting for Betterments and Replacements*

Need of More Accurate Reporting and More Consistent Classification of Expenditures to Be Charged Against Authorizations—Responsibility of the Engineering Department

BY H. N. BALFOUR

Head Bookkeeper Connecticut Company, New Haven, Conn.

IN accounting for money spent for new and reconstructive work, the accounting official must place great reliance for correct reports from the men overseeing the physical end of the job. Considerable of the work has its origin in outside departments, and it is of extreme importance to have the divisional reports, such as the distribution of the value of the material issued during the month, distribution of the time spent by track gangs on road work and many other statements and bills covering the outlay of money, receive very careful study on the part of the man in charge so that the final advice to the comptroller is an exact representation of just what happened.

One is likely when under pressure, or laboring under the wrong impression, to give an incorrect classification of the expenditures on construction work in reporting for the cost sheet record. The results of this are obvious. The charges, as made through their various sources, are accepted and placed on record and remain there until the completion of the work. The chances at this time of getting an absolutely correct classification of the expenses are lessened for the very reason that a proper division was not made in the first instance, and therefore cannot be correctly determined by assumption when the final inspection of the cost sheets is made by the comptroller and the engineer. It is not inferred that these omissions are made by any one department, or that they are exceedingly common, but in some cases there is a tendency to overlook the importance of properly classifying the outlay.

To have the work done properly from the physical standpoint is, of course, of prime importance, but no work can be considered as done properly unless the same degree of care is exercised in accurately accounting for the work in dollars and cents. Certainly some improvement could be made along these lines if everyone, and particularly those who make a report of an accounting nature, would vigorously attempt to familiarize themselves with the standard Interstate Commerce Commission classification of accounts. The results of this familiarity would give every man the same basic knowledge for the handling of the accounting end of his work, which would result in a greater consistency and accuracy in all reports and statements from which the cost sheets are written up. This is just the thing needed, as it must be realized that the possession of detailed records from which the separate costs of special work, rails, buildings, new paving and the like, can be expeditiously and accurately worked out, are valuable. The engineer is very much in need of accurate accounting records that reflect a true and permanent history of the performance of any job, so that he may be able to base his future estimates for new work. To get these, there certainly cannot be any confusion in the separate accounting of each job.

There appears to be a general misconception as to just what happens to the heavy charges made against authorizations. It is apparent that there is an underlying belief with some that when the items are placed through their many sources against the authorization, nothing further develops from that expenditure, and

*Abstract of paper read at meeting of Company Section No. 7 on April 4, at the Hotel Garde, New Haven, Conn.

the current operating expenses are not affected. This, of course, is wrong and, in cases where the authorization is underexpended, may lead to the inclusion of items that have no connection with the work in question. Not infrequently this has taken place. There is on record a case where the authorization was completed and underexpended a few hundred dollars, although the work did not differ materially from that originally in view. Some time after its completion a fair-sized charge made its appearance from the store report of issues. Investigation brought out the fact that, although the material was used in straight maintenance work in approximately the same location that this authorization work covered, the charge was made for the reason that it was known the authorization was underexpended and could therefore conveniently receive the charge and that consequently it could reduce the maintenance cost.

There is no decided cash fund set aside to meet the cost of work, as these betterments and replacements must be met and paid for out of the current earnings and surplus, and the over or underexpenditure merely represents that the work was done for more or less than the original estimated cost of the work as outlined by the engineer. The difference between the actual expenditure and the estimate is carefully checked, and if it is not bounded by a certain percentage justifiable reasons will be received from the engineer in authority. After the approval of the authorization a job number is assigned to it, and provision is at once made to keep separate the accounting of the cost of the job under this number or title.

The question of how the expenditures will be divided is the next step, and as the engineer's estimate of the work to be done shows in detail the estimated extent of the additions and betterments and the estimated original value of the things to be replaced, it gives a tentative basis upon which can be estimated the charges to be placed against the maintenance accounts each month. For example, an authorization may call for a total expenditure of \$20,000 divided equally as between betterments to property and replacements. If the work covers the reconstruction of track, there is a 50 per cent element of betterments to the property, and the balance is the depreciation on the things replaced. This depreciation on the original cost of the property being replaced represents the charge that will be made to operation. All accounts, however, are not equally affected. In the case of ties, the chances are that it is entirely a replacement, and if an untreated tie is replaced with a treated tie or one of exactly the same class, the entire cost of the new tie, as shown on the store report to Account 506, is charged directly to operating expenses through the distribution given that cost from the authorization sheets. This does not apply to steel ties substituted for wood ties. The rails, on the other hand, may be of a heavier type, and if so the difference between the value of the heavier rail and the existing rail would be charged to betterments, the balance in the account going to operation.

This principle of separating the cost is applied to all improvement work, such as the replacement of power-plant machinery, bridges, etc. Charges are made monthly along this basis during the life of the work, so that if the authorization mentioned was fully expended and the work was accomplished as originally contemplated by the engineer, the net accounting result would be a charge of \$10,000 to property account and a like amount to the maintenance accounts. The operating accounts effected would, of course, be those of the division upon which the work was done. It may be found, after completion of the work, that the method

used in computing the distribution of the expenditures was not strictly in accord with the actual work done, the work having differed greatly from what the engineer originally had in mind. In such a case an adjustment is necessary.

Some perplexing problems arise at this stage of the accounting, the solutions of which call for very close cooperation between the other departments, particularly the engineering and auditing departments. One very important step, in completing such accounting, is the final revised estimate of the original cost of the work which was actually replaced. The first estimate showed only the estimated original cost of what it was assumed would be replaced, and this figure almost invariably differs from that which results from an estimate made after the work has been performed. If the final statement of the actual cost of reconstruction is used against the preliminary estimate of the original cost of the thing replaced, the classification of the charges into the property and operating accounts will not be correct. An engineer's preliminary estimate for certain track reconstruction might assume the replacement of all the rails and ties, whereas perhaps only two-thirds of the ties and only a part of the rails were actually replaced. Thus the need of having the engineering department revise the estimate of original construction cost, after completion of the work and prior to the final classification of the charges, is apparent. The final classification then gives the proper division of items as between capital account and operating accounts, and the auditing department is fully fortified with the correct accounting for each job, and can at any time furnish the engineering department with reliable unit costs of the work. This true accounting cannot be accomplished properly unless all charges, as received by the auditing department against authorized work, are subjected to a close check as to their right to be in that particular account and as to their classification, and a great deal of responsibility in getting such facts rests with the engineer in charge of the work and with his representatives in the field.

Important Electrification in Montreal

The report of the Harbor commissioners of the city of Montreal, Canada, for the year ended Dec. 31, 1915, describes the proposed electrification of the railways under the control of that commission. These railways serve the docks and comprise 45 miles of track, on which last year 157,480 cars were moved. The commission has recently made a study of the electric freight terminals of the New York Central, Pennsylvania and New Haven Railroads, where it found electric power successfully applied to the movement of freight. For the work in Montreal, the report says that in addition to the primary object of overcoming the smoke nuisance, the application of electricity has proved that it has, among many others, the following advantages over steam for railroad terminal traction: economy in operation and maintenance, flexibility of control, availability for immediate service, fewer units required for equal service, elimination of corrosion of steel and galvanized iron by acid gases, fire danger reduced, and stand-by losses much lower.

The president of the Montreal Harbor Commission, under which this decision was reached, is W. G. Ross, who for many years was managing director of the Montreal Tramways, and later was president of the Quebec Electric Railway. He was also for many years prominent in the American Electric Railway Association, so that he brings an expert knowledge of electrical equipment to the proposed undertaking.

Safety a Real Economy in Columbus

A Description of the Organization, the Work and the First Year's Results Obtained by the Safety Department of the Columbus Railway, Power & Light Company, Columbus, Ohio

FROM the time that it started its safety movement, the Columbus Railway, Power & Light Company, Columbus, Ohio, has looked upon this work in the same light as any other economy measure, and as much attention was exercised in planning its organization as was given to any other operating department. Moreover, the work was not inaugurated as a campaign but was put on a permanent basis from the start. The results of the first year demonstrate that, aside from its humanitarian value, the safety movement has proved to be an economic measure in every sense of the word.

SAFETY ORGANIZATION

Active steps directed toward the reduction of accidents to employees, patrons and the public in general have always received very careful consideration on the part of this company. Just prior to the official organization of the safety movement, frequent talks were given to the employees on the subject of safety, and it was brought to the attention of the public through the newspapers. Safety-first signs were posted in conspicuous places over the property and on the cars, and safety-first lead pencils and watch fobs were distributed among the employees. In these ways the company endeavored to keep the safety idea constantly in the foreground. In connection with the company's original safety work, a great deal of attention was also given to fire prevention and the elimination of fire hazards. The employees and the public were also safeguarded by the installation of various protective devices on the cars, in the shops and in the power stations.

Encouraged by the good results obtained by this unorganized effort, the management concluded that the time had arrived for more thorough and systematic effort. It believed that the closer co-operation between all departments and the employees could be secured by more definite organization, and that this should be followed by a marked reduction in accidents.

On Dec. 22, 1914, all the department heads were called together and a safety plan was discussed and adopted. It was decided that the safety organization should include a central committee composed of the chairman and secretary of the organization and the heads of all the operating departments. Subordinate to this central committee were departmental committees with the department heads as chairman and representatives from the department branches as members. These committees in turn were further subdivided into department branch committees, with the foremen as chairmen and selected employees from the department as members. This brought together an organization consisting of approximately 117 employees, all of whom were members of various committees. These committees meet once each month, except for the special sessions subject to the call of the chairman. The transportation department committee, the inspectors' committee and the carhouse committees are exceptions to this rule, the transportation and carhouse committees meeting every two weeks and the inspectors meeting every week. In connection with the committee work, the usual practice was followed of doing this work outside of regular

working hours, but the men are paid for their time at their regular hourly rate.

DUTIES OF COMMITTEES

The duties of the various committees and sub-committees were distributed as follows:

The central committee (*a*) has general charge and supervision over safety work; (*b*) receives and passes upon all recommendations from departmental committees and from the community at large; (*c*) devises standards for safeguards; (*d*) formulates rules for safe operation; (*e*) gathers all available information, and (*f*) carries out educational work.

The departmental committees (*a*) receive suggestions from employees of their departments for the prevention of accidents or for lessening hazards; (*b*) pass upon suggestions received and forward them to the secretary of the central committee with record of the action taken by them in each case, and (*c*) make inspections of their departments.

The inspectors' committee (*a*) receives and passes upon suggestions for accident prevention in connection with the cars and tracks; (*b*) considers reported violations of traffic ordinances, dangerous practices of drivers of all classes of vehicles, and any other dangerous condition, making recommendations for their elimination, and (*c*) forwards all suggestions and recommendations to the secretary of the transportation department committee.

The carhouse committees (*a*) receive and pass upon suggestions from their divisions and forward them to the secretary of the transportation department committee with a record of the action taken in each case.

GENERAL PLAN

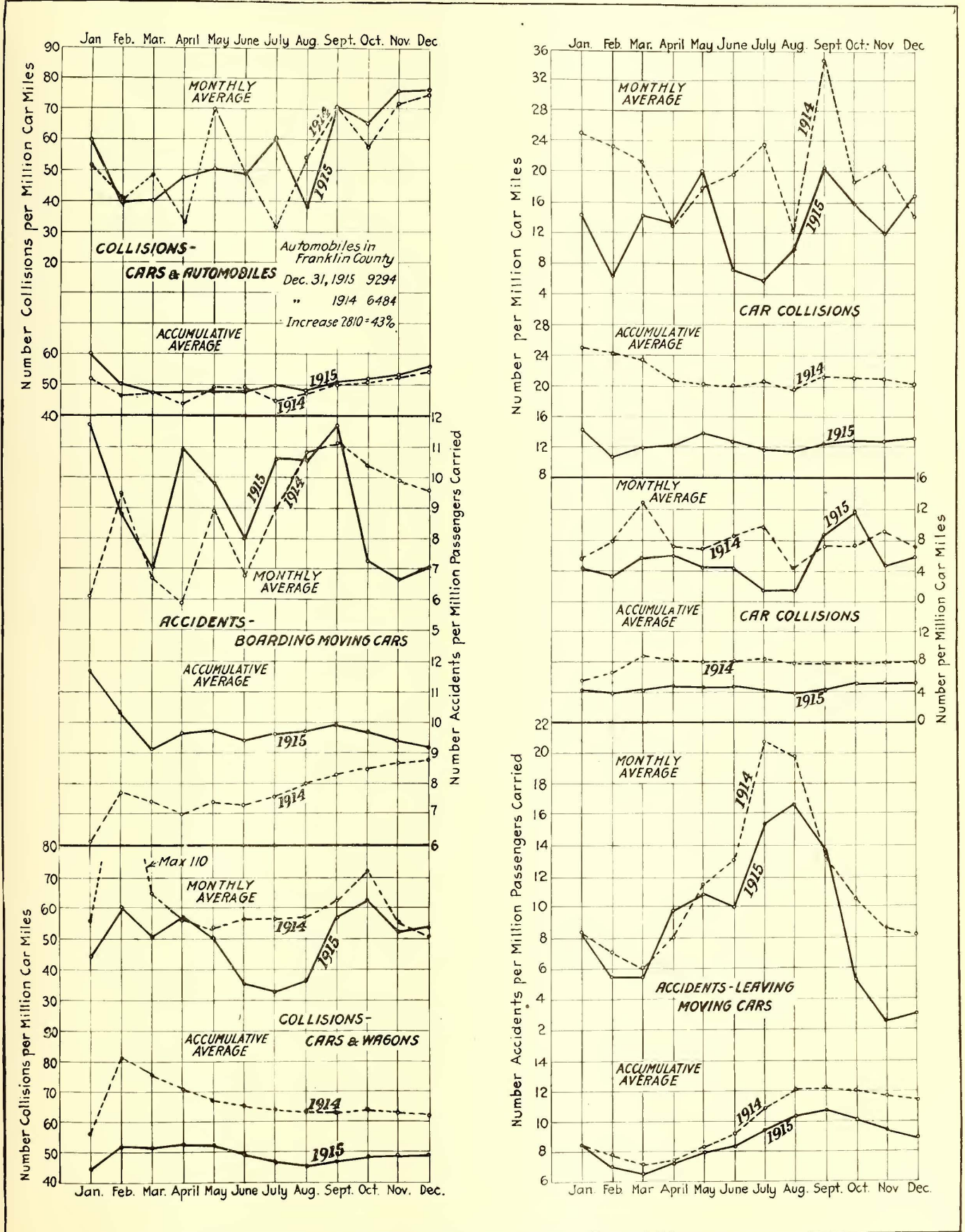
To keep all the employees informed regarding the work of this safety organization, bulletin boards were installed in the various departments on which notices, illustrations and other information relating to safety matters were posted from time to time. The employees were asked to make suggestions for changes in methods or equipment, which in their judgment would make operation safer. They were told that suggestions could take the form of reports of conditions which were or might be the cause of accident. They were instructed to make their reports and suggestions to the departmental or branch committees, which were in turn instructed to give careful consideration to any such suggestions and pass them on with their recommendations to the central committee for final action. To insure that the individual employees received credit for the suggestions accepted, a record was carefully compiled.

Instructions concerning the general plan informed the employees that the company expected to receive many suggestions and that the great majority of them would probably be of such nature that they could be adopted and economically carried out. On the other hand, there would probably be a few which would be impractical and so could not be used, and others would require large expenditures or changes in the standards, the approval of which might be delayed for either or

both causes. The employees were further impressed with the fact that the company was back of the safety movement and that the management would do all within its power to put into effect the approved suggestions.

After instructions had been issued regarding the plan and organization, a definite campaign of education

among the employees was started and special emphasis was laid upon the fact that results could only be accomplished through their hearty co-operation. The employees responded eagerly and helped in every way possible, as the results of the first year's work indicate. Numerous suggestions for the elimination of hazards



SAFETY WORK IN COLUMBUS—CHARTS OF MONTHLY AVERAGES OF ACCIDENTS

were received, the majority of them being approved and the suggested changes made. The disposition of the various suggestions received are shown in the accompanying tabulation.

One factor which has tended to create good feeling among the employees has been the regular practice of acknowledging by personal letter all suggestions approved and ordered put into effect. Employees making suggestions that were disapproved also received a personal letter, explaining to them the reasons leading to

SAFETY SUGGESTIONS ACTED UPON BY CENTRAL COMMITTEE, MARCH 31, 1915
MECHANICAL DEPARTMENT

Suggestion by	Suggestion	Disposition of
No. 200 William Naus	Use locknuts on bolts with wood blocks placed on car wheels to deaden sound. Also use softer wood and larger washers to prevent bolts from dropping out on railing.	Being taken care of by leather washers with different method of fastening.
No. 209 E. Brown	Have gong clappers inspected and properly balanced so that gongs will give loud, clear sound.	Taken care of by inspection and by instructions to remove all lugs from gong pins.
No. 213 T. C. Neilson	Replace with removable handles the present levers used in rebuilt cars for operating front exit doors.	Taken care of by installation of latches on these exit doors.
No. 218 J. Devoe	Place guard rail around pump pit in boiler room at West Broad Carhouse.	Guard rail installed.
No. 230 G. W. Ryan	Arrange trapdoor lifts on standard gage cars so they will fit down in groove provided for that purpose.	Taken care of by instructions for cleaning out grooves.
No. 248 A. Feather	On standard pay-enter cars place lock on motorman's exit door to prevent sliding open in case handles become displaced.	Taken care of by latches on these doors.

TRANSPORTATION DEPARTMENT

No. 263 J. M. Jewell	Discontinue the selling of newspapers on cars by newsboys.	Newsboys' methods being regulated.
No. 209 H. T. Dennis	On single track from Innis Avenue to Viaduct on Parsons discharge passengers from west side of car.	Scioto Valley car men have orders to use extreme caution when passing our cars on this single track.
No. 210 H. T. Dennis	Bring attention of transfer companies to reckless way in which some drivers approach car tracks.	Under consideration.
No. 220 J. Moore	Give better instructions to motormen in use of sand in stopping cars, as some do not start to apply sand soon enough.	Instructions to be again given to platform men.
No. 236 H. E. Gardner	Use some means to prevent school children jumping on cars at Monroe and Leonard Avenue schoolhouse.	Principal written to; inspector visited school concerning this question. No trouble being experienced.

WAY DEPARTMENT

No. 215	Countersink nuts on bolts which project above top surface of loading platforms used in track construction.	Nuts countersunk as suggested.
No. 227 W. H. Lincoln	Place a platform at Hocking Valley crossing—Marble Cliff division—east-bound—for conductors to board cars more easily and safely.	Platform placed.

POWER DEPARTMENT

No. 265 J. C. Wheeler	Place longer radius elbow on down spout to roof of a.c. switchboard room, Spring Street. One now in use fills up with cinders. Water might back up and run down on switchboard and regulators.	This is to be changed.
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such action. The management is satisfied that this "personal touch" system is one of the most potent factors in producing good results. From time to time various forms of safety literature were also posted on the bulletin boards, largely consisting of lists of the suggestions, crediting to their originators and explaining what disposition had been made of them. Samples of these suggestions are given in the above table.

One of the most frequent forms of accidents was collisions between cars and vehicles of various kinds. In August, 1915, some special educational work was undertaken by the various safety committees through the medium of bulletins. The number of collisions of this nature, for which the cars from each carhouse were responsible was tabulated, and a comparison was made of the number of collisions for the same period in 1914. This information was posted in bulletin form in the carhouses and tended to put the spirit of contest into the movement to reduce this class of accident. This campaign resulted in a decrease of 9.3 per cent in the number of collisions for the year 1915 as compared with 1914. The same plan will be followed during 1916, and at the end of each month the records of the various carhouse crews will be posted. The average for the entire system for the month of January, 1916, shows a marked improvement over the same months for 1914 and 1915.

OTHER ACTIVITIES

In the beginning it was thought that much good could be accomplished in the prevention of accidents in connection with car service by working through the city safety council, but it was found that the council's work was too general to be of much aid in such a highly specialized field. In consequence, very little has been done in the way of appealing to the public to assist in the work, and practically everything that has been accomplished is attributable to the hearty co-operation of the employees. It is expected, however, that when the city safety council, which represents the public, takes an active part in the work, even better results will be secured. To reach the public in a general way, the company placed an exhibit in the safety show at the Ohio State Fair, and to obtain information on accident prevention work, the safety inspector of the company was sent to the fourth annual congress of the National Safety Council at Philadelphia, Pa.

The following are some of the details of the several phases of the safety work which has been conducted by this company:

SAFETY SUGGESTIONS—NUMBER RECEIVED BY MONTHS

Month	Number	Month	Number
January	64	July	35
February	127	August	31
March	104	September	28
April	35	October	22
May	76	November	7
June	52	December	38
Total for the year.....		619	

Departments to which work was referred:

	Number	Per Cent
Mechanical	205	33.1
Transportation	159	25.7
Way	30	4.8
Power	139	22.4
Line	29	4.8
Meter and distribution	9	1.5
Stores	21	3.4
General	27	4.3
619		

Final disposition made of all suggestions:

Approved and ordered put into effect.....	372	60.1
Disapproved	183	29.5
Held for future action	64	10.4
619		

COST OF SAFETY WORK

In connection with the safety work certain expenses were incurred for committee meetings, literature and wages of the employees. In addition to these quite a large sum was spent in conforming to the suggestions approved by the safety organization. The distribution of the various expenditures to the different departments follows:

1. Meetings			
At general office, Jan. 4.....	\$5.00		
At Roosevelt picture house, Jan. 8.....	20.00		
Industrial exposition, Jan. 13-16.....	14.55		
Public meetings, Chamber of Commerce, May 27-28	54.65		
Ohio State Fair, September, safety booth.....	52.03		
Attendance Annual Safety Congress, Philadelphia	42.25		
			\$188.33
2. Distribution of literature			
(a) Twenty-seven bulletin boards.....	\$232.72		
(b) Safety cards for cars.....	97.50		
(c) Additional copies National Council			
Bulletins	\$15.43		
Photographic work	45.49	60.92	
(d) Stationery and printing.....	\$151.99		
Office supplies	25.15	177.14	568.28
			48.71
3. Twenty-six suggestion boxes.....			
4. Lungmotors—instructions, accessories, etc.....			
5. Wages:			
Salary of safety inspector.....	\$1,285.50		
Committee members—attendance at meetings	51.88		1,336.42
Total expended			\$2,183.42

In addition to these items and not included in the suggestion costs, there was expended for goggles a total of \$175.15 which was charged to capital account. The following is a statement of the total authorized expenditures by departments for carrying out the suggestions made:

Department	Total Authorized Expenditures
Mechanical	\$1,654.80
Transportation	122.21
Way	417.32
Power	1,545.02
Line	123.67
Meter and distribution	33.23
Stores	76.06
General	339.33
Total	\$4,311.64

It is also of interest to note that of these costs, \$2,904.57 was charged to capital account and \$1,407.07 to various operating accounts.

RESULTS OF SAFETY WORK

The results of safety work for the year 1915 are best shown by the tabulated statement which follows:

EMPLOYEE ACCIDENTS		
Number of employee accidents for 1914.....		234
Number of employee accidents for 1915.....		413
Number of Accidents	Class of Injury	
Mechanical	76 Bones broken	6
Transportation	73 Bruises	165
Way	107 Burns	28
Power	75 Cuts	96
Line	32 Electric shocks	4
Meter and distribution	22 Eye injury	50
Stores	25 Foot injury	5
General office	3 Internal injury	5
	Loss of member	2
Total	413 Nails torn off.....	8
	Sprains and strains.....	36
	Miscellaneous	8
	Total	413

Under the heading of "employee accidents" it will be noted that there was an increase in the number, but this was because the company adopted the policy of requiring reports of all personal injuries, no matter how trivial. Of the total number of accidents, however, those of a serious nature were very greatly reduced. This is made quite evident in an examination of the expenditures of the Ohio Industrial Commission on account of employees' accidents. It will be noted that the year 1915 shows a total decrease of 31.4 per cent over 1914.

AMOUNTS PAID BY THE OHIO INDUSTRIAL COMMISSION ON ACCOUNT OF EMPLOYEES' ACCIDENTS			
	Physicians' Fees	Employees' Compensation	Total
1914	\$2,233.95	\$13,911.79	\$16,145.74
1915	3,200.64	7,868.13	11,068.77
	Inc. \$966.69	Dec. \$6,043.66	Dec. \$5,076.97

In connection with employees' accidents it is also of interest to note that there were three deaths resulting from accidents during 1914, and there were also three fatal accidents in 1915.

CAR AND AUTOMOBILE COLLISIONS

Accidents constituting the greater majority of those encountered in the operation of the railway system other than those affecting employees included collisions between cars and automobiles, and between cars and wagons, boarding and alighting accidents and car collisions. These are arranged in their relative importance, and it was considered that the best results could be obtained with the least effort by directing particular attention to these classes of accidents. For the first half of 1915, 42.6 per cent of all the accidents were collisions between cars and other vehicles. Of this percentage more than two-thirds were between cars and automobiles. While the company did not expect that it could entirely eliminate collisions, it did believe that the total number could be greatly reduced. Accordingly a strong appeal to the motormen and conductors was sent out in a circular prepared by H. W. Clapp, general superintendent. As a direct result of this, although the total number of automobiles increased 43 per cent, the total number of accidents increased only 3 per cent. The detailed figures on car and automobile collisions follow:

COLLISIONS—CARS AND AUTOMOBILES		
	1915	1914
Actual number	463	458
Number per million car-miles.....	56.4	54.7

As will be noted from the increase in the number of automobiles the records of the Ohio automobile department showed that in 1914 there were 6484 in Franklin County in which Columbus is situated, and this number was increased to 9294 in 1915. In connection with collisions of this nature, the rate of increase in the number in Columbus as compared with other cities is of interest. The records for seven other large cities in the United States showed an average increase of 28 per cent in the number of automobile collisions for 1915 over 1914. A 20-per cent decrease in the number of collisions between cars and wagons was shown in 1915 over 1914. The figures for accidents of this kind follow:

COLLISIONS—CARS AND WAGONS		
	1915	1914
Actual number	405	521
Number per million car-miles.....	49.4	62.2

Accidents over which the company has little or no control include those where passengers attempt to board moving cars. Conductors have been urged to warn passengers against this hazardous practice whenever the opportunity is presented, but this method has not been very effective. The results accomplished in this class of accidents follow:

BOARDING MOVING CARS		
	1915	1914
Actual number accidents	700	691
Number per million passengers.....	9.2	8.8

Other results of the safety work that show a marked improvement in 1915 over 1914 include the number of accidents to passengers alighting from cars, car collisions and car pull-ins on account of collisions.

In connection with the results of the accident prevention work, it is also of interest to note how the number of accidents varied from month to month during the year. These data are plotted on the diagrams on page 773. In connection with each diagram the accumulative average is shown, which is the average for

the period of the year up to and including the month for which any average is plotted.

PREVENTING PULL-INS

In connection with the safety work a special effort was made to reduce the number of car pull-ins. The company adopted the practice of reschooling twice a year the old men in the service as well as the new. At first the old men were averse to being examined concerning rules and instructions, but they soon learned that it was to their best interest, because it kept them informed and was a great aid in keeping down the number of car pull-ins. During 1914 the number of pull-ins totaled 15 per cent of the cars in service, whereas in 1915 this was reduced to 3 per cent. This meant an increase in the car-miles per car for an eighteen-hour day from 153½ to 167½. In order to keep the equipment in first-class condition, all cars are inspected on a 600-mile basis and overhauled on a 5000-mile basis.

As soon as the records of the safety work for the year were available a large poster was prepared for the information of the company's patrons. This called attention to the decreases in the various forms of accidents in 1915 over 1914. In connection with the increase in the number of accidents to passengers boarding cars, the public's attention was called to this fact and urged to assist in reducing this class of accidents. To quote this poster, "Every citizen of Columbus should be enlisted in accident prevention work. It means much not only to you individually, but to us as a public service company, and to Columbus as a community to have this city known as the safest place to live and the safest city in which to do business." Taken as a whole, the company is very much pleased with the results of its safety work during 1915, and it will continue to pursue the same plan of accident prevention work during the year 1916.

Street Traffic Signal in San Francisco

One Officer Regulates Traffic in Three Directions with Electric Whistle and Colored Lights Visible for 300 Ft. in Brightest Sunlight

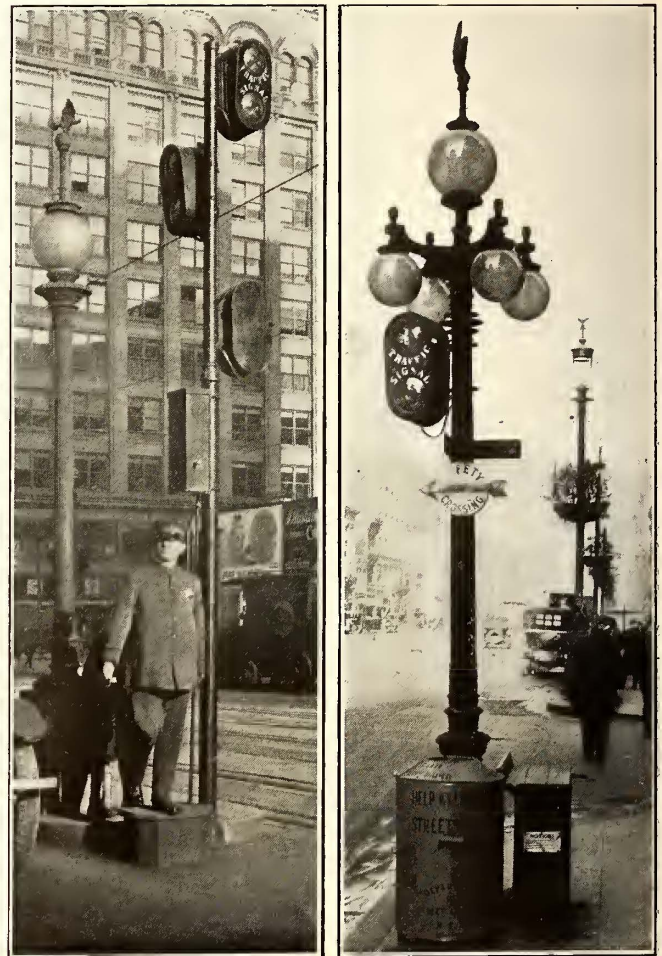
HANDLING the traffic on lower Market Street in San Francisco presents unusual problems not only because of the heavy traffic which this main artery carries but because of the angular street intersections involved. From the south the cross streets run into Market Street at right angles, but from the north side all streets intersect this thoroughfare at an acute angle. Thus, where streets from both north and south intersect Market Street at about the same point, three streams of traffic must be regulated, and four traffic officers are usually required, or one officer with some mechanical assistance.

Since the advent of the jitney bus the traffic has been particularly difficult to handle satisfactorily, and experiments have been made with a number of signal schemes. One of these, which is still in use at the ferry, was described on page 671 of the *ELECTRIC RAILWAY JOURNAL* for April 3, 1915. Recently, however, a system of light signals, developed by G. Ghiglieri of San Francisco, has been finally adopted by the police department and is now giving satisfaction at a number of the more congested crossings. In fact Sergeant Charles Goff, in charge of the traffic department, San Francisco police, has affirmed that the new signal system has increased the traffic capacity of Market Street crossings 20 per cent.

The new signal system consists of lights showing in as many directions as there are streams of traffic, in connection with which a whistle is blown as the lights

change, all being controlled by a treadle at the traffic officer's stand. The control apparatus consists of a service cutout and meter, whistle and contactor box, and officer's stand with treadle or foot push button, which the officer is shown using in one of the accompanying illustrations. This treadle is connected to the whistle and contactor box by a rod, the mechanism in this box being arranged for two positions. In one the whistle is sounded one blast and the green lights are shown for east and west traffic and the red lights for north and south traffic, while the other position blows two blasts and reverses the signal indications. The whistle is of the standard traffic officers' type and is blown by means of a motor and small rotating pump.

Three lead-sheathed wires run to each signal, lighting 25-watt lamps behind large lenses, an arrangement



SAN FRANCISCO STREET TRAFFIC SIGNALS

which centralizes all moving mechanism and simplifies the control. The light is sufficiently powerful to show the color indications plainly at a distance of 300 ft. in the brightest sunlight.

Where the streets intersect at right angles a similar signal equipment regulating traffic in two directions is mounted on a street lighting standard, as shown in the second illustration. The apparatus for a right-angle crossing costs not more than \$200, a figure which does not include installation.

F. W. Hoover, general manager of the Nashville Railway & Light Company, Nashville, Tenn., has arranged to show one of the safety-first motion pictures taken in Detroit. Local papers have paid generous attention to the film in their news columns.

A. I. E. E. Discusses Tendencies in High-Voltage D.C. Railway Practice

At New York Meeting of April 14, the History of the High-Voltage Development Was Traced and the Possibilities of Standardization Were Considered—Some of the Factors Which Render Very High Voltages Uneconomical Were Pointed Out

AT the meeting of the American Institute of Electrical Engineers held in New York on April 14, a paper prepared by Clarence Renshaw on "High Voltage D. C. Railway Practice" was read by N. W. Storer in the absence of the author. An abstract of the paper is given below. After reading the paper Mr. Storer gave an illustrated description of the equipment of the experimental Grass Lake line of the Michigan United Traction Company. This was covered in an article by Mr. Storer in the issue of the *ELECTRIC RAILWAY JOURNAL* for Oct. 2, 1915, page 660. The points raised in Mr. Renshaw's paper were discussed by Frank J. Sprague, New York, W. J. Davis, General Electric Company, San Francisco, Cal.; W. B. Potter and A. H. Armstrong, General Electric Company, Schenectady, N. Y.; Calvert Townley, Westinghouse Electric & Manufacturing Company, New York, B. F. Wood, United Gas & Electric Engineering Corporation, New York, S. I. Oesterricher, New York; and N. W. Storer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

High-Voltage D.C. Railway Practice

BY CLARENCE RENSHAW

Railway Engineer Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Ten years ago the idea that approximately 600 volts was the maximum potential to be hoped for in the operation of d.c. railways was almost as firmly established as was the belief in the days of Columbus that the earth was flat. Then suddenly the plan was suggested of coupling four 600-volt motors ordinarily employed on interurban cars in pairs of two in series instead of two in parallel, and of connecting the generators in the station in a similar manner so as to employ 1200 instead of 600 volts. The plan was successful, and the use of voltages from 1200 to 1500 has become so common that to-day we are able to discuss details of high-voltage d.c. practice.

HIGH-VOLTAGE CAR EQUIPMENT

Motors.—Experience has shown that, in the design of motors, no precautions are necessary to provide against abnormal voltage distribution between motors due to slipping of wheels. Insulation and creeping distances on motors must, of course, be made suitable for the full potential. The extra insulation required for 1200-volt operation is now obtained by the use of better quality rather than greater quantity of material, and the extra distances by improved shaping and arrangement of parts. Generally speaking, therefore, motors are produced to-day for use in series on 1200 or 1500 volts with the same dimensions and weights as if made for use on only 600 or 750 volts.

There have been one or two instances where motors have been wound directly for full line potential. Speaking generally, such motors are heavier and depart more radically from standard low-voltage design than motors for operating two in series, and moreover they do not lend themselves as well to the operation of cars partly

on 600 and partly 1200 volts, as is so often required. High-voltage d.c. railway practice, in the matter of motors, therefore, may be said to consist in the use of two machines in series, these being identical in construction with standard motors for low-voltage service except in the comparatively minor details of quality of insulation and length of creepage path.

Control.—Our first 1200 and 1500-volt equipment employed thirteen pneumatically operated switches, while with the same current at 600 volts eight would have been sufficient. Experience showed that by improvements in interlocking, and by using no more resistance notches than with 600-volt motors it was possible to cut down the number of additional switches necessary on account of increased voltage to two for small equipments, and three for large ones. In dimensions also, it has been possible to work out designs for 1200 switch groups with the same cross-sectional area and the same weight per switch as those for 600 volts.

Auxiliary Control Devices.—In the first equipments for use on 1200 volts, it was considered undesirable to employ this voltage for auxiliary circuits such as those for lights, control, air compressors, etc., and a dynamotor was included to provide 600-volt current. To reduce the capacity required in the dynamotor, the air compressor motor was next wound for full line potential, and later the two machines were combined into a dynamotor-compressor. In locomotives or other equipments where forced ventilation is required, the blower fan is now mounted on the shaft of the dynamotor.

On cars of small or moderate size even the above arrangement is handicapped in the matter of cost and simplicity as compared with 600-volt equipment, so the next step was to arrange the lighting and control circuits for operation directly on line voltage. These two general arrangements constitute a dual standard, and one of the first decisions to be made in planning any given installation is between these two schemes.

OPERATION ON TWO VOLTAGES

Many high-speed, high-voltage interurban lines enter towns over the tracks of 600-volt systems. High speed in the city is not permissible in any case, so that half speed on 600 volts is sufficient. Under such circumstances, it is usual to provide for reconnecting the lighting and control circuits to receive full voltage on the 600-volt section, so that the main motors will remain permanently coupled in series. If a dynamotor-compressor is employed, the same changes automatically connect it for full speed on both voltages. Where cars which operate in this way employ a high-voltage compressor instead of a dynamotor-compressor, no change is ordinarily necessary for low-voltage operation.

High-voltage cars can, in general, be arranged to operate at full speed on both high and low voltage. When the proper scheme of operation on the two voltages has been decided, the next point to determine is the manner in which the change-over should be affected. The simplest method is the use of a manually operated switch on each car. It is sometimes desirable, however,

to have the change-over switch located beneath the car, and arranged for operation from the platform. In other cases, it is desirable to have the switches arranged not only for distant control, but also for simultaneous operation throughout the train. Protective devices are sometimes desired to prevent or minimize trouble, if the car is subjected to high voltage when the change-over switch is in the low-voltage position. These ordinarily consist of relays, which act quickly on excess voltage, and cut off the circuits likely to be damaged.

While the choice between automatic and non-automatic acceleration is not influenced particularly by the use of high voltages, there is a tendency to adhere to non-automatic control for simplicity. The same applies with regard to field control.

ALTERNATIVES IN CONTROL APPARATUS

In designing high-voltage d.c. interurban lines the common questions are: (1) Should the voltage be 1200 or 1500? (2) Should the equipment be of the dynamotor-compressor or of the non-dynamotor type? (3) Will it have to operate on high voltage only, or on both high and low voltage? (4) If required to operate on low voltage as well as high, will half speed be sufficient on main and compressor motors, or will full speed on both motors be necessary? (5) Must the change-over switch be arranged for indirect control, or will manual operation be sufficient? (6) If indirect control is required, will it be confined to the individual cars, or will simultaneous operation throughout the train be required? (7) Is a protective device essential to guard against damage by the application of the wrong voltage, or will this not be required? As far as I can judge, the current practice seems to be turning in the following directions: Where the high-voltage cars must run over existing 600-volt lines to any considerable extent, the exact ratio between 600 and 1200 volts offers some advantages. Since high-voltage motors are made from existing standards also, there is a wider range of choice for 1200-volt operation than there is for 1500-volt operation, especially where small sizes of the motors are required. So far, 1500 volts have been used in sections where 600-volt lines have been established only to a limited extent, that is, in comparatively virgin territory, whereas 1200 volts have been employed in sections where there has already been considerable 600-volt development. It seems probable that high-voltage practice will continue to follow these lines except in the case of the electrification of branch lines on steam railroads or similar instances where connections with existing lines will have little bearing. The general tendency is toward the use of the dynamotor-compressor on large, expensive cars, particularly where full speed is required on half voltage. It is particularly suitable for locomotives where forced ventilation is utilized. In the older sections of the country where distances of 4 miles or 5 miles must sometimes be run on city tracks, equipments are usually required to operate at full speed on half voltage. However, equipments for operating at half speed offer considerable advantages in weight, cost and simplicity. Where large cars are arranged for full speed on both voltages, the tendency is toward the use of full speed for the air compressor. The general tendency is to employ the simple, manually operated change-over switch except where cars are operated at close headway or constantly used in trains. In most cases, devices to protect against the wrong voltage are not considered necessary.

POWER GENERATION AND DISTRIBUTION

Power Supply.—D. c. power for high-voltage lines is generated in 1200- or 1500-volt machines which usually

employ a compensating winding as well as commutating poles. Twenty-five-cycle rotary converters producing 1200 or 1500 volts on one commutator are in successful use, but with 60 cycles the maximum voltage so far employed for a single machine is 750, so that two machines in series are still required for high-voltage lines. Common substation practice is to employ single synchronous converters where 25-cycle power is available, and either motor-generator sets or two converters in series on 60 cycles.

Switching.—The principal changes which have been made in handling current at 1200 or 1500 volts have been for the purpose of insuring safety. Switchboard panels have been made higher and circuit breakers and knife switches located out of direct reach, long wood rods leading to insulated handles being provided for opening and closing the circuits. Barriers are placed between breakers to prevent tendency to flash across.

Line Construction.—Catenary construction is generally used, although third-rail is in successful use on several lines. The voltage surges to which the latter may give rise under some circumstances, the difficulty of clearing a car in case of accident and the general accident hazard incident to the maintenance of a large conductor so close to the ground, are likely to limit the use of this form of construction. A growing practice is that of carrying the feeders for a considerable distance from the station before tapping into the contact wire, so as to limit the possible current flow.

Economic Significance.—The high-voltage d.c. railway development has been carried out with ease, success and speed, many of the possible difficulties seemingly having been overestimated in importance, for much of the trouble anticipated has failed to appear. This system has made possible the construction of interurban lines and the electrification of branch steam railroad lines at considerably less expense for a given grade of construction than with 600 volts, or to render possible for a given expenditure the construction of lines capable of handling much heavier traffic.

Voltages of 2400 and 3000.—Inasmuch as the 1200-volt systems have been brought about by the use of two 600-volt motors in series, and as a few motors wound directly for this voltage have been produced with no particular difficulty, the obvious procedure was to continue the geometric progression and connect 1200-volt motors and generators in series and operate at 2400 volts. One line installed on this basis has had a remarkably successful record. From a general standpoint, however, while the results have been welcomed as a contribution to the development of the art, similar applications for this particular voltage are apparently somewhat lacking. For trolley roads of the usual interurban class it requires apparatus which departs too widely from existing standards. For heavy traction, on the other hand, this voltage is much too low to solve the problem in a sufficiently comprehensive way. Even a voltage of 3000 does not do so completely. It is regrettable, also, that both 2400 and 3000 volts have been employed, and that in carrying on the upward progress in d.c. voltages, 1500-volt apparatus was not used at once for coupling in series for carrying on the geometric progression without the intermediate step.

STANDARDIZATION OF VOLTAGE DESIRABLE

Ultimate Limits of D.C. Voltage.—The general limits upon which standard practice in any industry is ordinarily settled are usually fixed by broad economic considerations rather than by physical limitations. It is entirely possible, for instance, to operate trains at a maximum speed of 90 m.p.h. or more, while the maximum ordinarily attained is from 60 to 80 m.p.h., and

the general average for interurban cars is 50 to 60 m.p.h. These values have been established by gradual increases until, without conscious effort, standardization has been automatically secured. In the voltages which may be employed in the d.c. railway system, there is some tendency toward the same procedure. While in a way such procedure would be the conservative and natural way for progress to come about in the use of higher d.c. voltages, its disadvantages are numerous. The apparently more radical plan of trying to select in advance the voltage where progress would naturally stop, and going at once to this voltage, would hence seem to be the more rational, and it is with this idea in view that our efforts toward the use of that kind of 5000 volts are being put forth. The 5000-volt experimental car on the Grass Lake line of the Michigan United Traction Company averaged 5295 miles per month from Oct. 1 to March 5 on a schedule which allows only 15 m.p.h., and its record would have been better had it not been for numerous mechanical difficulties with trucks, wheels, brake rigging, stove, pilots, etc. From November to February, the average was 5813 miles per month. Only two of the failures were due in any way to the use of 5000 volts.

Conclusion.—The pernicious flexibility of the 1200 and 1500-volt systems and the innumerable alternatives which they present for application to any definite case in interurban work seem to give timely warning of the great desirability of early standardization in the matter of higher d.c. voltages. The comparative ease with which apparatus for each voltage has been developed gives the most encouraging feeling for the future development along the same lines. The possibilities which a d.c. system at 5000 volts would offer were the apparatus commercially available make this voltage seem a logical one, and the results obtained with the experimental equipment now in operation give great hope that this voltage may some day be established commercially as the standard of d.c. high-voltage practice.

Discussion

MR. SPRAGUE ON INCREASES IN POTENTIAL

The discussion of Mr. Renshaw's paper was opened by Frank J. Sprague, who traced the history of d.c. voltage increase, which he had consistently advocated. He stated that in the early days of stationary motor development he had built special machines to operate normally at from 500 to 600 volts, but on which in the exigencies of service the voltage had been boosted to 1000. In the experiment on the Thirty-fourth Street line of the Manhattan Elevated Railroad in the latter part of 1886 he had used 600 volts from the third-rail. The voltage 400 to 450, adopted for Richmond and St. Joseph was regarded as extreme, but the standard was gradually raised to about 600, where it remained for a long time.

Mr. Sprague stated that in the early nineties, he pointed out the possibilities of high voltage, setting a limit for direct current at from 1000 to 1200 volts on single motors, above which it would probably be necessary to put motors in series. In an article in the *Electrical World* in 1903, he suggested that with the three-wire system it might be possible to make use of a maximum trolley potential of nearly 4000 volts. In 1905, he offered to undertake the construction of a third-rail road to operate at not less than 1500 volts, stating that that was not the limit of practical d.c. operation, and he urged upon the engineers of the Washington, Baltimore & Annapolis line that they adopt 1200-volt, d.c. operation. His recommendation of 1200 volts with third rail for the Central California Traction Company

was adopted, being the first installation of its kind.

Mr. Sprague stated further that in 1906, in a discussion before the A. S. C. E., he mentioned three radical developments which had taken place in d.c. motor construction; the use of commutating poles which, with additional facilities in control, make possible the construction of motors at from 1200 to 1500 volts, with the further possibility of operating two in series on double potential. He quoted H. M. Hobart as predicting in 1907 that within ten years d.c. systems as applied to railway electrifications would employ line pressure of the nature of 2000 or 3000 volts.

In conclusion, Mr. Sprague said that for practically twenty years the potentials for d.c. railways remained unchanged at 600 volts. In ten years it has jumped to 3000 volts, as used on the Chicago, Milwaukee & St. Paul Railway, one of the typically most difficult, and embracing in its 437 miles of line more route mileage than all the trunk line electrifications in the world. The 11,000-volt, 15-cycle system which some engineers at one time thought would become standard, is non-existent, and no single-phase motors are now being installed except on the few systems remaining.

MR. DAVIS DISCUSSES VOLTAGE LIMITATIONS

Referring to the conditions on the Southern Pacific system, Mr. Davis stated that the electrification there presents no new problems. It has been in operation for seven years with very marked success. He stated that the voltage to be used in an electrification depends upon certain limitations as to tonnage and speed, the former depending upon the number of tracks in service. On a four-track road, the drop in voltage in the track is small, the tracks and third-rails respectively being in multiple, so that lower voltages may be used than on single-track roads having to handle heavy tonnages. Hence, as far as distribution is concerned, lower voltages are satisfactory with many tracks.

Mr. Davis showed that the most desirable voltage depends not only upon saving in copper, but upon the load factor on the substations, and the cost and number of locomotives required to handle the traffic. With single-track freight roads, very little improvement in load factor is obtained if the substations are spaced more than 30 miles to 35 miles apart. With this spacing, the copper required for 3000 hp. to 4000 hp. per train is not excessive, and the size of wire is fixed as much by mechanical considerations as by current capacity and voltage drop. Similarly, substation capacity as applying to the whole system, is not materially reduced because motor generator sets must be large enough to carry three times normal load, and as long as 33 per cent load factor is obtained there is no saving in apparatus.

From the standpoint of locomotive cost, Mr. Davis said that the locomotives of a single-track road cost about one-third of the cost of electrification. If, therefore, there is a material increase in the cost of 5000-volt locomotives as compared with 3000-volt locomotives, this increase might prove the determining factor in selecting the voltage. On the C., M. & St. P. Railway forty-two locomotives are required, and here an increase in cost of 30 per cent to 40 per cent would offset savings in the distribution system due to increase in voltage. On a double-track road, the difference would be still more marked, and would indicate the desirability of a voltage less than 5000.

MR. POTTER GIVES C., M. & ST. P. DATA

Mr. Potter indorsed Mr. Renshaw's statements that economic considerations must govern, and that we are more concerned with the future than with the past. He agreed with Mr. Renshaw's concluding sentence with

the provision that the word "available" be changed to "economical." Thus modified the sentence would read "The possibilities which a d.c. system of 5000 volts would offer, were the apparatus commercially economical, make this voltage seem a logical one, etc."

Some of the factors in electrification are but little affected by the operating voltage, *e.g.*, power station equipment, high-tension transmission, bonding, etc. In general the cost of substations with equipment of established character is but little affected, as with the higher voltage there is an increased cost per kilowatt, offset in some measure by the less number of substations due to the wider spacing, but not directly as the individual capacity of each substation must usually be increased to handle the included traffic within the longer section. The feeder copper and rolling stock are the factors which are more directly influenced. In selecting the voltage for the C., M. & St. P. electrification, both 3000 and 5000 volts were considered. While the initial cost was about the same in either case, the saving in copper at the higher voltage was offset by the increased cost of locomotives, and from considerations of maintenance and depreciation it is obvious that, for the same total, the expenditure should preferably be in copper rather than in rolling stock.

The relation of cost for certain factors in the C., M. & St. P. electrification is substantially as follows: High-tension transmission lines, 10 per cent; overhead construction, feeder copper, etc., 28 per cent; bonding, 4 per cent; substations, 18 per cent, and locomotives, 40 per cent, the total for the substations complete, together with the direct-current copper, being less than for the locomotives.

Referring to 5000-volt apparatus, Mr. Potter said that such can be handled without doubt. The B., A. & P. locomotives were operated successfully as an experimental equipment in testing control equipment at this voltage. It is true also that the high-voltage arc burns less than does that produced at lower voltage, as it seems to spread around. Regarding the choice of 2400 volts for the Butte, Anaconda & Pacific Railway, he said that the voltage might have been 3000.

From the standpoint of collection of current, 3000 volts potential is sufficient for the largest locomotive likely to be required. The B., P. & A. has roller collectors, operating with 800 to 1000 amp. For high speed these rollers must be carefully balanced, and as the C., M. & St. P. passenger service involves speeds up to 60 m.p.h., collectors which would not require balancing were found preferable. The wear on the contact wire was found to be due to incipient arcing rather than to friction, and it was reduced by increasing the pressure and by lubrication. Maintenance of contact between the pantograph shoe and the contact wire is necessary, and on the C., M. & St. P. the contact wire is slightly lifted by the pantograph. Currents up to 1800 amp. have been collected experimentally at 70 m.p.h. and up to 3000 amp. at lower speed.

In conclusion Mr. Potter said that the C., M. & St. P. electrification operation has been very satisfactory. The regulators used in connection with the motor-generator sets caused some trouble, easily overcome, due to their being small for the duty. Some of the cam-operated switches caused trouble due to defects in manufacture. An interesting operating feature was the frosting of cold electric locomotives when they were taken into the roundhouse. The regenerative system has been successful, eliminating the necessity for stopping trains for inspection. The use of 3000 volts was only an incident in connection with regenerative operation, the principal value of which is in permitting the making of schedules.

On the general topic Mr. Potter stated that he did

not consider 3000 volts the limit, but he emphasized the fact that as railroads are operated for profit, standards cannot be established arbitrarily.

MR. ARMSTRONG CONTENDS THAT STANDARDIZATION CANNOT BE ARBITRARILY IMPOSED

Mr. Armstrong pointed out that some of the statements in the paper by Mr. Renshaw discredited the electrifications for which high-voltage direct current has recently been adopted. The questions to be asked are: "What is the trouble with the voltages in use?" and "What is the purpose in suggesting the use of 5000 volts?" Five heavy electrifications have been put in recently at from 2400 to 3000 volts, three of which are in operation, and two will be so in a few months. The inadequacy of these voltages must be proved before a higher voltage is adopted.

High-voltage equipment is necessarily expensive. From the standpoint of distribution it should be noted that on the C., M. & St. P. electrification, a 500,000-circ. mil feeder is used on most of the lines, and with this the average drop is but 10 per cent, and the maximum not over 20 per cent. This road has nineteen substations of a combined capacity of 59,500 kw., and the aggregate capacity of the forty-two locomotives is 126,000 kw. The substations are spaced about 30 miles apart. A greater spacing would increase the necessary aggregate capacity due to the fact that the trains would be bunched on the substations.

Mr. Armstrong did not agree that 5000 is the proper voltage for standardization. Such standardization is not an easy matter, and must come as a result of long effort on the part of many engineers.

Referring to the Grass Lake experimental line, he commented on the absence of d.c. circuit-breakers, necessitating the opening of the a.c. circuit, with the attendant difficulties. He regarded the 5000-volt line as an interesting experiment, but as leading to no definite conclusion.

Mr. Townley expressed his opposition to any attempt to establish a standard voltage, or to state the limits beyond which progress cannot go. If improvements in what may be termed "the fundamentals" can be carried out, the advance must be welcome. Transmission voltage is such a fundamental. Increase in a fundamental is a permanent advance and equipment can be improved to correspond. Mr. Townley attributed the sudden increase in d.c. railway voltage during the past few years to the demands of heavy traction and to competition with the single-phase system. He regarded the high-voltage development as a step in the direction of interchangeability. Mr. Oesterreicher directed attention to a high-voltage d.c. road in Austria-Hungary designed by Dr. Fisher of the Budapest City Railroads. A storage battery with Pirani control equipment is a feature of this. The speaker described the construction of the road with the aid of lantern slides.

Mr. Wood stated that what the steam railroads want is dependability in operation. Standardization is important to this end.

In closing, Mr. Storer said that he had never opposed the use of the d.c. locomotive, but had advocated alternating current on account of the higher voltage which could be used with it. He said that a system that is reliable will have low maintenance cost, but that no system would be suitable for standardization that is not thoroughly reliable. While the 5000-volt system seems promising it has not yet been proved out. There is no doubt that current collection at 3000 volts is satisfactory, but there is nothing to show that 5000-volt equipment will be more costly than that for lower voltage.

To sum up the whole situation, however, Mr. Storer said that engineers must get together on standards.

COMMUNICATIONS

Efficient Car Operation

NEW HAVEN, CONN., April 14, 1916.

To the Editors:

I have followed with a good deal of interest the recent discussion in your columns on the above subject. The issue between Messrs. Chappelle and Koehler now seems to have narrowed to the consideration of the conditions under which it is economical to run in the series position and avoid moving into the parallel position.

Mr. Chappelle sums up his conclusions by saying "Pausing on the series position with the controller should be discouraged to attain the best efficiency in practical operation." Mr. Koehler, on the other hand, shows that under certain special conditions it proved more economical to make the run in series. Mr. Chappelle bases his opinion on the fact that the gain in time, and consequent saving in energy consumption made possible by more rapid acceleration, may on the whole more than offset the extra losses in the starting resistance caused while moving from the series to the parallel position. It seems to me that both are right.

Some years ago I made a series of tests to establish this very point, and at that time reached the conclusion that for the conditions investigated, and on relatively short runs, there was a net gain by avoiding moving into parallel, whereas for longer runs it was more economical to move into parallel without appreciable delay on the full series notch. I believe that in general this rule holds true and it is entirely a question of the length of run involved.

I am in entire agreement with Mr. Chappelle as to the undesirability of cluttering up the motorman's mind with complicated instructions. A few simple practical instructions will be more effective, but it is not difficult for motormen to be made to appreciate the advantages of series operation for short runs. In fact, in most cases they will do this quite naturally. There is no fixed rule about it, however. The length of run for which it is more economical to avoid parallel operation is different for different conditions. It can only be found by experiment or analysis. In general it would appear sufficient simply to instruct the motormen to avoid moving into the parallel position when it is apparent that a short run will be made and at other times move as rapidly into full parallel as the ordinary considerations of safety, comfort of the passengers and care of equipment will permit. After such general instructions the motorman's judgment and experience will gradually guide him as to the most efficient method to employ at any moment; *i.e.*, providing his interest in the subject is aroused and maintained, and his operation checked by one of the methods available for this purpose. The writer believes this matter of checking the relative efficiency of motormen to be absolutely essential if economical operation is to be realized and maintained. Experience has invariably proved that instruction of itself will produce no permanent improvement.

In 1904, while assistant electrical engineer in charge of the electrified system of the Lancashire & Yorkshire Railway, England, it fell to the lot of the writer to personally train a large number of motormen and teach them the principles of economical operation. The points emphasized were as follows:

1. Accelerate as fast as practicable to full series. Pause there for three or four seconds, then move rap-

idly to full parallel on all runs excepting those which are very short.

2. Coast as much as possible.

3. Apply brakes at as high a rate and as evenly as practicable, making, when possible, one application do the work; and releasing the brakes just before the final stop in order to avoid the jerk.

4. Conductors were advised to shorten the station stops as much as possible, having regard to the safety and convenience of the public.

There were other instructions but these were the chief ones. Each motorman was thoroughly instructed in the fundamental principles involved. A test train was run to establish the most economical rates of acceleration and braking, and, before being allowed to drive an electric train in service, each motorman was made to operate a dummy controller specially fitted up in the carhouse for instruction purposes. In some cases men were made to operate the dummy controller several hours per day for a period of two or three weeks before being allowed to handle a train. The manipulation was repeatedly checked by stop watch methods until the men acquired the right rate and efficiency. In trolley work ordinarily such careful training is not required. It was necessary in this case, however, for the reason that the operating schedules were unusually severe. This was the pioneer steam railroad electrification of England. The schedules were the most difficult in the world, 30 m.p.h., with stops about 1 mile apart. Acceleration rates of 2 to 3 m.p.h.p.s., and correspondingly high braking rates, were maintained. At this point the writer can bear out what Mr. Chappelle has maintained, namely, that passengers do not object to a high acceleration or braking rate—it is the uneven or jerky start and stop which is uncomfortable. Coasting signs, also, were developed and their location carefully tested for. Since three-, four- and five-car trains made the same schedule, three differently located coasting signs were necessary between adjacent stopping points in each direction. This coasting-sign method of saving power was quite crude compared with the more recently developed coasting recorder. Nevertheless, the savings made in power and brakeshoes were quite material. So far as the writer has been able to discover, this (1904) was the first time that coasting signs were used to save power and brakeshoes on an electric railway.

WILLIAM ARTHUR.

"Manners Make the (Platform) Man"

EASTON, CAL., April 7, 1916.

To the Editors:

I have read the editorial in the April 1 issue entitled "Manners Make the (Platform) Man." Did it ever occur to you that the manners of a platform man may often be molded largely by the treatment accorded to him by his immediate superiors?

I have in mind my own experience as a motorman a few years ago on a large system. After I had worked hardly long enough to know all the rules of the employing company, I was called into the division superintendent's office and in no gentle terms informed I had violated a certain rule the day before. Without wishing to be disrespectful I replied such was not the case, whereupon this official's face assumed an expression of uncontrollable rage, and he glared at me like a wild beast and roared out, "By the eternal it happened yesterday, and don't you dare to deny it or or you go to the cashier's office at once." This particular official, I learned afterward, was in the habit of intimidating every new man the same way.

If politeness is to count in modern railway practice,

could one possibly place a greater stumbling block in the path of men new in a company's service than a bullying superintendent or an inspector too big for his job? Should it not be incumbent on company officials to set a good example before the men?

F. P. WILL.

A Plea for Patriotism

DREW ELECTRIC & MANUFACTURING COMPANY

INDIANAPOLIS, IND., April 18, 1916.

To the Editors:

Preparedness, Propaganda and Patriotism are popular words during these piping days of unprepared peace. I think everyone has a vague idea that something ought to be done to protect the country, that the army and navy should be increased and strengthened, that Congress should appropriate \$1,000,000,000 more or less to provide more artillery, more ships, more coast defenses, etc. It is, generally speaking, however, a case of "let George do it," while the rest of us go on making money, getting out of debt, earning dividends and trying to win promotion or some other selfish end.

If it requires the continuous operation of fifty lathes to supply ammunition for one 3-in. field gun, should not we (not the other fellow) do something to put our country, the richest prize in the world—on some self-protective basis? Why not let every manufacturer have ready a descriptive list of all machinery, its adaptability and capacity for turning out munitions work, the names and identity of all skilled operators for such machines, and such other information as may be of use?

The members of the American Electric Railway industry are employers of large numbers of men. Thousands of these men, if properly encouraged, would take military training. A great many could become part of the National Guard with little interruption to their duties. For the employer there would be a twofold or probably manifold motive. In the first place, and the most important, he would be serving his country. In the second, he would reap the benefit of the method, efficiency and discipline that military training produces. I do not refer to unskilled men only, but fine mechanics and men from the offices can be used. In recruiting men for a battery of field artillery in Indianapolis recently the commanding officer told us he needed men proficient in mathematics as well as men familiar with horses.

The general press has fairly impressed most of us with the needs of our country. As part of one great branch of American industry, can we not add our full quota to the general campaign? Many great engineers are giving their time. Five of America's greatest technical societies have organized for combined aid to the nation. Organized labor is lifting its ban on guard service. Not one American in a hundred knows how even to pick up a flobert rifle. If one of the warring countries in Europe trained her raw recruits nine months before sending them to the front in a period when they were sorely needed, how long would this country require to recruit and equip a force sufficient to repel a few shiploads of veterans from some enemy country?

I suggest that railway companies and manufacturers put the following notice as bulletins in their plants and property, or as inclosures in their pay envelopes.

Appreciating the necessity for a greater degree of military preparedness and patriotic spirit in the United States, and desiring to co-operate with such of its employees as are or may be enlisted in military organizations, it is hereby announced that this company wishes to encourage enlistments in the (name of State) National Guard, that time will be granted all employees to attend drills, maneuvers

or to perform other military duties, and that no employee shall suffer in his employment or opportunity for advancement with this company by reason of such military service.

It is further announced that employees will be paid by this company regular wages while such employees are attending maneuvers, under orders, not to exceed two weeks in any one year.

The above pay envelope slip is one being offered to manufacturers in Indiana by the military affairs committee of the Chamber of Commerce in Indianapolis.

Pending official united action by the electric railway industry, which surely ought to come in this matter, every individual employer should encourage himself and his men to assist in awakening patriotism and in preparing for adequate protection on land and sea. Put a suitable sized United States flag on every city and inter-urban car and building. Let us try to live for our country now rather than wait to die in it, unprepared and in vain.

Let us by a little sacrifice of time and money do our part toward enabling the United States of America to enforce on land or sea, at home or abroad, her rights as a world power.

JAMES H. DREW, President.

Electric Roads to Serve Large Market

Newly Formed Company Announces Immediate Start on Construction of Union Market Terminal in the Heart of Los Angeles

ARTICLES of incorporation have been filed in the California State capital for the Los Angeles Union Terminal Company, which announces that work will be started at once on a terminal in Los Angeles for handling wholesale and market business. The site selected covers the 32 acres bounded by Seventh, Eighth and Alameda Streets and Central Avenue.

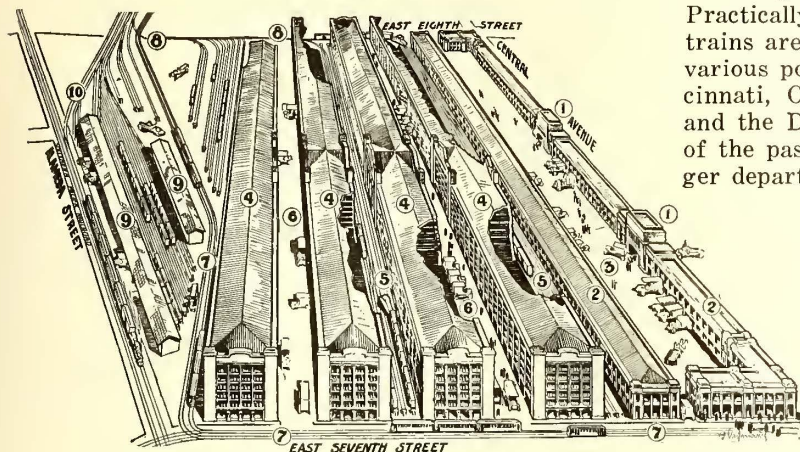
The plan was conceived by Benjamin Johnson, president of the Los Angeles public market, as a means of eliminating the costly haul between railroad and steamship terminals and warehouses and markets. Mr. Johnson interested Paul Shoup, president of the Pacific Electric Railway, and through him San Francisco and Los Angeles capital was attracted to the enterprise. The new company has sold \$3,250,000 in bonds to a syndicate of Los Angeles and San Francisco bankers headed by Herbert Fleishhacker and including E. H. Rollins & Sons, the Anglo & London-Paris National Bank of San Francisco, and others. The plans, which have been under consideration for almost two years, involve the expenditure of about \$6,500,000 in the first unit of construction.

It is planned to construct six buildings, each 1250 ft. long, with a frontage of 100 ft. on Seventh Street, four of which will be six stories high, and two to be used by the Los Angeles public market, two stories in height. These will be supplemented by a market yard 1200 ft. long and 180 ft. wide. Each warehouse building is to have an 80-ft. private paved street on one side and separate tracks on the other. Altogether there will be about 2 miles of railroad trackage involved in the new terminal.

The shops and carhouses of the Pacific Electric Company, which now occupy part of the area involved in the new construction, are to be segregated for transfer to Watts, Vineyard Junction and Covina Junction. As part of the deal the Pacific Electric takes over the present property of the Los Angeles public market on East Sixth Street and transfers to the Los Angeles Union Terminal Company all its equity in the Seventh Street property required for the new terminal.

The Pacific Electric has already entered into an arrangement with the city of Los Angeles to operate the

municipally owned sections of railway at the harbor so that with the completion of the wholesale terminal there will be a central point for the collection of all shipments gathered from the harbor wharves, as the terminal will be immediately adjoining the incoming and outgoing freight houses of the Pacific Electric so that practically



LOS ANGELES MARKET AND ELECTRIC RAILWAY TERMINAL.

- | | |
|---|---|
| 1. Entrance to market through two-story building. | 7. Pacific Electric Railway main line. |
| 2. Wholesale market buildings. | 8. Entrance of Pacific Electric tracks to buildings. |
| 3. Market yard. | 9. Pacific Electric incoming and outgoing freight houses. |
| 4. Buildings for wholesale houses. | 10. Connection between Pacific Electric and Southern Pacific. |
| 5 and 6. Two of these streets to be occupied by Pacific Electric tracks, two for auto trucks. | |

the entire shipping business with southern California suburban towns will probably center in the new terminal.

Work will be begun first on the public market buildings so that the public market can be transferred at the earliest possible date. Construction is to be started this month, it is stated.

How the Detroit United Stimulates Traffic

Methods Used by the Publicity and Passenger Departments Which Have Resulted in Marked Increase in Passenger Traffic

PRACTICALLY a \$1,000,000 increase, equivalent to 8 per cent of the gross earnings from passenger traffic on the Detroit (Mich.) United Railway's lines during the year 1915 over the one previous, is a phenomenal showing for a period during which this country was just recovering from a serious business depression. Detroit and the territory contiguous were more fortunate than other parts of the country in that there was little or no evidence of the general business depression which existed elsewhere. On the other hand, the persistence and ingenuity of the traffic and publicity departments of this company did much to stimulate passenger traffic so that approximately 62,000 more revenue passengers were handled daily in 1915 than in 1914.

Publicity in various forms is largely responsible for the success attending the work of the passenger and the publicity departments. Under various headings coming events in Detroit and at points along the Detroit United lines are announced in the *Electric Railway Service*, a paper published by the publicity department of the Detroit United Railway. This keeps the public continually advised of all forms of entertainment in which they may be interested. Banner boards printed in large type and attached to the fenders of the street and interurban cars also direct attention to events of interest.

Remarkable results have also been obtained by advertising the fact that various steam railroads operating either out of Detroit or other cities touched by the Detroit United Railway's lines will run excursion trains. In this connection the passenger department also advertises special rates for those who want to take advantage of these excursions on the steam railroads. Practically every Sunday during the year excursion trains are run over the steam railroads from Toledo to various points, including Cleveland, Columbus and Cincinnati, Ohio, Indianapolis, Ind., and St. Louis, Mo., and the Detroit United Railway delivers a large share of the passengers for all of these trains. The passenger department of the electric line keeps in close touch with the steam railroads so that the passengers it delivers to any of them will be cared for comfortably.

Touched by the various branches of the Detroit United Railway lines are a number of popular summer resorts. Beginning about the first of February, each year, the passenger department advertises on its banner boards and in *Electric Railway Service*, requesting the owners of summer cottages to list them with the department. Upon inquiring as to what information is desired, the department furnishes the cottage owners with standard forms for cottage lists. These contain the name of the owner, the telephone number, the address, the number of cottages for rent, the location of the cottages relative to car lines and other summer resorts, the rates per week, month or season, the number of rooms and the conveniences. Following this request in 1915 a large number of cottages were listed and more than 500 requests for these lists were supplied.

Just as soon as a number of cottages have been listed the printed matter on the banner boards is changed to read "Make your summer reservations at Lake Orion, Phone, Main 4804." The fact that the passenger department has these cottage lists is also advertised in *Electric Railway Service*. At the same time these advertisements are being run, articles suggesting various plans for renting cottages are also published. As a result of this plan of advertising, the Detroit United Railway's interurban lines have become a popular means of reaching the numerous summer resorts in eastern Michigan.

Another plan of stimulating passenger traffic followed by the passenger department, is that of keeping in touch with the activities of the various churches, societies, lodges, graduating classes, etc., in the cities and villages touched by its lines. Early in February letters are sent to each of the way station agents, requesting them to make a list of all these organizations in the cities and towns in which their stations are situated, and also to furnish the name of the president or secretary of each organization. As this information is received it forms a mailing list for all circular matter which is of interest to such organizations. These lists are also supplied to the various boat lines operating on the Great Lakes out of Detroit, and to the various summer and pleasure resort managers. These in turn circularize the organizations, and the combined effort of all has produced excellent results for the passenger traffic department.

The Master Carbuilders' Association is to exhibit the results of educational work carried on by the steam railroads in connection with the annual convention to be held in Atlantic City in June. Jacob Yoder of the Pennsylvania Railroad is chairman of the committee which will have this exhibit in charge.

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

ASSOCIATION NEWS

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

President Henry Addresses Membership in Letter on Convention Plans—Association Issues Comprehensive Valuation Bibliography—Membership Committee Plans Aggressive Campaign—Engineering-Accounting Committee Meets in New York—Company Section News

PLANS FOR CONVENTION EXHIBITS AND ENTERTAINMENT

During the present week President Charles L. Henry has sent to members of the association and others interested in the electric railway industry a circular letter on the plans for the convention to be held at Atlantic City on Oct. 9 to 13. In this is explained the new arrangement for the management of the exhibit and entertainment features by the American Association rather than by the Manufacturers' Association, as formerly, manufacturers now being on the same footing as railway companies or members of the former association.

The letter contains the lists of additional members of the company membership committee and of the members of the convention committees, as printed in last week's issue of the *ELECTRIC RAILWAY JOURNAL*. These comprise a general convention committee and three sub-committees on exhibits, entertainment, and exhibit and entertainment finance respectively. The committees are complete with the exception of the sub-committee on entertainment.

Mr. Henry states that manufacturers' exhibits will be made by member companies in accordance with space rates to be arranged by the exhibit committee. All other privileges of the convention will be open to representatives of all railway and manufacturing companies without payment of fees of any kind other than the company membership dues. Dues of manufacturing member companies for the fiscal year ending Oct. 31, 1916, will be one-half of the full annual dues.

Mr. Henry concludes his letter as follows:

"The new plans for the association and its work, which called for the addition of manufacturing companies to its membership, have been fully discussed and are now well understood. It is encouraging to all interested in the industry to know that the more these plans are considered the more they meet with the enthusiastic approval of all. The new privileges as to membership have already been taken advantage of by many manufacturing companies and the indications point to a very large combined membership for the association. The exhibit committee and others who have begun the work for the October convention feel assured that the exhibits and other features will more than measure up to the increased membership of the association and the broadened work in which all are engaged."

BIBLIOGRAPHY ON VALUATION

The committee on valuation of the American Association is now sending out to the executives of member companies a seventy-two page bibliography on the valuation of public utilities, prepared by the library staff of the American Society of Civil Engineers, under the direction of the sub-committee of the committee on valuation, and published by the American Electric Railway Association. The bibliography is in two sections, the first one, up to July 16, 1913, being that prepared for the special committee on valuation of public utilities of the American Society of Civil Engineers (*Transactions*, Vol. LXXVI, page 2133), while the other is a

continuation thereof up to Dec. 23, 1915, for the benefit of the committee on valuation of the American Electric Railway Association. These combined sections, therefore, bring up to a very recent date the various references to the increasingly important subject of valuation, and the book should be very valuable to all member companies. The division of the references under street and interurban railway, railroads, electric light and power, and similar headings makes the use of the bibliography very easy.

Copies have been sent free to company members of the association, and can be supplied to individuals by Secretary Burritt at the nominal price of 50 cents per copy.

COMMITTEE ON COMPANY MEMBERSHIP

The manufacturers' branch of the American Association committee on company membership met in New York on April 18, with all of the members in attendance. A list of these was printed last week. H. C. Donecker, Public Service Railway, and L. E. Gould, *ELECTRIC RAILWAY JOURNAL*, were also present by invitation. The purpose of the meeting was to organize for an active campaign, the first part of which will be the sending out, next week, of a circular letter of invitation. The work of the committee was apportioned among the members and will be actively pushed.

ENGINEERING-ACCOUNTING COMMITTEE

A meeting of the joint committee representing the Engineering Association and the Accountants' Association was held in New York on April 17 with the following members present: L. P. Crecelius, electrical engineer Cleveland (Ohio) Railway, co-chairman; H. Bates, assistant engineer Connecticut Company, New Haven, Conn.; E. P. Roundey, engineer maintenance of way New York State Railways, Syracuse, N. Y.; F. H. Sillick, comptroller Hudson & Manhattan Railroad, New York, N. Y., co-chairman; J. C. Collins, secretary and general auditor New York State Railways, Rochester, N. Y.; C. H. Lahr, auditor Northern Ohio Traction & Light Company, Akron, Ohio, and H. A. Gidney, auditor Barre & Montpelier Traction & Light Company, Boston, Mass. The meeting was also attended by Martin Schreiber, engineer maintenance of way Public Service Railway, Newark, N. J., who represented the valuation committee of the American Association, and by T. P. Kilfoyle, auditor Cleveland (Ohio) Railway and president Accountants' Association; John Davis, head of the inventory department Cleveland (Ohio) Railway, and Edwin Gruhl, assistant to president North American Company, New York, N. Y., whose experience along the lines of its work the committee desired to know.

The largest part of the session was devoted to the first part of the work assigned to the committee, *i.e.*, the development of a property ledger looking toward the maintenance of a continuous inventory of all the physical property of a company. Messrs. Kilfoyle, Davis, Gruhl and Bates described the advances made by their companies along this line, and after a spirited discussion of the main outline of the proposed ledger a sub-committee, composed of Messrs. Bates (chairman),

Collins and Sillick, was appointed to work up the exact details. The committee then discussed its two other subjects—interdepartmental charges and the subdivisions of the accounts covering steam power-plant costs as presented by the 1915 committee on power generation. It concluded the work of the meeting with a decision that this second topic should be referred for consideration to the committee on standard classification of accounts of the Accountants' Association.

HAMPTON SECTION

At a meeting of the executive committee of company section No. 10, held on April 17, the last Friday of each month was selected as the regular meeting time. As announced in a recent issue of the *ELECTRIC RAILWAY JOURNAL*, Edgar C. Kelly is president of the section and Wilkie F. Collins is secretary. Brief biographical sketches of these men are given below.

Mr. Kelly was born in Huntington, Pa., in 1876, and after receiving a general education in the local public schools, he took a course of study at the Coast Artillery School, Fortress Monroe, Va. He has been in railroad work for nearly twenty years, serving in different capacities, including those of master mechanic of the West-



GROUP OF OFFICERS AND DIRECTORS COMPANY SECTION NO. 10

chester, Kennett & Wilmington Railway & Electric Company, and master mechanic of the Hampton Roads Traction Company. At present he is head electrician and pit foreman in the car shop of the Newport News & Hampton Gas & Electric Company. He is very popular among the employees of the company.

Mr. Collins is a newcomer in the electric railway field, having completed a four-year course in civil engineering at the Rensselaer Polytechnic Institute, Troy, N. Y., in 1915. Previous to this time he was for a year in the employ of the Fonda, Johnstown & Gloversville Railroad at Gloversville, N. Y., where he was connected with the engineering and mechanical departments. After leaving school, he entered the employ of the local company in Hampton as assistant engineer, which position he now holds. Mr. Collins hailed originally from Buffalo, N. Y., where he was born twenty-three years ago.

WASHINGTON R. & E. SECTION

Company section No. 4 held its regular meeting on April 12 in the new assembly hall of the company building, Vice-President J. T. Moffett presiding in the absence of President C. S. Kimball.

The feature of the meeting was an address by L. F. Schmeckbier of the National Park Service, who graphically described the work undertaken by the government in the development of the arid lands of the West, the address being illustrated by means of motion pictures and slides taken under the supervision of this branch of the government's service. An orchestra of four pieces, directed by Herbert Jackson of the engineering department of the company, rendered popular and classical selections during the evening, and a buffet luncheon was served to the 125 members attending the meeting.

Valuation Analysts Wanted

Civil Service Commission Announces Examination for Analyst for the Division of Valuation, Interstate Commerce Commission

THE United States Civil Service Commission has announced an open competitive examination on May 9, 1916, for valuation analysts in the division of valuation, Interstate Commerce Commission. The salaries in the first grade range from \$3,600 to \$5,000 and in the second grade from \$1,800 to \$3,300. Appointments to these positions will be principally for duty in Washington, D. C., but some appointments may be made for duty in the field. The duties of this position will be to compile data and to prepare complete, concise and logical reports upon valuation subjects, and to analyze, edit and digest reports submitted by sections of the division of valuation.

Applicants should have had actual experience in the final preparation of financial, statistical or valuation reports upon public utilities, and possess the ability to prepare such reports in a concise, clear and logical form. Applicants for positions under grade 1 must show that they have had at least eighteen months' responsible experience in the final preparation of financial, statistical or valuation reports upon public utilities and must be between thirty and sixty years of age. For grade 2 positions, such experience for at least six months must be shown and the age limit is between twenty-five and fifty years. In each case this experience should have been gained in the employment of a public authority or commission engaged in the effectual regulation of public utilities, or with an important public utility, or in investigations of a similar character. Experience with mercantile concerns, with large utilities in routine positions, or with small utilities with limited operations will not be accepted as qualifying experience in this connection.

Traffic Over the New York Bridges

The Public Service Commission for the First District of New York has received from the bridge department a report of the annual count of passengers using the various East River bridges. The count was made on Oct. 28, 1915, and covered a continuous period of twenty-four hours. The travel in each direction was counted. By far the largest traffic passed over the Williamsburg Bridge, which carried 355,561 passengers in the twenty-four hours. This was an increase of about 28,000 over the previous year, when the total was 327,134. The Brooklyn Bridge showed a falling off of 50,000, the figures for 1915 being 243,617 as against 293,706 in 1914. The Queensboro Bridge showed a slight increase, with 93,654 as against 89,847. The opening of the Fourth Avenue subway line across the Manhattan Bridge is indicated by the large increase in the traffic over that structure. Its total was 111,314 as against 52,395 the year previous. The total traffic on all bridges increased from 763,002 in 1914 to 804,146 in 1915.

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.

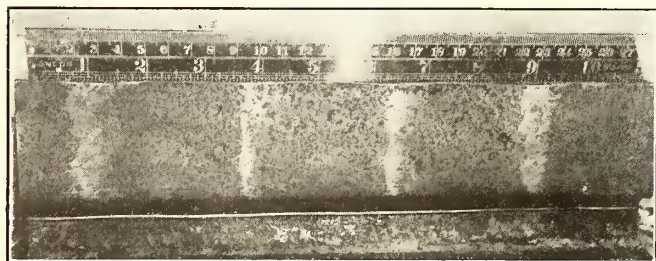
A Study of a Corrugated Rail

BY HENRY M. SAYERS
M. I. E. E. (England)

Despite the extensive literature dealing with rail corrugation, very little has been published to show precisely how a corrugated rail is affected in its minute structure. The disease has been studied from the point of causation, but the symptoms of the suffering patient, *i.e.*, the rail itself, have not been investigated or put on record in any detail.

It seems essential to the cure of such a trouble as rail corrugation that a full investigation should be made of the condition of the rail, so that as far as possible the nature of the failure of the material shall be ascertained, which may indicate the direction in which a modification of its mechanical properties should make it more resistant.

With this end in view a good specimen of corrugated



RAIL CORRUGATION—FIG. 1—CORRUGATED SURFACE OF RAIL

rail, kindly furnished by A. L. C. Fell, chief officer of the London City Council Tramways, has been closely examined and photographed. The resulting photographs were used to illustrate Stephen Sellon's paper on "Rail Corrugation and Its Causes," read before the Institution of Civil Engineers, England. The rail came from the tramway on the Victoria Embankment, London. It had been in use thirteen months, corrugations had been ground out of it twice, the last time in October, 1913, and it was cut out for examination at the end of January, 1914. It was the outside rail on a long-radius curve. By means of a straight edge laid on the rail

table and feeler gages slid beneath in the hollows the depths of the hollows were determined. The depth was found to be as great as 0.016 in. in two places. Fig. 1 is a face view, showing the characteristic appearance of corrugated rail, and also showing by the straight edge a marked detrusion to the outside of the rail at each hollow. Figs. 2 and 3 show the natural or untreated surfaces of a crest and a hollow respectively, magnified $13\frac{1}{2}$ diameters.

These photographs, which may all be considered as naked-eye views, show clearly that the crests are polished as by combined grinding and rolling action, whereas the hollows are dull and pitted, and that the metal at the hollows has, in part, flowed or detruded laterally, in this case to the outside of the rail. There is some indication, not shown on the photographs, of detrusion to the groove side, but there is considerable wear due to the throat of the flanges bearing on the edge of the groove which does not permit of any precise statement about it.

The micro-photographs described below are from polished and etched specimens showing the minute structure of the steel, and how it seems to be affected in the crests and hollows respectively.

Fig. 4 is the surface of a crest and Fig. 5 that of a hollow, magnified in each case 110 diameters. In the preparation of these surface specimens care was taken to remove as little as possible of the surface metal, but necessarily the surface examined was some very small depth below the working surface of the rail table. Fig. 4, the crest, shows a nearly uniform bright surface crossed by some transverse cracks, while Fig. 5 shows a network surface.

Figs. 6 and 7 are longitudinal sections at a crest and at a hollow respectively, also magnified 110 diameters. They show that the network structure is altered at the crests to a thin skin of structureless material, whereas at the hollows the network structure of the steel persists unaltered to the extreme surface. Fig. 8 is a longitudinal section well below the surface, and may be taken as showing the normal structure of the steel, a "ferrite" network round "pearlite" masses. This specimen is magnified 700 diameters.

Figs. 9 and 10 show the surfaces of crest and hollow



RAIL CORRUGATION—FIGS. 2 AND 3—NATURAL SURFACES OF CREST AND HOLLOW, RESPECTIVELY, OF CORRUGATED RAIL, MAGNIFIED $13\frac{1}{2}$ DIAMETERS; FIG. 4—SURFACE OF CREST, MAGNIFIED 110 DIAMETERS



RAIL CORRUGATION—FIG. 5—SURFACE OF HOLLOW, 110 DIAMETERS; FIGS. 6 AND 7—LONGITUDINAL SECTIONS AT CREST AND HOLLOW, 110 DIAMETERS

respectively, magnified 700 diameters. Fig. 9 has caught one of the surface cracks shown in Fig. 4 at the lower magnification, and both Fig. 10 and Fig. 11 confirm the lower power micro-photograph in respect to the surface characteristics. Fig. 11 is a longitudinal section at a crest, showing one of the transverse cracks in section. The magnification is 300 diameters, and the depth of the crack as shown is about 0.067 in. The crack gets through the altered skin layer into the normal network structure below. Fig. 12 is a longitudinal section of a hollow, magnified 700 diameters, showing one of the smaller pits in the rail table in section.

The high-power photographs confirm the low-power ones, by showing that the lack of apparent structure in the crests is not due to insufficient magnifying power. It is possible that this lack of visible structure is due to the metal resisting the attack of the etching acid, but whatever the exact cause may be, it is clearly altered, while the surface of the hollows consists of unaltered steel.

To sum up, this examination of a particular specimen shows the following facts: The corrugations have a pitch of about $2\frac{3}{8}$ in., of which the crest occupies about $\frac{1}{2}$ in. (varying slightly in the width of the table, and also as between successive crests). The crest presents a bright surface consisting of metal which has been altered from the normal condition of the steel in the sense that it has for a small depth a greater resistance to acid attack, and is of a finer and apparently more homogeneous structure than that of the body of the rail head. The crest metal shows transverse cracks, especially on the edge of the crests, suggesting that it is more brittle, or that it has been stretched beyond its tensile strength, and it may be added that in the process of cutting and polishing it was found perceptibly harder than the body of the metal. The hollows, on the other hand, show a dull pitted surface, with lateral flow of metal on the free edge, and surface unaltered from the

normal structure of the metal, suggesting that particles are torn off or crushed off, leaving a rough fractured surface, which was not perceptibly harder than the body of the steel when it was cut and polished.

There may be some difference of opinion as to what kind of failure these appearances indicate, and there is room for a good deal of discussion as to why the two effects should be produced in such regular alterations, but it seems clear that what happens to the rail is as follows:

At the crests, the surface is cold rolled, and is made harder and more brittle by the cold rolling. It may be



RAIL CORRUGATION—FIG. 11—LONGITUDINAL SECTION AT CREST, 300 DIAMETERS; FIG. 12—LONGITUDINAL SECTION AT HOLLOW, 700 DIAMETERS

that it is stretched longitudinally and cracks under the tension, but it seems more likely that the transverse cracks are due to the surface brittleness, and mark the first stage in the flaking away of the hardened skin from the unaltered metal below. It is certain that the transverse cracks are most plentiful at the edges of the crests.

In the hollows the table is subjected to a compressive stress (vertical pressure) in excess of the compressive strength of the material, resulting (a) in detrusion or cold flowing on the free edges, and (b) in crumbling on the surface. If only detrusion resulted, it would indi-



RAIL CORRUGATION—FIG. 8—LONGITUDINAL SECTION BELOW SURFACE, 700 DIAMETERS; FIGS. 9 AND 10—SURFACES OF CREST AND HOLLOW, RESPECTIVELY, MAGNIFIED 700 DIAMETERS

cate that the elastic limit of the material had been exceeded, but the crumbling shows that the crushing point is reached.

It seems, therefore, that corrugation will not occur to a rail which, in the first place, does not develop a brittle layer when cold rolled, and in the second place has a compressive elastic limit and crushing point in excess of the maximum pressures to which it is subjected by the wheels. Exactly what degree of resistance to each of the influences named is necessary, and how such resistance can be attained, are questions which can only be answered by experiment, and by the skill of metallurgists and rail rollers; but this seems to be the most hopeful direction in which to seek a cure.

The inferences drawn from the examinations herein set out seem to receive confirmation from the well-known fact that wrought-iron rails did not corrugate, and from statements made in various quarters that neither very soft steel nor very hard steel rails corrugate. This latter statement may be contradicted by certain cases, as is the way with statements about rail corrugation, and particularly in respect to manganese steel, both in special work and in rails; but I should like to suggest that iron-manganese alloys have a very curious set of properties, and that in their case at least hardness is not inconsistent with considerable ductility. It is also well known that the properties of high-manganese steel are remarkably susceptible to heat treatment, and it seems possible that there may be similar peculiarities in respect to change under mechanical treatment, which accounts for hard manganese materials succumbing to this much-debated and very troublesome affection.

Reclaiming Worn Button-End Axles

BY A. H. THOMPSON

Car-Shed Foreman,* Christchurch (New Zealand)
Tramway Board

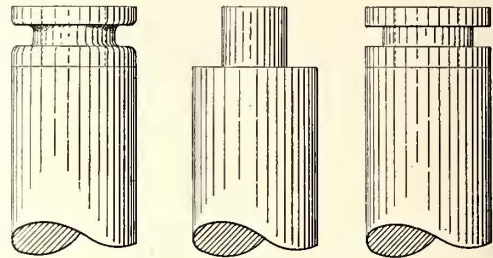
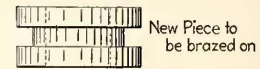
In the issue of the *ELECTRICAL RAILWAY JOURNAL* for Jan. 8, 1916, page 89, appeared an article on the above subject by J. N. Graham, master mechanic of the Rockford & Interurban Railway. As this item of repair is one which must be faced by all railway men having to do with this type of axle, it occurred to the writer that his experience in reclaiming worn button-end axles might be of interest to the readers of the *JOURNAL*.

The procedure followed by the writer is this: The axle is placed between lathe centers, and the worn end is turned down to $1\frac{1}{2}$ in. diameter, from the end to a point $\frac{1}{2}$ in. from the inner edge of the check-plate groove. A piece of old axle is cut off to the required length, bored for an easy fit on the $1\frac{1}{2}$ -in. diameter end, and brazed upon it by means of a gas blow-pipe connected to the shop air system. The axle is then placed in the lathe, and the new portion is turned flush with the journal. Finally, the groove is cut to suit the check plate.

The above operation has been carried out several hundred times during the past ten years, and has failed only once during that period, when the new part loosened probably owing to want of care in brazing. It appears to the writer that the result obtained by the method described is better than that resulting from the use of Mr. Graham's method because the groove is restored to the condition which existed when the axle was new. By this method the inner edge of the groove is untouched and, being subjected to as much wear as the outer edge, it ceases to do its share in checking the lateral movement of the axle.

*NOTE. This is the Australian title corresponding to "master mechanic" in this country.—Eds.

In this connection it may be of interest to note that the writer has recently adopted a malleable, cast check plate, which can be refilled at the surfaces, which are in contact with the axle, with fresh liners of phosphor bronze as these liners are worn out. The liners are cast in recesses which are left in the malleable check plate.



WORN AXLE END, AXLE END TURNED READY FOR NEW END, AND FINISHED AXLE END

We pay the equivalent of 36 cents in United States money for castings, and receive 12 cents for scrap. As our driver check plates weigh $3\frac{3}{4}$ lb., it can be readily seen that a substantial saving is effected by using the body of the check plate over and over again.

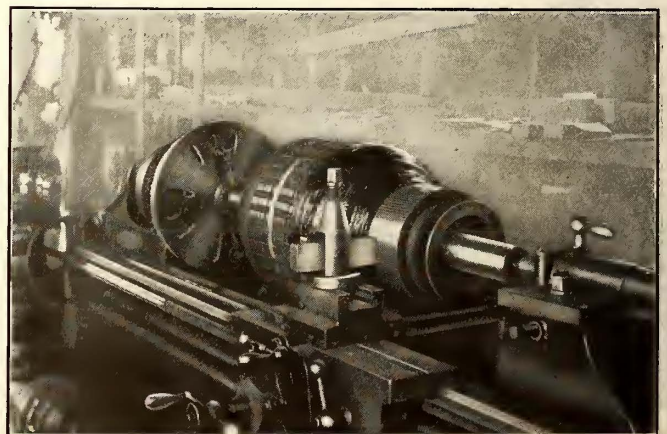
Grinding Commutators in Evansville

BY K. D. LEAVITT

Master Mechanic Public Utilities Company, Evansville, Ind.

Commutator and brush life has been prolonged and the cost of turning commutators has been greatly reduced by the substitution of grinding for the usual cutting operation in the shops of the Public Utilities Company of Evansville, Ind. Grinding blocks especially suited for this purpose were obtained from the Norton Grinding Company of Worcester, Mass.

The grindstone blocks were wedged, as shown in the accompanying illustration, in an ordinary tool rest, the armature turning and banding lathe. The grinding of the commutator makes slotting unnecessary, because the copper in the commutator segments is not carried over the grooves and, at the same time, the amount of metal removed in turning is reduced to a minimum. The finished job has been found much more satisfactory because the surface of the commutator is perfectly true and round and, at the same time, it is highly polished. The accuracy of the finish is reflected in the increased



COMMUTATOR IN PROCESS OF GRINDING

life of the brushes. During the grinding operation the armature is turned at an approximate speed of 500 r.p.m., and where armature turning and slotting usually required two and one-half hours the grinding is accomplished in slightly less than one hour. It is estimated, after taking all the advantages into account, that the substitution of grinding for turning reduces the cost of this phase of commutator maintenance about 60 per cent.

Track Life Extended Three Years by Electric Welding

BY J. H. SUNDMAKER

Chief Engineer Ohio Electric Railway, Springfield, Ohio.

While this company does not own an electric welder, it has had a considerable amount of joint welding done under a contract with the Indianapolis Switch & Frog Company, which is located near by. This work to date has comprised the installation of 437 joints in track which was considerably run down. As a result, we know that the life of the track has been extended for at least three years at a very moderate cost. If it was not that the company mentioned, which makes the Indianapolis welder, is located in Springfield, the amount of work to be done on this property would undoubtedly warrant us in owning a welder. The track which has been repaired is laid with 9-in. tram rail. The cost of installation of each joint, including grinding, has been approximately \$5. The time consumed per joint, not including grinding or repaving, has averaged about forty minutes.

The accompanying illustrations are typical of the work which has been done. The first shows the appearance of joints with track laid on gravel foundation, on wood ties, and with ordinary bolted and bonded joints. The rail ends were from $\frac{3}{16}$ in. to $\frac{3}{4}$ in. apart, and they were bent and cupped. When the joints were opened up the splice bars were found to be battered down, resembling compromise joints in appearance. All of the bonds were loose, and in many cases they were entirely off.

The second illustration shows the application of a Simplex joint in connection with the header or supporting plate which is now incorporated in a unit plate, and

known as the Apex type of joint. In the joint shown a $\frac{1}{2}$ -in. shim has been inserted to close the joint, and hard steel has been welded on to the top of the rail to fill up the cup.

The third illustration shows a finished joint after grinding to the original surface. The head support is easily distinguished, as are also the hair lines showing the insertion of the shim.

As stated before, the results of this work have been very satisfactory, and on a recent inspection we found less deflection at the joints than between them. The conductivity is also equal to if not greater than that of the unbroken rail. There has been no change in the condition of the track since the joint repairs were made in the spring of 1913.

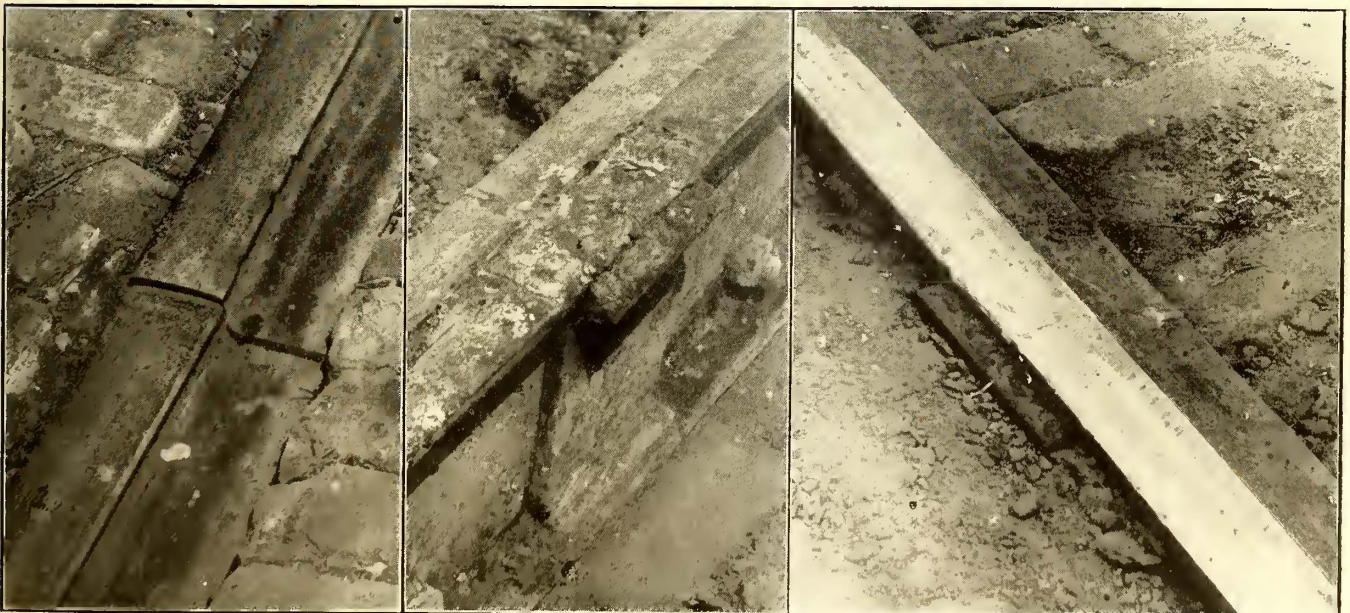
It is an almost universally recognized fact that joint and bonding problems are the most serious items in maintenance work and, in my opinion, it is only a matter of time until the mechanical bolted and bonded joints in paved streets will be a thing of the past.

Steel Newsstands for New York Subway

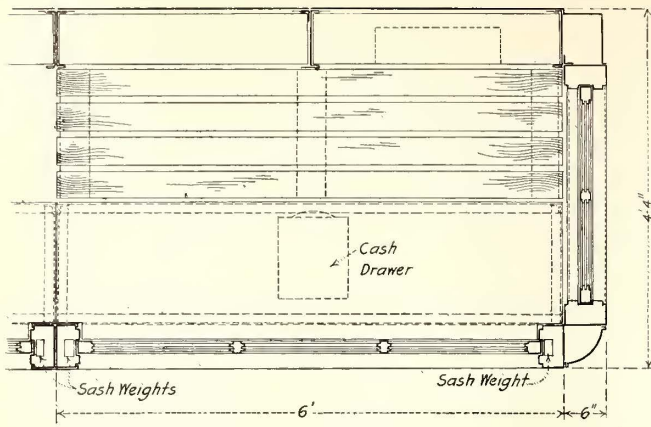
A remarkable improvement in subway station equipment has been effected by the recent installation of eighty-five tastefully-designed and well-equipped steel newsstands in the Interborough Rapid Transit Company's present operating subway in New York in place of the discarded wooden stands.

In addition to a great increase of sales, owing to their clean and inviting appearance, whereby two attendants are now required in certain locations as compared with one formerly, the new stands have proved such a boon to the comfort and health of the attendant himself that a higher grade of employee than formerly has been attracted to this form of work.

The newsstands, shown in the accompanying illustrations, are absolutely fireproof, being constructed entirely of steel. The prepossessing appearance of the stands painted tastefully as they are in Sherwin-Williams "Interborough" light green enamel on the exterior and white enamel on the inside, together with the attractive way in which the periodicals and candy



TRACK LIFE EXTENDED BY ELECTRIC WELDING—BATTERED JOINT IN TRACK ON GRAVEL FOUNDATION, UNGROUND WELDED JOINT AND FINISHED JOINT GROUND TO ORIGINAL SURFACE



PLAN OF STEEL NEWSSTANDS, SHOWING INTERCHANGEABLE UNIT ARRANGEMENT

are displayed, is enhanced by the agreeable diffusion of light by indirect lighting. All lights are placed along the recess on the inside of the upper cornice.

Adaptability to different size requirements, according to the business demands, has been secured by designing all the stands with interchangeable sectional units. If the business of any stand increases sufficiently as to require a larger layout, it is only necessary to unbolt one end of the stand and insert another section. At one location, at the Grand Central Terminal express station, one unit includes a ticket office.

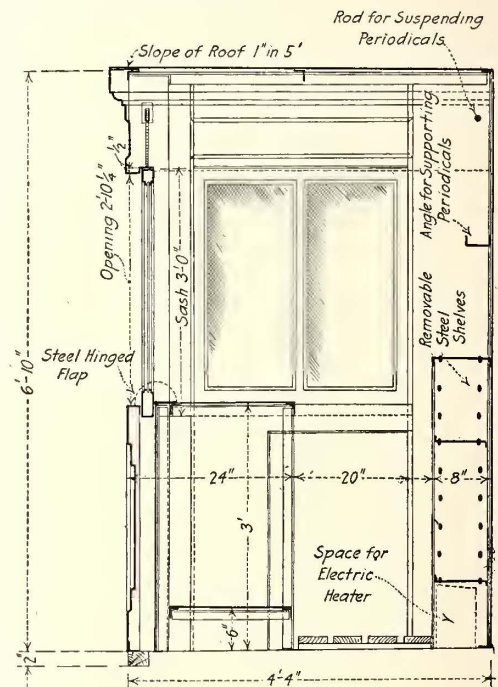
The design of the stands meets in every way the convenience and comfort of the attendants. They are easily opened up for business in the morning and closed at night. In opening up the booth, the strong wireglass window sashes may be lowered into a pocket below the level of the counter, or, if the weather is cold, raised up slightly to allow just enough space for handling sales and change. In either case, a hinged steel flap is turned over so as to cover the sash drop opening, thus preventing articles from falling into the aperture. In cold weather, when the front windows are practically closed, proper ventilation is obtained by raising the end window sash 6 in. Under this sash is located a creep door for access to the booth. In order to prevent cold feet from the cement floor of the station, as formerly prevalent, a wooden mat is laid inside the booth. This mat may be easily removed and cleaned. For the comfort of the attendants during the summer season, it is intended to have electric fans fur-



STEEL SUBWAY NEWSSTANDS IN DISPLAY CONDITION

nished. A space under the shelves at the rear has also been arranged for electric heaters if they are found necessary during the winter.

An unusually large area is available for the convenient, neat and conspicuous display of periodicals and confections. On the outside, below the cornice, are bracketed metal rods from which magazines are neatly hung by clips. Literature may also be fastened in front or by the side of each section pier, and laid along the steel counter contained within the stand. At the rear, on the inside, ample provision for displaying periodicals has been procured by the installation of a series of removable pressed-steel shelves, arranged in tiers from a height of 10 in. above the floor to 8 in. above the level of the counter. Above the row of magazines resting on the top shelf projects a small angle for supporting another row, and above this row periodicals are suspended from rods, as on the outside. Confectionery is placed on sanitary glass trays and glass shelves suspended from the ceiling of the booth.



END VIEW OF STEEL NEWSSTANDS

A parcel checking service between 9 a. m. and 7 p. m. has been established at the newsstands, at the rate of 10 cents per parcel. Parcels are stored on a shelf under the counter, placed 6 in. above the floor in order to avoid dampness.

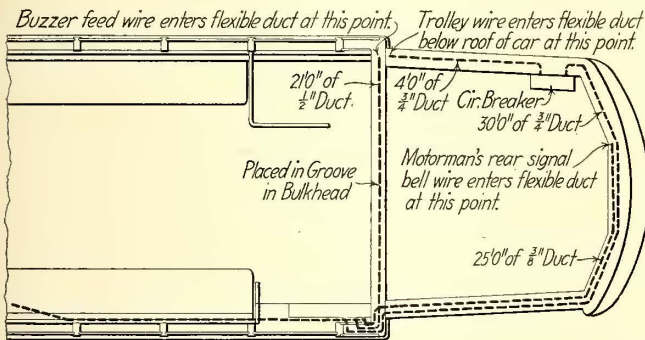
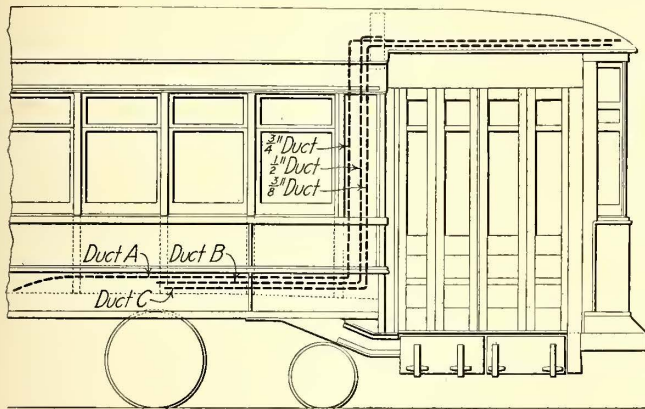
The responsibility for installing the steel newsstands is accredited to C. E. Atkinson, manager, Ward & Gow, New York, which company holds the advertising and newsstand privileges in the subway. The design was prepared and the materials manufactured and installed by the Elleon Company, New York, together with the co-operation and approval of the Interborough Rapid Transit Company and the Public Service Commission, First District of New York.

At the recent annual meeting of the London & North-Western Railway it was stated that although only a portion of the company's electrification scheme is yet in operation, the number of passengers carried on these lines shows an increase of 16 per cent compared with those carried just prior to the inauguration of electric operation.

Flexible Conduit in Car Wiring

The accompanying diagram shows the location of flexible conduits on the near-side cars of the Philadelphia Rapid Transit Company. In this wiring, 3/4-in., 1/2-in. and 3/8-in. duct is used. The 3/4-in. duct is used for the trolley wire from an entry point near the corner post under the vestibule roof, through the circuit breaker to the fuse box, a total conduit run of 34 ft.

The 1/2-in. duct is used for the buzzer feed wires, a point near that at which the trolley wire enters the



FLEXIBLE DUCT AS INSTALLED ON NEAR-SIDE CARS OF PHILADELPHIA RAPID TRANSIT COMPANY

3/4-in. line to the interrupter located under one of the longitudinal seats at a point nearly over the rear axle of the forward truck. This run is 21 ft. long.

The 3/8-in. duct is used for the motorman's rear signal bell wire leading from the front of the vestibule to a battery located near the buzzer interrupter. This run is 25 ft.

All of the conduit is cleated with galvanized pipe straps, and all ends are left open, as they are all used in a perfectly dry inclosure.

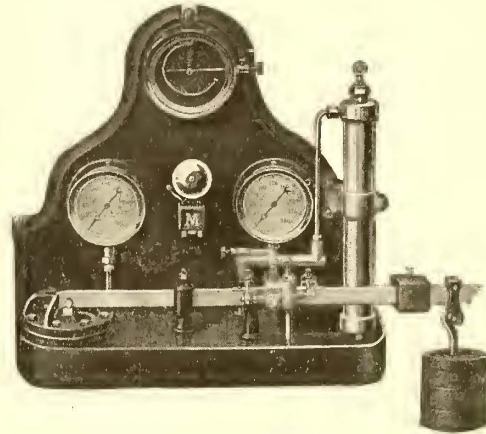
Automatic Damper Regulator for Steam Boilers

An automatic damper regulator for use in boiler plants, particularly in plants where the steam demands fluctuate, has been developed by the McDonough Automatic Regulator Company, Detroit, Mich. This regulator controls the positions of the dampers, regulates the fan speeds and signals the fireman when fires need attention, or controls the rate of fuel feed. The regulation is positive within 1/2 lb. per square inch variation in steam pressure, and the total pressure variation is held well within the 1-lb. limit. The regulator will control the firing conditions of practically any number of boilers, and in many plants its service is said to be equal to that of an assistant fireman. It is claimed that from \$300 to \$400 per boiler was saved annually.

This regulator is of the hydraulic cylinder type with

diaphragm, lever and counterweight attachments. It is mounted on a cast-iron wall panel containing a steam gage, water gage and electric, low-pressure alarm bell.

The full boiler pressure acts at all times on the lower surface of the diaphragm, and any variation in pressure causes a variation in the deflection of the diaphragm and raises or lowers the balanced lever, thus



AUTOMATIC DAMPER REGULATOR

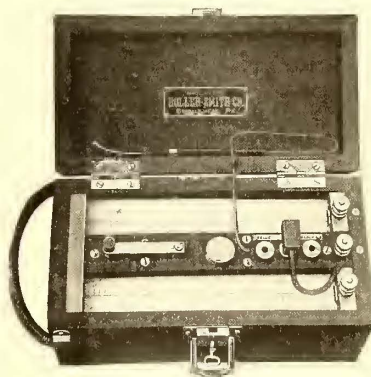
operating a set of sensitive valves which govern the water pressure applied to the operating cylinder.

For natural-draft, hand-fired boilers the damper regulator automatically controls either the main damper or the auxiliary damper on each boiler, and when the steam pressure falls below a predetermined limit the alarm bell signals the fireman that his fires require attention.

Where forced draft is used the regulator controls the blower motor speed or the engine speed directly, according to variations in boiler pressure. In plants where a combination control of both blower speed and dampers is used, this regulator governs both.

New Ohmmeter for Signal Systems

The accompanying illustration is of a new direct reading ohmmeter which has just been placed on the market by the Roller-Smith Company, New York, N. Y. It is in general a slide-wire bridge having a self-contained galvanometer of sensitive but rugged design, self-contained dry cells which are conveniently located for renewal, galvanometer key, stylus and resistances. There are three ranges, 0-1, 0-10, 0-100 ohms respectively. The scales for these are 15 in. long, each scale being a different color—blue, red or black.



DIRECT READING OHMMETER ESPECIALLY ADAPTED TO SIGNAL WORK

Any unknown resistance, such as that of relay points in an electric signal system, can be measured by connecting to binding posts suitably labelled. A plug is inserted in one of the sockets marked respectively blue, red and black, and the stylus is tapped along the wire which is stretched above the scale. The resistance is then read direct from the scale at the point where there is a zero deflection on the galvanometer. This is a convenient type of a small, light, portable instrument, and its ranges have purposely been changed from those of previous designs to adapt it to signal system testing.

NEWS OF ELECTRIC RAILWAYS

WORK ON NORFOLK FRANCHISE COMPLETED

Committee Which Has Been Considering Blanket Franchise Terms Presents Its Findings

The special committee of the Council of Norfolk, Va., which has been at work since Feb. 8, 1915, upon the terms of a new franchise for the Virginia Railway & Power Company, has presented its findings. The committee held forty-three meetings, twelve of which were conferences with officers of the company. It is expected that the franchise will be presented to the Council this month for consideration.

The first of the present franchises of the constituent companies will expire in 1930 and the last in 1944. The proposal in the new grant on this point is that the new blanket franchise shall expire in 1946. The rates of fare in force at present on the various lines follow: old city division, 5-cent cash fare; railway and light company division in Berkeley, 5-cent cash fare or six tickets for 25 cents on the cars; Bay Shore Terminal line, including line to Berkley, etc., 5-cent cash fare, with 3-cent cash fare or ten tickets on cars for 25 cents, from 5 a. m. to 8 a. m. and 5 p. m. to 7 p. m.; other hours six tickets on cars for 25 cents. School tickets are required on Bay Shore Terminal line. The proposed ordinance stipulates that on all lines the cash fare shall be 5 cents and that for the first three years of the new grant tickets good on all lines shall be sold at the rate of six for 25 cents at thirty places in the city designated by the board of control. Thereafter the strip tickets are to be sold on all cars. The rates just mentioned are to run for ten years, after which they may be changed by the corporation commission. It is expressly stipulated, however, that the cash fare for service within the present limits of the city shall not exceed 5 cents at any time during the life of the franchise. School tickets are to be furnished for all lines on the same basis as heretofore for part of the system.

The transfer situation in Norfolk is somewhat similar to that in other cities in which the various operating companies work under franchise terms that are dissimilar. The new grant stipulates universal transfers, with special provision for additional transfer when necessary to and from the Colonial Palace and the Edgewater lines. Closely allied with this subject is the matter of control of service. At present there are definitely fixed schedules for different lines which prescribe cars not more than ten minutes apart on some lines and twenty-four minutes apart on others. The new grant stipulates that the company shall give "adequate, good service, etc." The question of the sufficiency of service is to be vested with a local public service commission. Provision is made for appeal from the decision of the local commission to the Virginia Corporation Commission.

Some of the lines in Norfolk have 5-ft. 2-in. gage. Others are standard gage. The new grant prescribes that all of the lines shall be standardized.

At present the Norfolk Railway & Light Company is obligated to pay a license tax for the use of the streets. No limit as to the amount of this tax is stated in the franchise. The State law requires the electric light company to pay one-half of 1 per cent on its gross receipts. The city has imposed a tax of \$1,500 annually on the Church Street-Ocean View line, and 6 per cent on gross receipts of the Norfolk Railway & Light Company, but has not imposed the license tax on the Bay Shore Company, as there was some doubt about collecting this. The tax at present imposed on all the above business is about \$35,250 yearly. The new franchise stipulates that an amount is to be paid on the railway and on the electric light and power business which shall be equal to 1½ per cent of the gross receipts for the first three years and 2 per cent thereafter. The gross receipts for the year 1915 amounted to \$1,716,330. It is estimated that this business will increase from year to year so that for the fourth year the 2 per cent rate will make the total payment to the city under the new grant greater than it would be under the present tax.

NEW YORK LEGISLATURE ADJOURNS

Bill Passed Which Arbitrarily Fixes Rates—No Appropriation for Thompson Committee

In the closing hours of the session of the Legislature of New York the Assembly passed the so-called Brooklyn 80-cent gas bill, which arbitrarily fixes by direct legislative enactment a uniform 80-cent price for gas in the Thirtieth and Thirty-first wards of Brooklyn, thus making the rate the same for all companies throughout the borough. The bill was passed by the Senate on April 6 under suspension of the rules. It now goes to the Governor for his signature. The bill is of unusual interest on account of its effect on rate making and was the subject of an editorial in the *ELECTRIC RAILWAY JOURNAL* of April 8.

In the debate in the Senate on the bill, exception was taken to a message from Oscar S. Straus, chairman of the Public Service Commission for the First District of New York, in which he virtually urged the Legislature to pass the bill, saying that the commission would not interpose any objection to action by the Legislature which will secure the people of the sections previously mentioned reductions in rates that have been delayed by the technical provision of the law as it stands. The case involving the rates for gas in the territory affected has been pending before the commission for six years. Senator Wellington explained that the case once had been carried to the Court of Appeals; that new testimony would have to be taken before a final determination could be reached, and that the commissioners advocated the passage of the measure merely as a short cut to the relief desired. The vote on the bill was forty-six to three.

Commissioner Travis H. Whitney explained why the commission had supported the bill. He said that the commission held that the Legislature must make the law more effective if the responsibility of ratemaking was to be left to it. The commission had sent bills to the Legislature proposing such amendment of the law as it thought necessary. These would prohibit or restrict the court review of rate and service cases by certiorari; would give the commission power to make a new rate effective at any time after a proceeding had been begun; would permit the commission, after complaint, to declare existing charges excessive and to order their repayment, and would change the penalty provision of the law.

By a unanimous vote the Senate on April 17 passed the Thompson committee bills amending the public service law and taking from the Public Service Commission of the First District supervision of the construction of New York City subways and elevated railroads. The measure provides that, after the Board of Estimate has decided upon a subway, the Public Service Commission shall turn over to a commission to consist of one member from each borough, with the Mayor and Comptroller serving as members ex officio, all supervision of construction. The bill is a direct outgrowth of the investigation of the Public Service Commission conducted by the Thompson committee.

Senator Thompson, however, lost his fight to have the use of the writ of certiorari denied to corporations in contesting commission rulings. This measure was ardently supported by the public service commissioners, but was killed in a caucus of Republican Senators when it was decided to amend the law so that a corporation would have the right to one review by the Appellate Division on a writ of certiorari. In the event that two Appellate Divisions differ as to facts, the right of resort to the Court of Appeals is granted.

The Legislature adjourned without appropriating any money for the Thompson committee, which is investigating the Public Service Commissions. Senator Thompson is reported to have said that the investigation will be continued until July 1, the date for ending the hearings as fixed by resolutions passed by both houses some time ago.

REPORT ON "PUBLIC UTILITIES ANNOTATED"

Henry C. Spurr, editor *Public Utilities Annotated*, reports that 5900 opinions and orders were received during 1915. Of this number 990 cases were printed in full, 3861 were abstracted and 1049 not used. The last mentioned cases were largely made up of preliminary orders that decided nothing, many of them being mere notices of hearings or formal dismissals of complaints upon agreement of parties. Some of the cases received also were outside of the scope of the reports, as several corporation commissions have jurisdiction much wider than that of public utilities or public service commissions. All comment received from commissioners so far has been favorable and much of it commendatory. One commissioner, however, wrote that if he had any criticism to make it would be too many cases of little value as precedents were reported. The publishers intend in the future not to publish any case in full which has not some value as a precedent, owing to the rapid increase in the number of cases. There were six volumes in 1915 and there may be seven this year. To publish all of the cases in full would probably require twenty volumes for the current year. The commissioners have given very valuable counsel, and continuation of such help, especially in calling attention to cases that ought to be printed in full because they decide a new question or one that is new under particular jurisdiction, will be appreciated. Chronological order is not followed absolutely in the publication of decisions, as an important case receives preference as compared with one of less value even if the latter is delivered earlier.

Mr. Spurr also reviews the history of the decision to publish these reports. While the need was obvious to those who wish to follow the decisions, the cost was enormous, and no publisher of experience could be found who would undertake to publish such series of reports without some guarantee of subscriptions. To get such a publication, a group of those most largely interested in utility enterprises agreed to take the number of subscriptions which the publishers, the Lawyers' Co-operative Company, Rochester, N. Y., required as a basis for undertaking the risks of the enterprise.

In conclusion the editor adds that in the head-notes care is taken to cover the questions actually raised and decided and nothing more. This is the policy followed by the company in its other legal publications. Where everything is put in the head-notes—argument, discussion, reasons and all—the reader never knows what the case is authority for until he has carefully consulted the opinion. The annual digest for 1915 is now in the hands of the printers and will be issued shortly.

NEW YORK MOTOR BUS APPLICATION RENEWED

The New York Motor Bus Company has renewed its application for a franchise to the Board of Estimate and Apportionment. In its communication to the board the company signifies its desire to carry out the original proposals made by it, and calls attention to the delay of months in taking definite action on its application. The company claims that at the hearings held last fall the need for more motor buses was demonstrated and that no real objection was made to the acceptance by the city of the proposal of the company, which the franchise committee of the board pronounced superior to all others submitted in competition with it. The company said:

"The system contemplated is not large. It is not so great as really to compete with the system of the Interborough Rapid Transit Company. Our company and your board have been through all the required complicated legal formalities to the point of actually conferring and accepting a franchise. After an exhaustive study on the part of your franchise committee of routes, and all questions involved, a public bidding was held and the bid made by this company was approved. We have deposited \$60,000 in cash with the comptroller to show our good faith. Our financing is provided for, the type of our vehicle has been determined upon, and we have a factory ready and equipped to duplicate it in large quantities for the early inauguration of the much desired service. Statistics of the growth of traffic proved beyond doubt that the inauguration of an improved and comprehensive bus service could not possibly impair the financial interests of the city in the enlarged subway."

CHICAGO SURFACE LINES HOLD TROPHY DINNER

The annual meeting and the trophy night dinner of the Chicago Surface Lines Club was held on the evening of April 10 at the Mid-Day Club. The Surface Lines Club now numbers 620 members, and more than 350 were present at the annual celebration. W. D. Bartholomew acted as toastmaster. During the year eight bowling teams, representing the different departments of the Chicago Surface Lines, played for the honor of holding the L. A. Busby silver cup. The season lasted twenty-one weeks and included sixty-three games for each of the eight bowling teams. In 1915 the L. A. Busby trophy was awarded to the legal department, which was again successful this year. The team which is awarded this trophy for three years in succession is permitted to retain it permanently. In addition to the trophy, medals were awarded to various members of the bowling teams for high scores made during the year.

At the annual election which followed the dinner and the awarding of the trophy, the following directors of the club were elected for the ensuing year: J. V. Sullivan, statistician, representing the executive department; A. L. Dewey, auditor of disbursements, representing the accounting department; M. C. Morton, bookkeeper, representing the treasurer's department; F. C. Mitchell, representing the engineering department; A. J. Klatte, assistant electrical engineer, representing the electrical department; E. L. Brookman, representing the transportation department; N. M. Thorsson, assistant purchasing agent, representing the purchasing and insurance department; A. R. Peterson, trial attorney, representing the legal department, and W. E. Nemits, assistant general claims agent, representing the claims department. These directors, in turn, will elect the officers of the club at an early date.

TOLEDO COMMUNITY OWNERSHIP PLAN DISCUSSED

The proposed community plan of ownership of the railway property of the Toledo Railways & Light Company, as submitted by the sub-committee of Mayor Milroy's general railway committee, was discussed at a conference in Mayor Milroy's office at Toledo, Ohio, on April 12, and a supplemental report was read.

One matter to which attention was called was as to who would control the property at the end of the five-year period if a majority of the stock were not then lodged with the public. Another was that people who have no stock will bear the brunt of the burden in case fares have to be advanced from the present rates to insure 6 per cent interest to the stockholders, as provided in the plan. Another was as to the status if people who bought stock on the community plan and received 6 per cent on their investment, should refuse to sell their holdings to the city when it desired to take the property over.

Members of the sub-committee explained several doubtful features in detail and said that the Supreme Court would be asked to pass on a number of points before the plan was put into operation. They admitted that fares would fluctuate under this plan and said that there was no way of escaping this if the people wanted service at cost.

The supplemental report provides for the creation of a commission to value the property and a new company to take it over. This company would issue 6 per cent common stock to the amount of the agreed value of the property which would be delivered to the Toledo Railways & Light Company. The company in turn would deposit the stock with five trustees to be selected under a trust agreement, which would provide that the trustees vote the stock for a period of five years, except such as was sold from time to time. Stock would be offered to the people of Toledo in certificates of \$10 each under conditions which were outlined at length in the *ELECTRIC RAILWAY JOURNAL* of April 15, page 746.

The sub-committee recommends that a street railway commission be created by the Milroy committee for the purpose of perfecting the proposed plan, raising funds for employing legal, engineering and such other assistance as may be necessary to secure a valuation, to incorporate a company to issue stock, to buy and take over the street railway property, prepare necessary ordinances and initiate and submit them to the voters.

New Agreement Under Way in Albany.—Officers of the Albany and Troy locals of the Amalgamated Association are working upon a new agreement to be presented to the United Traction Company, Albany, N. Y. The present agreement will expire by limitation on June 30.

Washington Suburban Line to Arbitrate with Employees.—Differences between the Washington & Old Dominion Railway and its employees as to wages and working conditions are to be arbitrated as the result of an agreement reached by the company and its employees on April 18. The agreement is to remain in force for a period of one year. The decision to arbitrate was reached after a series of conferences lasting ten days.

Electrification of Iowa Road Contemplated.—A meeting of the directors of the Muscatine North & South Railway, which operates from Muscatine to Burlington, Iowa, will be held in Davenport about May 1 for the purpose of considering plans to lift the receivership, reorganize the company and electrify the line. The road will probably be operated in connection with the Davenport & Muscatine Railway, a part of the system of the Tri-City Railway & Light Company. E. H. Ryan, Davenport, is president of the road.

Strike in Alliance Settled.—The three-day strike of the motormen and conductors of the Stark Electric Railway and the Cleveland, Alliance & Mahoning Valley Railway, Alliance, Ohio, ended on April 14, when the men returned to work at advanced wages, but without the recognition of the union. The new rates for the city of Alliance are: First six months, 22 cents; second six months, 24 cents; after two years, 26 cents; for the Stark Electric, interurban, 26, 28 and 30 cents, respectively, and for the Cleveland, Alliance & Mahoning Valley, 24, 26 and 28 cents, respectively.

Wage Demands Considered in Pittsburgh.—Demands for an advance of from 20 to 43 per cent in wages have been made by a committee representing the motormen and conductors of the Pittsburgh (Pa.) Railways appointed to arbitrate the wage scale to go into effect on May 1. The negotiations have been going on since April 3, but according to a statement of the company, the employees' committee wants the initial advance guaranteed as a condition to negotiating for a further advance. The company said that it was useless to waste time discussing such an unreasonable request and suggested the appointment of an arbitration board at once to settle any other question than that of wages, upon which the company and the men could not agree.

Illinois Commission Establishes News Bulletin.—The State Public Utilities Commission of Illinois has begun the publication of a bulletin giving news of the activities of the commission. Brief accounts of some of the matters under consideration and a digest of the orders entered during the preceding month comprise the contents of the first number, which is dated April. For the present the bulletin will be issued on the first of each month. It is expected that subsequent issues will include a record of new cases filed with the commission, as well as short reports from each of the departments. The bulletin will be distributed free of charge. It will be mailed to the editor of every daily and weekly newspaper in the State.

New York State Track Laborers Get Eight-Hour Day.—As an outcome of recent arbitration proceedings between the officials and the track laborers of the New York State Railways, Rochester, N. Y., a new wage agreement was reached on April 17. The new contract, which is to go into effect on May 1, and will hold good for a year, specifies an increase in the wages of track employees to 23½ cents an hour, with time and a half if the employees are called after Sunday at 8 a. m., and an eight-hour day instead of a ten-hour day. A tentative agreement has already been entered into between the company and representatives of the motormen and conductors, subject to approval of the local labor organization. This agreement, if ratified, will also become effective on May 1.

Commission Appoints Chicago Elevated Real Estate Appraisers.—Real estate appraisers to revalue the property owned by the Elevated Railroads of Chicago, have been appointed by the Chicago Traction & Subway Commission. A part of the work assigned to the commission was that of

revaluing the elevated railroads and recommending some basis of merging their operation with that of the surface lines. In the valuation of the elevated railroads made in 1912 the difference in the real estate values, as found by the representatives of the city and by the railway company, could not be reconciled. The new appraisers are W. W. Baird and W. A. Bond, both former presidents of the Chicago Real Estate Board, and Mark Levy, a member of the valuation committee of the same board. A joint fee of \$10,000 has been fixed for their services.

Wage Agreement Arranged in Scranton.—An agreement between the Scranton (Pa.) Railway and its employees covering working conditions was signed on April 6. It is to run from April 1, 1916, to April 1, 1919. Under the agreement which expired on April 1 this year, motormen and conductors received from 22 cents to 26½ cents an hour. Under the new agreement the men will receive 25 cents an hour the first year; 27 cents the second year, and 29 cents after the third year. Employees in uniform are hereafter to be carried free within the city limits on all cars, even including those of the Scranton & Binghamton Railway. Stools will be provided for motormen for use outside of the limits of certain safety zones. All cars used on the system are to be operated with two men in charge. A 10 per cent increase in wages is made to apply to all carhouse, power house and track men.

Strike of Laborers on New York Subway Settled.—About 1000 members of the International Compressed Air & Concrete Foundation Workers Union of America, at work on the new subway lines in New York and Brooklyn, struck for higher wages on April 8. On April 10, the contractors declared open shop, and hired men to fill the places of the laborers and timbermen on strike. Many of the new men who were employed were non-union, and using this as a reason the hoisting engineers of the Broadway section struck on April 11. They were joined by the tool sharpeners and blacksmiths. After conferring for three days in the offices of the Public Service Commission for the First District, the contractors agreed not to discriminate against the union and to an increase of 25 cents a day for the 12,000 laborers and timbermen. The compressed-air workers in the East River tubes, however, are still on strike.

St. Paul Operating 220 Miles Electrically.—On Tuesday, April 11, the Chicago, Milwaukee & St. Paul Railroad commenced electric operation on the second one of the four engine divisions comprising its projected electric zone, running trains electrically between Three Forks and Harlowton, Mont. This establishes complete electric operation on the eastern half of the proposed 440-mile electrification, the traffic over this part of the line being handled by eleven freight engines and two passenger engines that are now in service. At the present time the company is hauling a very much increased freight tonnage, the daily traffic averaging 15,000 tons eastbound and 10,000 tons westbound. This is practically 100 per cent increase in freight traffic over last year's figures, and while it is believed that the increase is due in part to the fact that the Panama Canal has been closed, it is thought that a considerable part of it is due to improved business conditions in the Western country, there being a very heavy shortage of empty cars on the Pacific Coast at present.

Mr. Stanley Discussed Cleveland Wage Matters.—J. J. Stanley, president of the Cleveland (Ohio) Railway, on April 14 outlined some of the things the company will demand in case the motormen and conductors insist on an increase of wages such as requested in their original communication. Among other things he mentions abolition of arbitration in cases of discipline of men, doing away with wearing of badges or emblems that are objectionable to the company, continuation of any new agreement for two years without change, semi-annual physical examination of men more than fifty years of age for fitness, and payment of half of all arbitration expenses by the union hereafter. Mr. Stanley said that the company cannot change the service or increase the expense without the permission of the city. Representatives of the union met with the committee on labor disputes of the Cleveland Chamber of Commerce on April 13. In all probability the men will seek a conference with the company officials at an early date. Mr. Stanley has expressed his willingness to meet the men.

Illinois Traction Freight and Fare Franchise.—A bill enlarging the franchise of the St. Louis Electric Terminal Railway (McKinley System) by permitting it to haul freight through St. Louis in trains of four trailers and a motor car and authorizing the company to increase its fare to 10 cents between St. Louis and Granite City, has been introduced in the Board of Aldermen of St. Louis. The measure has been referred to a special committee with instruction to make prompt report. The proposed ordinance grants to the McKinley System a franchise to construct, maintain and operate a single or double track, etc., along and across certain streets. A clause specifies that "no arbitrary" charge shall be made for hauling freight, express or passengers across the McKinley bridge. The fare increase permits the company to charge 5 cents, with half fare for children, between any points on its line between Twelfth Street and Venice. An additional 5-cent fare is permitted between Venice and Granite City. The bill would require the company to sell six tickets for 50 cents between St. Louis and Granite City.

PROGRAMS OF ASSOCIATION MEETINGS

Society for Electrical Development, Inc.

The fourth annual meeting of the Society for Electrical Development, Inc., will be held on May 9 at the executive offices of the society in the United Engineering Societies Building, New York. The board of directors for the ensuing year will be elected. An amendment to the by-laws will also be voted upon. J. M. Wakeman, general manager of the society, will read his annual report and outline the extensive plans for "America's Electrical Week" campaign this fall.

Iowa Street & Interurban Railway Association

The program for the meeting of the Iowa Street & Interurban Railway Association, which is to be held at Dubuque on May 10, 11 and 12, has been issued by H. E. Weeks, Davenport, secretary-treasurer of the association. The program does not, however, include the topics for the combined meetings of the organization with the Iowa Gas Association and the Iowa section of the National Electric Light Association on May 11. The meetings of the Iowa Street & Interurban Railway Association will be opened on May 10 at 1.30 p. m., with the address of the president, R. A. Leussler, Omaha, assistant general manager of the Omaha & Council Bluffs Street Railway. The following papers will then be read:

"The Selection and Training of Trainmen," O. S. Lamb, superintendent of the Waterloo, Cedar Falls & Northern Railway.

"Rail Joints," R. H. Findley, superintendent of track and roadway of the Omaha & Council Bluffs Street Railway.

The session on the morning of May 12 will be opened at 10 a. m. The following papers will be read:

"Inspection and Maintenance of Rolling Stock," by John Sutherland, master mechanic of the Tri-City Railway and the Clinton, Davenport & Muscatine Railway.

The presentation of this paper will be followed with an illustrated lecture on:

"Steel Poles as a Substitute for Wooden Poles," by A. H. Bates, inventor of the pole which bears his name, and manager of the Bates Expanded Steel Truss Company.

The session on the afternoon of May 12 will be opened at 1.30 o'clock. It will be an executive session. The minutes will be read, the report of Mr. Weeks will be presented and directors elected.

The meeting at Dubuque will be the first time the three associations have joined in conducting a convention. It has been the custom to hold the annual sessions of the Iowa Street & Interurban Railway Association and the Iowa section of the National Electric Light Association in the same city, but the two organizations have never united. The Iowa Gas Association has seldom held its conventions in the same city as the other two. Samuel Insull, president of the Commonwealth Edison Company, Chicago, and Gen. George H. Harries, vice-president of H. M. Byllesby & Company, Chicago, will speak on May 11, the only day of the convention when the three organizations will give up their own sessions and join in a combined meeting.

Financial and Corporate

ANNUAL REPORT

Union Traction Company of Indiana

The comparative statement of income, profit and loss of the Union Traction Company of Indiana, Anderson, Ind., for the years ended Dec. 31, 1914 and 1915, follows:

	1915		1914	
		Per Cent		Per Cent
Revenue from transportation:				
Passenger	\$2,071,832	83.33	\$2,089,785	83.74
Baggage	10,539	0.42	11,009	0.44
Parlor, chair and special car	9,059	0.37	8,709	0.35
Mail	1,070	0.04	1,002	0.04
Express	81,867	3.30	89,854	3.60
Milk	24,724	0.99	25,305	1.01
Freight	223,751	9.00	211,514	8.48
Switching service .....	.....	...	193	0.01
Total	\$2,422,842	97.45	\$2,437,371	97.67
Revenue from operation other than transportation:				
Station and car privileges	\$9,208	0.36	\$8,201	0.33
Parcel room receipts	1,146	0.05	1,269	0.05
Storage	3	0.00	58	0.00
Car service	8	0.00	32	0.00
Rents of tracks and terminals	10,692	0.43	11,207	0.45
Rent of equipment	4,577	0.18	3,593	0.14
Rent of buildings and other property	7,682	0.31	7,234	0.29
Power	29,161	1.18	25,505	1.03
Miscellaneous	927	0.04	1,054	0.04
Total	\$63,404	2.55	\$58,153	2.33
Operating revenues	\$2,486,246	100.00	\$2,495,523	100.00
Operating expenses:				
Way and structures	\$261,192	10.50	\$261,258	10.47
Equipment	160,992	6.48	147,544	5.92
Power	229,344	9.22	233,923	9.37
Conducting transportation	456,637	18.38	466,371	18.69
Traffic	23,478	0.94	15,004	0.60
General and miscellaneous	318,407	12.80	311,470	12.48
Extraordinary flood expense charged in 1915	21,500	0.86	20,700	0.83
Total	\$1,471,550	59.18	\$1,456,270	58.36
Net operating revenue	\$1,014,696	40.82	\$1,039,253	41.64
Taxes	118,020	4.75	119,430	4.78
Operating income	\$896,676	36.07	\$919,823	36.86
Other income	17,895	0.72	32,756	1.31
Gross income	\$914,571	36.79	\$952,578	38.17
Deductions	857,238	34.48	884,783	35.45
Net income	\$57,333	2.31	\$67,795	2.72

The foregoing amounts and the percentages based on the operating revenues indicate the general results secured by the company during 1915, as compared to 1914. The chief points to be noticed are that the decrease in passenger revenue and as a whole in transportation revenue was met by a perceptible increase in operating expenses, so that the operating ratio rose from 58.36 per cent in 1914 to 59.18 per cent in 1915. Taxes increased slightly, but the decrease in other income was more than counterbalanced by the decrease in deductions from income. It will be observed that the operating revenue in 1915 was \$9,277 less than in 1914 and the operating expenses \$15,280 greater, but after the decrease of \$27,545 in income deductions the net income for the year showed a loss of only \$10,462. It is said the loss in operating revenues arose from the decline in the first eight months of the year, the last four showing continuous improvement.

The amount charged for additions and betterments during the year was \$46,883. A credit of \$16,000 was made to this account, leaving the net charge \$30,883. Of the gross sum, \$40,502 was spent on way and structures. These expenditures were in addition to \$24,251 advanced during the year to the Traction Light & Power Company and expended for light and power equipment for the company. They were also in addition to \$53,446 paid out on account of sinking funds.

The total expenditures caused by the 1913 flood chargeable to maintenance were \$77,902 up to Dec. 31, 1915. Of this total \$41,400 was included in operating expenses of

1913 and 1914, and \$21,500 in operating expenses of 1915, leaving the net amount still in suspense \$15,002. To this amount it is said several thousand dollars will be added for work yet to be done.

The Oct. 1, 1914, first preferred dividend was passed, and no dividend on this stock has since been paid. No dividends have been declared or paid to date on the second preferred stock. Dividends on these stocks are cumulative. Miscellaneous statistics of the company for 1915 are shown in the following table:

Passengers carried, interurban lines.....	9,037,691
Passengers carried, city lines.....	7,441,844
Total passengers carried.....	16,479,535
Freight handled (tons).....	83,841
Express handled (exclusive of Wells, Fargo & Company express) (tons).....	6,786
Mileage of cars, interurban lines.....	6,384,751
Mileage of cars, city lines.....	1,656,015
Total mileage of cars.....	8,040,766
Coal consumed at all plants (tons).....	84,236
Power generated (a.c.) at all plants (kw.-hr.).....	43,975,980
Power generated (d.c.) at all plants (kw.-hr.).....	27,043,667

RAILWAY EARNINGS FOR NOVEMBER AND DECEMBER

The information bureau of the American Electric Railway Association has just made public the figures for October and November, as well as those for the last quarter of 1915. A comparison of these figures with the corresponding months of 1914 made by the bureau shows that business improved but slightly during that period, the increase in operating revenues being more than counterbalanced by the increase in operating expenses. This applied to the companies reporting taxes as well as to those not reporting taxes. Those reporting taxes showed large increases in taxes paid. The number of companies reporting for the quarter were 176 and had operating revenues during that period of \$62,496,730.

The classification followed is as follows: Eastern district, Mississippi River and north of the Ohio River; Southern district, south of the Ohio River and east of the Mississippi River; Western district, west of the Mississippi River.

An exact comparison of the figures in the accompanying table and those published on page 750 of the issue of April 15 is not possible because the companies are not in all cases the same. Those whose figures are quoted in the accompanying table are larger in number than those quoted last week, but, based on the figures for the final quarter, have less aggregate operating revenues.

FORECLOSURE ACTION AUTHORIZED AT SYRACUSE

Judge also Sanctions Acquisition of Monroe County Line—Committee Formed for Syracuse, Lake Shore & Northern Bondholders

Justice Andrews at Syracuse, N. Y., on April 15, authorized the Equitable Trust Company, New York, N. Y., to bring foreclosure action under the mortgage issued to secure the bonds of the Empire United Railways, Inc. The justice stated that he desired it to be understood that no allowance would be made by the court for any foreclosure expenses unless the proceedings turn out to be advantageous to the general purpose of the receivership.

On the same day the announcement was made of the formation of the Syracuse, Lake Shore & Northern bondholders' committee. The Syracuse, Lake Shore & Northern committee, organized by officers representing the Syracuse Trust Company, is composed of James M. Gilbert, treasurer of the Syracuse Trust Company, chairman; Fred W. Zoller, president of the Union Trust Company, Rochester; Richard B. Young, manager of the New York office of E. H. Rollins & Company; Douglas E. Petit, treasurer of the Onondaga County Savings Bank, and H. M. Verrill, Portland, Me., representing a number of savings banks in Maine, where it is understood some \$600,000 of the bonds were sold. Jerome L. Cheney is attorney for the committee and Harral S. Tenney, secretary. This committee does not represent the Auburn & Northern bondholders, and it is stated that probably no such committee would be appointed, as very few, if any, of the Auburn & Northern bonds are in the hands of the public, having been retained by the syndicate that constructed the road. What steps the Syracuse, Lake Shore & Northern committee will take with reference to the mortgage of that company will be determined later. As matters stand now, there has been no default. Justice Andrews, however, some time ago directed the receivers not to pay any interest due on May 1.

On April 15 Justice Andrews announced that he would enter an order permitting the use of funds of the Empire United Railways, Inc., now in the hands of the Columbia Trust Company, to be expended for the acquisition of the physical property of the Monroe County Electric Belt Line in the village of Fairport. A schedule of the present obligations of the Monroe County Belt Line shows that the

REVENUES AND EXPENSES OF ELECTRIC RAILWAYS FOR LATEST PERIODS IN 1915, WITH PERCENTAGE INCREASES OVER 1914

Account	November, 1915				December, 1915				Quarter, October-December, 1915			
	Companies Reporting Taxes		Companies Not Reporting Taxes		Companies Reporting Taxes		Companies Not Reporting Taxes		Companies Reporting Taxes		Companies Not Reporting Taxes	
	Amount	% Inc.	Amount	% Inc.	Amount	% Inc.	Amount	% Inc.	Amount	% Inc.	Amount	% Inc.
<i>United States:</i>												
Operating revenues...	21,802,181	6.91	20,914,406	7.34	11,309,214	4.13	10,385,031	4.55	32,575,309	4.47	29,821,421	5.25
Operating expenses...	11,867,628	5.71	11,328,694	5.77	6,774,754	7.41	6,207,086	7.54	19,745,194	10.23	18,268,157	11.94
Net operating revenue	9,934,553	8.38	9,585,712	9.25	4,534,460	d0.42	4,177,945	0.42	12,830,115	d3.30	11,553,264	d3.84
Taxes.....	.....	.....	1,280,329	4.61	.....	.....	683,126	6.21	.....	.....	1,926,570	8.62
Operating income.....	.....	.....	8,306,383	10.02	.....	.....	3,494,819	d0.64	.....	.....	9,626,694	d6.00
Operating ratio, { 1914	55.05	.....	54.97	.....	58.07	.....	58.11	.....	57.44	.....	57.59	.....
per cent. { 1915	54.43	.....	54.16	.....	59.90	.....	59.76	.....	60.61	.....	61.25	.....
Number of companies represented.....	112	.....	96	.....	97	.....	81	.....	96	.....	80	.....
<i>Eastern:</i>												
Operating revenues...	16,171,880	6.99	15,840,430	7.12	6,344,374	8.71	6,005,429	8.87	18,736,422	7.32	17,706,529	7.71
Operating expenses...	9,063,967	6.62	8,870,443	6.69	3,691,356	9.38	3,489,974	9.71	12,042,874	16.95	11,451,275	17.84
Net operating revenue	7,107,913	7.46	6,969,987	7.67	2,653,018	7.79	2,515,455	7.74	6,693,548	d6.52	6,255,254	d6.93
Taxes.....	.....	.....	951,813	2.10	.....	.....	328,206	0.31	.....	.....	988,576	2.75
Operating income.....	.....	.....	6,018,174	8.61	.....	.....	2,187,249	8.95	.....	.....	5,266,678	d8.55
Operating ratio, { 1914	50.23	.....	56.22	.....	57.82	.....	57.67	.....	58.98	.....	59.11	.....
per cent. { 1915	56.04	.....	56.00	.....	58.18	.....	58.11	.....	64.27	.....	64.67	.....
Number of companies represented.....	49	.....	46	.....	41	.....	38	.....	41	.....	38	.....
<i>Southern:</i>												
Operating revenues...	847,782	2.81	564,040	0.25	846,461	2.54	554,516	0.93	2,498,138	0.75	1,624,056	d1.37
Operating expenses...	489,569	d4.02	318,288	d8.84	476,202	d2.71	294,523	d9.62	1,434,420	d4.27	904,879	d10.01
Net operating revenue	358,213	13.88	245,752	15.12	370,259	10.18	259,993	16.31	1,063,718	8.40	719,177	12.20
Taxes.....	.....	.....	50,270	20.23	.....	.....	57,703	36.14	.....	.....	155,120	26.90
Operating income.....	.....	.....	195,482	13.88	.....	.....	202,290	11.67	.....	.....	564,057	8.75
Operating ratio, { 1914	61.85	.....	62.05	.....	59.29	.....	59.31	.....	60.43	.....	61.07	.....
per cent. { 1915	57.74	.....	56.43	.....	56.25	.....	53.11	.....	57.41	.....	55.72	.....
Number of companies represented.....	22	.....	16	.....	21	.....	15	.....	21	.....	15	.....
<i>Western:</i>												
Operating revenues...	4,782,519	7.42	4,509,936	9.08	4,118,379	d1.92	3,825,086	d1.09	11,340,749	0.86	10,490,836	2.35
Operating expenses...	2,314,092	4.47	2,139,963	4.51	2,607,196	6.73	2,422,589	6.96	6,267,900	2.46	5,912,003	5.63
Net operating revenue	2,468,427	10.33	2,369,973	13.55	1,511,183	d13.96	1,402,497	d12.47	5,072,849	d1.04	4,578,833	d1.59
Taxes.....	.....	.....	278,246	11.35	.....	.....	297,217	8.64	.....	.....	782,874	13.57
Operating income.....	.....	.....	2,092,727	13.91	.....	.....	1,105,280	d16.82	.....	.....	3,795,959	d4.23
Operating ratio, { 1914	40.74	.....	49.52	.....	58.17	.....	58.56	.....	54.41	.....	54.60	.....
per cent. { 1915	48.39	.....	47.44	.....	63.30	.....	63.33	.....	55.27	.....	56.35	.....
Number of companies represented.....	41	.....	34	.....	35	.....	28	.....	34	.....	27	.....

various notes total \$50,000. Two of these notes, totaling \$5,000, are held by the Empire United Railways, Inc. This leaves \$45,000 and interest, amounting to some \$785, outstanding. This the receivers are now permitted to pay. Previous to the receivership it had been arranged for the Columbia Trust Company, as trustee under the Rochester, Syracuse & Eastern Railway mortgage, to pay this obligation from the funds in its hands arising from the sale of the Lyons power plant. Mr. Hotchkiss stated on April 15 that \$46,453 was in the hands of the trustee from this fund.

BAY STATE ISSUES APPROVED

Commission Sets Forth Its Limitations and Company's Responsibility in Matter of Deciding Upon New Security Issues

The Massachusetts Public Service Commission has approved an issue of 7357 shares of 6 per cent cumulative preferred stock of the Bay State Street Railway, Boston, Mass., at \$100 a share, and, conditional on the issues of these new shares, issues of \$400,000 of fifty-year 4 per cent bonds of the Boston & Northern Street Railway and \$300,000 of like bonds of the Old Colony Street Railway. The proceeds will be used for the payment of floating indebtedness and the purchase of property. The commission has rescinded its approval made in August, 1915, of an issue of 12,819 first preferred shares at \$112 per share, for the company was unable to obtain bids above \$100 per share.

At public hearings on the proposed new issues the city solicitor of Lynn and others asserted that no new stock should be authorized at this time, when the commission is considering the petition of the company for a general increase in fares. It was said that if the outcome of the fare case should be favorable to the company, its preferred stock should sell at prices considerably above par and the issuing of such stock at par under present conditions would merely give the Massachusetts Electric Companies (owner of the Bay State common stock), or allied interests, an opportunity to reap large profits at the expense of the Bay State company. It was argued that the latter company is now carrying its floating indebtedness at low rates, that money on short time loans is very cheap and that therefore the issuance of permanent securities should be postponed. The company, however, asserted that it is now carrying a substantial load of floating indebtedness; that much additional indebtedness of this nature must soon be incurred in providing for the needs of the property; that the European war and financial conditions made the market for securities uncertain, and that the best judgment of the management and its financial advisers is that the issue of permanent securities ought not to be postponed longer than necessary. Moreover, in behalf of the holding company, a written statement was filed to the effect that any new preferred stock taken would be sold by it upon competitive bids, and any profit given to the Bay State company.

In its decision the board holds that it has no authority to refuse to approve an issue on the ground that it could be made to better advantage at another time. Moreover, the statute leaves largely to the discretion of the company such a problem as the substitution of bonds in place of stock. No evidence appears upon which the commission can consistently disapprove the price now fixed by the stockholders, and the board has no reason to believe that the proposed block of preferred stock could now be sold in the open market at a price materially in excess of par. The management of the company is strongly of the opinion that the indebtedness which it now seeks to capitalize can be handled on the most advantageous terms in the way it has adopted, on the ground that an issue of both stock and bonds will open up a broader field of investment. The responsibility for this procedure rests with the company, for the commission holds that it cannot, even if it desired to do so, require the company to issue stock instead of bonds, or vice versa, or to issue a particular class of either. It is asserted, however, that if the directors should take any action at the expense of their company, they would do so at their peril and it would be the duty of the commission in any proceeding involving rates and service to prevent any injurious results to the public from such action.

REPORT OF GOTEBOURG MUNICIPAL TRAMWAY

The traffic receipts of the Goteborg (Sweden) Tramway system, which consists of 37.9 miles of surface-line track entirely owned and operated by the municipality, totaled \$703,800 for 1914. This sum includes \$8,107 for freight, baggage, carrying mail, etc. The gross income totaled \$738,156. Expenditures of \$526,981 included such items as \$231,080 for operating expenses, \$16,612 for office expenses, \$120,154 for electric energy, \$71,672 for rolling stock, \$47,068 for trackage, and \$12,353 for carhouse and workshop expenses. The net profit amounted to \$211,175. This was a decrease as compared to the preceding year, brought about by higher compensation to employees, allowances to employees mobilized for service in the army, and increased upkeep expenses.

The number of fares of the various kinds was 27,311,613 in 1914, as compared with 25,653,574 in 1913 and 10,629,969 in 1902. There were also sold, in 1914, 610 untransferable season tickets good for twelve months and 3094 good for six months at \$20.10 and \$10.72 respectively, and 456 tickets at \$13.40 good only for some particular line.

The rolling stock consists of 119 motor cars, seventy-five trailers and sixteen snow plows, repair cars and cars with ladders. Of the motor cars, 111 are for passengers, five for freight and three are bogies. Of the cars without motors, sixty-one are for passengers and thirteen for freight. The car mileage for the year was 3,657,136 for motor cars, 39,273 for locomotive cars for freight transport, and 870,675 for trail cars, a total of 4,567,084 car-miles. The number of employees in 1914 was 909 as compared to 807 in 1913.

Albany (Ga.) Transit Company.—The Albany Transit Company has certified to the Secretary of State an increase in the capital stock of the company from \$52,000 to \$75,000.

Alton & Jacksonville Railway, Alton, Ill.—A mortgage for \$2,000,000 by the Alton & Jacksonville Railroad, the successor to the Alton, Jacksonville & Peoria Railway, to John J. Cummings, Chicago, and the American Trust Company, St. Louis, trustees, has been filed for record in Madison County, Illinois. According to the mortgage, the loan was authorized on March 20, but dates from July 1, 1915. The loan is to run until July 1, 1955, at 5 per cent interest.

Ardmore (Okla.) Electric Railway.—For the second time since the first of the year the Ardmore Electric Railway was sold recently at receiver's sale. John F. Easley, former secretary of the company, purchased the property for \$4,450 and will offer it to the city at the price named, and if it is not operated as a municipal plant, the purchaser will dispose of the property as junk.

Auburn & Syracuse Electric Railroad, Syracuse, N. Y.—The New York Public Service Commission, Second District, has approved an issue of \$437,500 of 6 per cent five-year gold notes of the Auburn & Syracuse Electric Railroad, under a trust agreement to the Trust & Deposit Company, Onondaga. The notes will be sold at not less than par and the proceeds used to pay \$250,000 of notes matured on Feb. 1, 1916, and \$115,000 due on Aug. 1, 1916; to retire car trust certificates which matured on Jan. 1, 1916, to the amount of \$7,950; to pay accrued interest on first mortgage bonds due on April 1 and amounting to \$36,500, and to apply \$28,050 to accounts payable, which amounted to \$45,000 on Jan. 31.

Cities Service Company, New York, N. Y.—G. S. Bevin of Ellis & Company, London, England, and Watson B. Robinson and E. H. Johnson, New York, have been elected directors of the Cities Service Company to succeed Mr. William B. Joyce, New York, and William J. Henderson and Lawrence MacFarland, Montreal.

Denver (Col.) Tramway Power Company.—Forty-eight thousand dollars of first mortgage 5 per cent improvement bonds of the Denver Tramway Power Company dated 1903 have been drawn for redemption at 105 and interest on May 8 at the office of the International Trust Company, Denver, Col.

Fresno (Cal.) Interurban Railway.—The Fresno Interurban Railway has filed with the California Railroad Commission a supplemental application for authority to issue \$141,000 face value of its stock at \$80, and \$250,000 of its

bonds at \$90, to net a total of \$337,400. The money is to be used to build the company's line to Sanger from Fresno, and for construction from Fresno to Clovis.

Georgia Railway & Electric Company, Atlanta, Ga.—The Georgia State Railroad Commission has authorized the Georgia Railway & Electric Company to issue \$231,000 in bonds, for the purpose of defraying 75 per cent of the cost of improvements within the 7-mile limit, where the company operates in Atlanta, chargeable to capital account. The commission has also allowed the Georgia Railway & Power Company, which operates various power plants in north Georgia, but the bulk of whose property is located outside of the city of Atlanta, to issue \$124,000 in bonds for the purpose of defraying 80 per cent of the cost of improvements, additions, etc., chargeable to capital account.

Kansas City Railway & Light Company, Kansas City, Mo.—A meeting of the stockholders of the Kansas City Railway & Light Company will be held on April 28 to take action on the carrying out of the plan of reorganization of the street railway and electric light and heating system at Kansas City, supplemental to the scheme of July 30, 1915, prepared by Federal Judge Hook. Specifically, stockholders are to determine the proportion in which the shares are to be divided into separate participation of the equities of the Kansas City Railways and the Kansas City Light & Power Company. They are to select trustees, and to indicate the character of the contract to be executed.

International Traction Company, Buffalo, N. Y.—A syndicate managed by Bertron, Griscom & Company, New York, N. Y., and Reilly, Brock & Company, Philadelphia, Pa., has sold at prices varying with maturities from a 4¼ per cent to a 6 per cent basis \$1,050,000 of serial 6 per cent secured gold notes of the International Traction Company dated April 1, 1916, and due April 1, 1917 to 1926. The proceeds of the notes will be used to retire the floating debt of the company, to pay the accumulated dividends on the \$582,100 of 4 per cent preferred stock yet outstanding and for working capital. The notes are secured by the deposit of \$1,940,000 of 4 per cent collateral trust bonds and mature \$100,000 a year on April 1 from 1917 to 1925 and \$150,000 April 1, 1926.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—The Youngstown & Niles Railway has asked permission of the Ohio Public Utilities Commission to issue \$100,500 of common stock with which to complete its road from Youngstown to Warren through its preliminary stages. The company has spent about \$60,000 already on the right-of-way and surveys and \$40,000 more is needed to complete the work. It has so far borrowed funds from the Mahoning & Shenango Railway & Light Company.

Monmouth County Electric Company, Red Bank, N. J.—On application made to the United States District Court at Trenton, N. J., by R. M. Porter, Philadelphia, the Monmouth County Electric Company was placed in the hands of Charles F. Sexton, Long Branch, and William G. Bokler, Red Bank, as receivers on April 20. The court has issued an order directing the company to show cause on May 8 why the receivers should not be continued permanently. The financial difficulties of the company are attributed largely to the competition of the jitneys.

Newport News & Hampton Railway, Gas & Electric Company, Hampton, Va.—The directors of the Newport News & Hampton Railway, Gas & Electric Company have declared an initial dividend of 3 per cent on the common stock, payable on July 1 to holders of record of that date.

Pittsburgh, (Pa.) Railways.—A bill in equity was filed in the United States District Court at Pittsburgh on April 15 by Charles E. Estlack, Woodbury, N. J., asking that a receiver be appointed by the court to investigate transactions involving the stock of the United Traction Company. It is understood that the contention of the plaintiff is that under the lease by which the United Traction Company's lines are operated by the Pittsburgh Railways, a dividend of 5 per cent on \$3,000,000 of preferred stock was to have been paid annually to the holders of this stock. It is said that the payment of this dividend was discontinued on the ground that expenditures by the Pittsburgh Railways for maintenance of United Traction Company property made the payment of the dividend impossible.

Scioto Valley Traction Company, Columbus, Ohio.—A hearing on the application of the Scioto Valley Traction Company to sell \$200,000 of its preferred stock in order to purchase a similar amount of stock in the Columbus Depot Company was heard by the Public Utilities Commission on April 14. E. R. Sharp, vice-president and treasurer of the company, said that \$800,000 would be spent on the project.

Seattle (Wash.) Municipal Railway.—A. L. Valentine, superintendent of public utilities, in a report to the City Council, states that Divisions "A" and "C" of the Seattle Municipal Railway were operated during March at a loss of \$2,951. Division "A" was operated at a loss of \$427, to which is added an interest charge of \$1,593. The Lake Burien line, Division "C," lost \$930. The two lines will have been in operation two years on June 1, 1916, and the loss has been approximately \$3,000 a month, or \$72,000 for the two years. This deficit is cared for annually in the general fund of the city.

Union Railway, Gas & Electric Company, Rockford, Ill.—E. W. Clark & Company, Philadelphia, Pa., and Hodenpyl, Hardy & Company, New York, N. Y., are offering for subscription at 98½, yielding 5.5 per cent, \$3,000,000 of Union Railway, Gas & Electric Company three-year 5 per cent gold notes, dated April 1, 1916, and due April 1, 1919, with interest payable on April 1 and Oct. 1. The notes are redeemable at 101½ and interest on Oct. 1, 1916, 101 and interest on April 1 or Oct. 1, 1917, and 100½ and interest on April 1 or Oct. 1, 1918. The Bankers Trust Company, New York, is trustee. The present issue of \$3,000,000 of notes is secured by a pledge of \$4,000,000 of bonds of the Union Railway, Gas & Electric Company and underlying companies. Additional notes can be issued only to the extent of 75 per cent of the par value of bonds to be pledged. The notes are followed by \$2,500,000 of 6 per cent cumulative preferred stock and \$6,000,000 of common stock, practically all of which is owned by the Commonwealth Power, Railway & Light Company.

United Railways & Electric Company, Baltimore, Md.—At the annual meeting of the United Railways & Electric Company, on April 12, C. E. F. Clark was elected a director to fill the vacancy caused by the resignation of F. A. Furst.

DIVIDENDS DECLARED

Cape Breton Electric Company, Ltd., Cape Breton, N. S., 3 per cent, preferred; 1½ per cent, common.

Columbus Railway, Power & Light Company, Columbus, Ohio, quarterly, 1¼ per cent, preferred B; quarterly, 1¼ per cent, common.

Commonwealth Power, Railway & Light Company, Grand Rapids, Mich., 1½ per cent, preferred; 1 per cent, common.

East St. Louis & Suburban Company, East St. Louis, Ill., quarterly, three-quarters of 1 per cent, preferred.

Havana Electric Railway, Light & Power Company, Havana, Cuba, 3 per cent, preferred; 3 per cent, common.

Jacksonville (Fla.) Traction Company, quarterly, 75 cents, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

ATLANTIC SHORE ELECTRIC RAILWAY, SANFORD, ME.						
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income	
1m., Mar., '16	\$23,473	*\$22,283	\$1,190	.....	.....
1 " " '15	24,780	*20,871	3,909	.....	.....

BROOKLYN (N. Y.) RAPID TRANSIT COMPANY						
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income	
3m., Mar., '16	\$6,557,960	*\$4,428,157	\$2,129,802	\$1,401,223	†\$830,914	
3 " " '15	6,048,115	*4,069,886	1,978,237	1,170,146	†913,878	
9 " " '16	20,606,405	*13,000,486	7,605,918	3,772,990	†4,172,448	
9 " " '15	19,655,875	*12,451,748	7,204,136	3,520,739	†4,010,871	

PHILADELPHIA (PA.) RAPID TRANSIT COMPANY						
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income	
1m., Mar., '16	\$2,255,672	*\$1,254,493	\$1,001,179	\$816,555	†\$184,624	
1 " " '15	2,027,910	*1,182,265	845,645	812,925	†32,720	
9 " " '16	18,862,731	*10,565,708	8,297,023	7,345,864	†951,159	
9 " " '15	17,805,207	*10,345,667	7,459,540	7,285,439	†174,101	

REPUBLIC RAILWAY & LIGHT COMPANY, YOUNGSTOWN, OHIO						
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income	
1m., Mar., '16	\$330,046	*\$195,084	\$134,962	\$67,862	†\$67,395	
1 " " '15	242,236	158,298	83,938	55,244	†28,697	
3 " " '16	958,821	556,478	402,343	201,365	†201,920	
3 " " '15	724,837	459,348	265,489	165,888	†99,867	

WEST PENN. TRACTION COMPANY, PITTSBURGH, PA.						
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income	
1m., Feb., '16	\$471,176	*\$229,697	\$241,479	\$158,266	†\$83,213	
1 " " '15	949,079	*471,350	477,729	316,882	†160,847	

*Includes taxes. †Includes non-operating income.

Traffic and Transportation

DISCRIMINATORY FARES ELIMINATED IN INDIANA

Commission Order Entered Directing Substitution of Copper-Zone System for Low Fares in Franchises

The Public Service Commission of Indiana has issued an order which will eliminate the low passenger rates imposed by franchise conditions between such cities as Marion, Gas City, Jonesboro, Fairmount and Summitville and provide for the installation of the copper-zone fare system, which is at the rate of 2 cents a mile. The order is in a corollary proceeding to that in which the company was granted authority to establish the copper-zone rate system on its lines. Members of the commission say that the company will have no option in these particular instances, since the present discriminations in passenger fares are ruled out automatically by the utility law.

In similar instances, however, where no discriminations appear, the commissioners say, the electric railways involved might voluntarily keep the contract rates at former levels, if they so desired. In the Grant County cases, however, it is different, because the commission has determined that discriminations exist there.

The increase in rates will, in some instances, be more than 100 per cent. Where a fare of 5 cents formerly was charged between Marion and the Gas City junction the fare will be increased to 13 cents, and the fare from Marion to Fairmount, now 10 cents, will be increased to 22 cents, while the fare from Marion to Summitville, under the new order will be 33 cents.

Some time ago, when the commission granted authority to the Union Traction Company to install the copper-zone system of fares, officials of the company brought up the question of the franchise contracts in Grant County, and the commission ordered that a separate petition be filed, asking for a ruling on the points involved. This petition was filed and a formal ruling is to be made. Commissioner John F. McClure is having it prepared.

Commissioner James L. Clark stated the position of the commission in the questions involved as follows:

"The law itself (public utility law) makes discriminations unlawful and puts on this commission the burden of removing those discriminations of rates among all utilities in this State. These rates (Grant County franchise rates) being discriminatory, and our attention having been called to them, the Union Traction Company has been ordered to cease giving these rates. The fact that, in granting a franchise, some municipality has fixed a rate through the country to another municipality, we have not considered as interfering with the right of the State to declare that rate void, as discriminatory, for the reason that the legislature never conferred on any municipality the power to fix rates outside of its own corporate boundary. As to rates fixed by the county commissioners in granting a franchise, we conclude that the Legislature never, at any time, conferred power on them to fix a rate in any franchise that would be contractual and, therefore, protected by the constitution, when the State saw fit to fix a different rate."

Commissioner Clark stated that a similar question had arisen in Wayne County, Indiana, in which the utility involved was the Terre Haute, Indianapolis & Eastern Traction Company and that a similar order had been entered by the commission. In this case the matter was taken to court, and in the answer filed by the company it set out the powers and authority of the Public Service Commission, which had been received under the public utility act, and which were handed down to it by the Railroad Commission of Indiana, it being shown that the commission had full authority to establish uniform rates of fare throughout the State of Indiana. The judge before whom the hearing was held confirmed the answer filed by the company, and no further action has since been taken by the county.

SHUTTLE LINE OPERATION DISCUSSED

Brief reference was made in the *ELECTRIC RAILWAY JOURNAL* of April 8, page 715, to an order of the Massachusetts Public Service Commission requiring the Boston Elevated Railway to restore through service in the East Boston tunnel to and from Jeffries Point. In view of the bearing the board's comments have upon the general relation of shuttle and main-line service, a brief résumé of the decision is given below.

The company formerly operated a line of cars on a fifteen-minute headway during normal hours and a ten-minute headway during rush hours from Jeffries Point, East Boston, a manufacturing and shipping district, to Scollay Square via the East Boston tunnel. Following the completion of the East Boston tunnel extension to Bowdoin Square, the company rearranged the operating schedule by running a shuttle line between Jeffries Point and the East Boston entrance of the tunnel, a distance of about two-thirds of a mile, and by established free transfer privileges at the latter point to and from cars operated through the tunnel. This change was confined to normal hours, the through service being retained during rush hours on the former schedule. The petitioners claimed that this rearrangement of service had resulted in serious inconvenience to patrons of the line and requested the restoration of the former through service.

In its decision the commission states that, of necessity, many lines must be operated as shuttle or feeder lines connecting with the main arteries of travel. But the policy of confining through service to main trunk lines, the board holds, does not represent any inflexible principle which may be blindly followed without regard to the conditions of the particular case involved. Even if the general policy is sound the rule of reason must be used in its application. Where there are convenient facilities for transfer and where a quicker and more frequent service is provided, passengers are compensated for the inconvenience of transfer. But in this case a short line about 2 miles long was broken up into two fragments, the frequency of service was not increased, and owing to the delays from transferring the running time between Boston and Jeffries Point was considerably increased. Moreover it had been shown that the line could be operated as a through line on a paying basis and without interference with the service on other lines, and that if the old plan was followed and a more frequent service was furnished on the shuttle line, the cost of operating the additional car would practically offset any saving made by the company through the discontinuance of the through service. Through service was ordered restored on April 8.

BAY STATE FARE HEARINGS RESUMED

Hearings before the Massachusetts Public Service Commission were resumed on April 17 at Boston in the Bay State Street Railway fare case. The full board was in attendance. Cross-examination of R. M. Feustel, valuation expert of the Bay State company, occupied the sessions, and it is expected that an extended inquiry will be directed into the methods employed in obtaining the investment cost of the property, as previously outlined in this paper. Arthur G. Wadleigh, city solicitor of Lynn, Mass., acted as spokesman for the municipal counsel opposing the fare increase. Mr. Feustel said that by and large the records of the Bay State company were of first-order assistance in the investment cost determination, and that while judgment was used in utilizing such records, the final results represented a close approximation to the actual cost of the property. The witness stated that promotion costs included rough surveys, the cost of efforts to interest financial men, including salaries and expenses of persons thus employed, and cost of options. Other elements to be considered in the way of additional cost of development were deficits of early years, super-normal operating expenses and depreciation due to experiments necessary in getting a new business into working order. Mr. Feustel said that the total cost of the work done for the Bay State company in connection with the valuation was about \$120,000. The physical valuation cost approximately \$60,000. The hearings were adjourned on April 18 until April 21 owing to an intervening holiday and a legislative committee hearing.

TRACTION CONTEST ANNOUNCED IN SEDALIA

The efforts of Harry D. Frueauff, general manager of the City Light & Traction Company, Sedalia, Mo., operated by Henry L. Doherty & Company, to stimulate the company's railway business have been referred to previously in the *ELECTRIC RAILWAY JOURNAL*. Announcement is now made that a new idea is to be put into effect shortly, namely, giving the public prizes for guesses on the company's traction revenue based on past and present performances.

The purpose of the contest is to convince the residents of Sedalia that their welfare, as well as that of the company's, is best served by using the street cars at all times. In previous advertising campaigns Mr. Frueauff demonstrated the necessity of additional patronage to maintain and improve the service according to Sedalia ideals. The company will, prior to the starting of the contest, present figures in the newspapers of the revenue and traffic handled for this year and analogous periods of 1915, so as to give all guessers data upon which to base their estimates. Days upon which circuses or other entertainments swell the receipts will be set forth, and announcements will be made when similar occasions may affect the revenues during the guessing period. Prizes will be awarded to those whose estimates most nearly approach the actual returns.

CHICAGO ELEVATED REDUCES EMPLOYEES' ACCIDENTS A THIRD IN ONE YEAR

A comparative statement of accidents to the employees of the Elevated Railroads of Chicago for 1913, 1914 and 1915 shows that a 33 1/3 per cent decrease in accidents of this class occurred during 1915. The following table, taken from the company's April *Safety Bulletin*, shows the number of accidents to employees by departments and by months, for the year 1915:

	Transportation Department	Shop Department	Road Department	Electrical Department	All Departments
January	52	22	11	2	87
February	28	11	8	4	51
March	39	7	3	4	53
April	41	14	8	3	66
May	40	16	12	4	72
June	24	14	7	0	45
July	16	24	6	4	50
August	33	9	17	0	59
September	35	14	17	3	69
October	32	19	20	0	71
November	49	11	17	0	77
December	42	21	16	2	81
Total, 1915	431	182	142	26	781
Total, 1914	546	197	351	72	1,166
Total, 1913	551	203	323	79	1,156

This reduction in accidents to employees is attributed to the company's safety campaign which was conducted more vigorously during 1915 than in years previous. It is also interesting to note that the figures for January and February of 1916 show a marked improvement over the same months for 1915.

THE JITNEY AT SEA WITH ITS BINNACLE LIGHT OUT

Electrogram, a weekly bulletin issued by the Puget Sound Traction, Light & Power Company, Seattle, Wash., printed the following recently:

"In Los Angeles an electric car met a jitney bus with disastrous results, and among the passengers who were called upon to give testimony was a 'jackie' from the monitor *Cheyenne*. His letter to the claim agent, as printed in the *Los Angeles Herald*, follows:

"I was standing on the starboard fo'castle of the car when the gasoline cutter hove in sight off our port bow. We were making about fifteen knots, and the cutter was coming about the same along another channel. It was clear weather and not much ground swell.

"Our chief engineer blew his siren and reversed his propeller, but he couldn't heave her in time to keep from ramming her. There wasn't even time to get out the life preservers or sound the emergency call. We smashed in a couple of the little craft's compartments. Her captain stuck to his post. The jitney went down like a submarine.

"I think the cause of the wreck was that the jitney's binnacle light was out."

Information for Passengers.—The Cincinnati (Ohio) Traction Company will issue a booklet containing a list of the transfer points and other information useful to passengers.

Suggestions Wanted from Employees.—The Kansas City (Mo.) Railways is asking for suggestions from its employees for the betterment of the service. The company has announced that "the best one will be picked out, and for every available one \$5 will be paid."

Hoboken Fare Hearing Postponed.—The hearing before the Board of Public Utility Commissioners of New Jersey on the application of the city of Hoboken for an order to require the Public Service Railway to operate there at a 3-cent fare was postponed from April 4, 5 and 6 to April 19 and 20.

Suggested Use for Janitors Approved.—The City Council of Louisville, Ky., has passed an ordinance which will admit of the janitors of schools being authorized to serve as traffic police officers under certain conditions. The board of education has taken the matter up, and it is said to be probable that the janitors of at least some of the schools, where conditions of traffic present dangerous aspects, will be empowered to regulate traffic during certain hours of the day.

Commission Cannot Review Rates Arranged Between Companies Themselves.—The Ohio Public Utilities Commission on April 12 dismissed the complaint of the Dayton & Troy Railway against the Western Ohio Railway filed in an effort to secure a new division of receipts on through freight business over the two lines. The commission held that because it had never fixed freight rates for the two roads it could not review the rates arranged between them. The commission said that the remedy was for the complaining road to ask for the approval of a set of rates over the two roads.

More Fare Collectors in Kansas City.—In an effort to facilitate the loading of cars in the rush hours of the evening, the Kansas City (Mo.) Railways experimented in the Tenth and Main Streets district recently by stationing extra fare takers at the rear end of the cars as well as at the front end. This made three men receiving fares at each car and resulted in a much quicker loading. The count showed that 180 cars were loaded within the hour in the Tenth Street loop section, as compared with about 115 previously. It is said that it is probable the additional fare takers will be placed at all the congested points during the evening rush hours.

Waterloo One-Man Car Case Pending in Court.—The court has taken no action beyond that of issuing a temporary order to prevent the operation of the ordinance passed by the City Council of Waterloo, Iowa, ordering the Waterloo, Cedar Falls & Northern Railway to cease the operation of one-man cars. Since the original ordinance was passed a city election has been held, and most of the Aldermen who were responsible for the passage of the measure were defeated for re-election. With these and other changes in the city administration the situation appears more hopeful for the railway. In the meantime, however, the company is collecting more evidence on one-man car operation.

Chicago Traffic to Be Checked.—The Chicago Traction & Subway Commission will check the origin and destination of all passengers on the surface and elevated lines. The observers who will do the checking will be uniformed and will hand checking slips, punched to indicate point of origin, to each boarding passenger. These slips will be taken up when the passengers leave the car, and again punched to indicate the destination. The commission has explained the plan to the public through the press and requested its co-operation. More than 4,050,000 trips are made daily on the Chicago surface and elevated lines. Of these 2,310,000 are original trips and 1,740,000 are transfer trips. Checks on the elevated lines will be made by observers at the 206 stations, of which twelve are transfer points.

Steam Railroad Abandons Twin Tickets.—The Hocking Valley Railroad has abandoned the use of so-called twin tickets between Columbus and Marion, Ohio. The tickets have been used for several years in competition with the Columbus, Delaware & Marion Railway, and between Columbus and Lancaster in competition with the Scioto Valley Traction line. These tickets were sold in twos at

a lower rate than the regular fare, and were good in either direction. The passengers, however, formed the habit of buying the tickets and then leaving the train and buying tickets at Marion and Lancaster for the remainder of their trips. This cut into the receipts of the company very materially, and for some time it has been endeavoring to stop all but local passengers from using the tickets. It was finally decided to withdraw the tickets entirely and charge the full fare of 2 cents a mile from all stations.

Service Only Where Traffic Warrants.—In the matter of the complaint of John E. Judge of Plattsburgh against the Plattsburgh (N. Y.) Traction Company as to non-operation to Bluff Point during the winter months the Public Service Commission for the Second District decided recently that a street railway will not be required to extend the operation of its cars during the winter months for the purpose of developing real estate and improving the value thereof when there is not sufficient traffic to warrant the operation of cars over that portion of its lines where the service is desired; that the operation of street cars thirty minutes apart in a small city for the purpose of carrying local traffic, where no other street car service is given, would be inconvenient to the public and unremunerative to the company; and that the duty of the commission is to require service where the same is necessary for the convenience of the public and the traffic warrants it, but not otherwise.

Protest Against Caldwell Fares.—H. F. Dicke, manager of the Idaho Traction Company, Boise, Idaho, in a communication to the Mayor and the City Council of Caldwell, states that his company has discontinued collecting more than a 5-cent fare within the city limits. The City Council passed a motion recently which had for its intention the revocation of the company's franchise unless the fare was reduced to 5 cents. Heretofore the company has charged passengers riding from College Hill 10 cents, while others who proceeded a few hundred yards further to Rice Station were required to pay 15 cents. Both of these stations are within the city limits. The company's franchise stipulates that not more than a 5-cent fare shall be charged within city limits. Mr. Dicke explained in his communication that it was through a mistake that fares of 10 cents and 15 cents were collected. He pointed out, however, that observance of the franchise agreement worked a hardship on the company, as the mileage between city limits was unusually long.

D. U. R. Submits Rerouting Plan to Authorities.—A rerouting plan, indorsed by the Street Railway Commission and following largely the suggestion of the engineers employed by this commission to make a traffic survey, has been submitted by the Detroit (Mich.) United Railway to the public utilities committee of the Detroit City Council. In a series of articles in *Electric Railway Service*, the railway company's publication, beginning with the issue of April 14, the company is placing this general plan of rerouting before the public. In connection with the plan the following advantages of rerouting were submitted: "It will permit of the use of more cars. It will result in a greater regularity of service. It will shorten the running time between terminals with a still greater reduction if the cars are operated on the skip-stop system. It will permit of through service between east and west across Woodward Avenue (Detroit's principal traffic artery) being maintained through looping a portion of the car movements on either side of Woodward Avenue, at points convenient to that thoroughfare."

Safety Board Appointed on Interurban Line.—A safety board has been appointed on the Buffalo, Lockport & Rochester Railway, Rochester, N. Y., whose duties shall be the promotion of safety first in all departments. This safety board is composed of the heads of departments and one member from each branch of the service. The heads of departments will act as a permanent board. The members who are appointed from the various departments will serve for a period of six months, at which time they will be retired and will be succeeded by other employees from the same departments. The board organized on April 18. Hereafter meetings will be held on the second Tuesday of every month. The board will consider and investigate all matters brought to its attention which relate to the question of safety on

the road. Matters requiring investigation will be handled by committees appointed by the general manager, who will act as chairman of the board. The notice announcing the appointment of the board was published in all the local papers in the territory in which the company operates, with the advice that the company will be glad to receive suggestions from the traveling public.

President Kealy Discusses Fares.—P. J. Kealy, president of the Kansas City (Mo.) Railways, in a recent address to the Real Estate Board of that city, told of details of routing cars, and in general of plans for the extension of lines. Mr. Kealy referred to the partnership of the city in the street railway, and said that the city might eventually see the necessity of higher fares in outlying districts, and that the Public Service Commission might step in and say that such higher fares could be charged, if the prices of materials and labor continued to rise. Mr. Kealy pointed out that so long as the number of riders in the downtown district more than kept pace with the increase in the long-haul riders, the profit on the short haul would care for the deficit on the long haul. Mr. Kealy thought that the large class that desires 5-cent fares would not live more than forty minutes from its work. The intimation that the Public Service Commission might allow the city to increase fares in distant districts within the city limits, although the franchise provides for 5-cent fares in that area, was used to illustrate the difficulty of granting 5-cent fares on long hauls from outside the city limits as they are at present fixed.

Campaign by Employees Against Motor Vehicle.—The members of the Pacific Electric Railway Agents' Association, composed of employees of the Pacific Electric Railway, Los Angeles, Cal., have passed resolutions to the effect that members notify the superintendent of their respective divisions of any and all accidents to passengers or damage to freight when such accident or damage is chargeable to motor truck or jitney bus transportation; that members learning of any passenger or freight traffic that possibly may be secured in competition with jitney buses or motor trucks notify the traffic manager and the superintendent of the company; that members notify the superintendent when in their opinion changes in the schedules of trains in and out of their station will serve to secure passenger and freight traffic against jitney-bus and motor-truck competition; that members report to city and county officers any and all violations of city or county ordinances by autos, and that members of the association urge city and county officials to pass ordinances that will require motor trucks and buses to give regular service, charge uniform prices for transportation and pay to the city, county or State an amount equal to that paid by the Pacific Electric Railway, which contributes to the public funds 5¼ cents on each dollar of revenue received from the transportation of passengers and freight.

Hearing on Heating in Seattle.—At a recent hearing before the State Public Service Commission, held in Seattle, Wash., on application of the city of Seattle for an order directing the Puget Sound Traction, Light & Power Company to furnish heat in its cars during the winter months, thirteen witnesses, among them three health officials, furnished testimony. Among those who took the stand for the city were Dr. J. S. McBride, city health commissioner; T. T. Tuttle, State commissioner of health, and Dr. B. J. Lloyd, of the U. S. public health service. All three testified that the temperature in the cars should not fall below 40 deg. Fahr., or rise above 60 deg. Fahr. during the cold months. J. P. McCloy, car inspector in the city utilities department, said the cars on longer routes should be heated, but that heat was not required on the cable cars or other cars where passengers rode less than twenty-five minutes. On cross-examination Mr. McCloy said that the cars of Division "A" of the municipal line were unheated, but that the city would furnish heat if the Council would appropriate money for the purpose. He said that cars on the Lake Burien line, Division "C" of the municipal system, were heated. Heat is now furnished on some of the lines of the traction company. The city completed its case on April 10. The continuation of the hearing was set for April 17, when it was intended to hear the corporation.

Personal Mention

Mr. Forrest G. Fogg has resigned as division auditor of the Michigan Railway, Kalamazoo, Mich.

Mr. C. Dwight Baker, who has been general trainmaster of the Long Island Railroad, has been appointed superintendent of the company to succeed Mr. John B. Austin, Jr., resigned. Mr. Baker entered the employ of the company in 1891 as a clerk.

Mr. Garrow T. Geer, editor of the *B. R. T. Monthly*, has been appointed chief clerk of the bureau of public safety of the company, to succeed Mr. A. P. Gumaer, resigned. Mr. Gumaer had been chief clerk of the bureau of public safety since Oct. 1, 1915. He resigned to become advertising manager of *All Out-Doors Magazine*.

Mr. John B. Austin, Jr., for the last eleven years superintendent in charge of operations of the Long Island Railroad, has been elected vice-president and appointed general manager of the Gaston, Williams & Wigmore Steamship Corporation. Prior to his entering the services of the Long Island Railroad Mr. Austin was connected with the Pennsylvania Railroad.

Mr. James Lightbody, formerly on the staff of the Vancouver *Daily Province*, has been appointed publicity agent for the British Columbia Electric Railway, Vancouver, B. C., succeeding Mr. Bury I. Dasent, who resigned recently in order to return to Chicago to rejoin his wife, who is seriously ill. Mr. Lightbody was for three years a reporter on the Vancouver *Province*, and previously was on the staffs of Winnipeg newspapers.

Mr. Clyde B. Aitchison, chairman of the Oregon Public Service Commission, has accepted appointment as chief of the valuation department of the National Association of Railroad Commissioners at Washington, D. C. Mr. Aitchison has been a member of the Oregon commission since 1907. Previous to his appointment on the railroad commission he was, in 1905 and 1906, secretary of the Oregon Tax Commission, appointed to redraft the tax laws of the State.

Mr. William H. Dinsmore, who has succeeded Mr. James Hilton as traffic superintendent for the British Columbia Electric Railway, Vancouver, B. C., started with that company on Feb. 1, 1901, as a conductor. On Nov. 1, 1909, he was appointed inspector and since that time his rise with the company has been rapid. On Nov. 1, 1915, he was made chief inspector of the British Columbia Electric Railway and when Mr. Hilton resigned in March of this year Mr. Dinsmore became traffic superintendent.

Mr. Frank Julian Sprague, representative in the naval consulting board of the American Institute of Electrical Engineers, was invited to witness the 1916 battle maneuvers and exercises of the Atlantic fleet in Southern waters, and he is one of the few civilians, if not the only one, to whom that privilege has ever been granted by the Navy Department. In an article in the magazine supplement of the *New York Times* for April 16 Mr. Sprague, who is a graduate of Annapolis, for the first time since his return, told the story of his experiences with the greatest of all American fleets, and indicated what, in his opinion, should be done to make the fleet one of the most powerful offensive and defensive fighting organizations in the world.

Mr. B. T. Longino has been appointed superintendent of the Jacksonville (Fla.) Traction Company, succeeding Mr. W. E. Wood. Mr. Longino was graduated from the Georgia School of Technology in 1907, and following graduation spent one year in the Boston office of Stone & Webster. He was transferred to the Seattle (Wash.) Electric Company, where he spent about two years in the car shops and transportation department. From 1909 to 1913 he was assistant superintendent of the Tacoma Railway & Power Company, Tacoma, Wash. He left the street railway business and spent one year as cashier in the bank at College Park, Ga. Late in 1914 he accepted a position with the Jacksonville Traction

Company in charge of the safety-first campaign, in which work he has since been engaged.

Mr. H. A. Genung, whose appointment as chief engineer of the St. Paul (Minn.) Southern Electric Railway was announced in the *ELECTRIC RAILWAY JOURNAL* of April 8, was born in Evansville, Ind., in 1863. He has had thirty years of experience in the construction of steam and electric railways. Previous to his appointment to the St. Paul Southern Electric Railway Mr. Genung was in charge of the building of the following railways as chief engineer: Indiana & Lake Michigan; Dallas, Cleburne & Southwestern; St. Louis, El Reno & Western; Vinita & Western; Apolousas, Gulf & Northwestern; Evansville & Rockport Electric; Fort Scott, Iola & Western. He also served as engineer of maintenance of way of the International & Great Northern Railway from Taylor to Laredo, Tex., in 1908.

Mr. Charles Ruff has been appointed master mechanic of the Lincoln (Neb.) Traction Company to succeed Mr. H. H. Lytle, resigned. Mr. Ruff has recently held important positions in steam railroad locomotive repair shops, but before that was engaged in electric railway work. He began his electric railway experience as general foreman of the mechanical department of the Twin City Rapid Transit Company, Minneapolis, Minn., and later was general foreman of shops of the Indianapolis Traction & Terminal Company; master mechanic of shops of the International Railway, Buffalo, N. Y.; master mechanic of the eastern division of the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., and master mechanic of shops of the Indiana Union Traction Company at Anderson, Ind.

Mr. W. E. Wood, who has been connected with the Jacksonville (Fla.) Traction Company for a number of years in various capacities, and lastly as superintendent of the company, has been transferred to Houston, Tex., as general superintendent of the Houston Electric Company, succeeding Mr. R. T. Sullivan, whose appointment as manager of railways of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, was noted in the *ELECTRIC RAILWAY JOURNAL* of April 15. Both the Jacksonville and Houston properties are controlled by Stone & Webster. Mr. Wood was graduated from the Georgia School of Technology in 1907. He spent the year after graduation in the Boston office of the Stone & Webster Company and was then transferred to the Jacksonville Traction Company. He worked in all departments of the Jacksonville Traction Company as a student and in 1912 was made superintendent, holding that position up to the time of his transfer to Houston, Tex.

"OFFICIAL PUBLIC SERVICE REPORTS"

Publication was begun the first of this year on a new series of commission reports by the Law Publishing Company of New York. This company is associated with the Law Reporting Company, official reporters for the Interstate Commerce Commission, New York Public Service Commission of the First District, and the National Association of Railway Commissioners, and the reports are being published under the direction of the latter body, under a resolution adopted at its San Francisco meeting in 1915. The reports will include not only all decisions handed down by State or municipal public service, railway and corporation commissions, but also decisions handed down by State and federal courts reviewing or affecting commission decisions or relating to regulation of public utilities. Each decision has a syllabus, and each volume will contain a subject index and a syllabus digest. There will also be an annual digest and a legislative supplement, and the publishers expect to issue a supplementary digest of commission and court decisions handed down from 1907 to 1914 with references to the present edition.

The reports are issued in two forms, namely, as advance sheets, which are issued weekly, and as bound volumes. The former are furnished for \$25 a year, and the bound volumes for \$4.50 each. The number of volumes per year will vary, depending on the number of decisions published, but for the present there will probably be about ten. The Law Publishing Company is also planning to issue the decisions during 1915. These decisions will make nine volumes in addition to one volume of digests.

Construction News

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

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

FRANCHISES

***Elsinore, Cal.**—Charles DeLacour has asked the Board of Supervisors for a fifty-year franchise to construct an electric railway from Elsinore to San Diego, via Wildomar, Murrietta and Temecula.

Moline, Ill.—The Tri-City Railway Company of Illinois has asked the Council for a franchise to construct double tracks along Fourth Avenue, Moline.

New Orleans, La.—The Orleans-Kenner Electric Railway has asked the Council for a franchise to furnish electricity for lighting and power in Kenner.

St. Paul, Minn.—The City Council of St. Paul has adopted the ordinance requiring the Twin City Rapid Transit Company to construct extensions of its St. Clair-Hope Street line and East Seventh-Randolph Street line. The first line must be extended from Oxford Street to Snelling Avenue by Sept. 1, 1917. The second line must have a single-track extension from Snelling Avenue to Cleveland Avenue in operation by Aug. 1, 1916.

Utica, N. Y.—The New York State Railways has received a franchise from the Council to construct an extension on James Street from Elm Street to Neilson Street.

Sharon, Pa.—The Youngstown & Sharon Street Railway has received a franchise from the Council to construct an extension to Buhl Farm. The company is given the option of constructing the line over State Street from Stambaugh Avenue to Tenth Street, or on State Street to Case Avenue and thence northwardly on Case Avenue to the borough limits at Linden Street, and thence to the park.

Jackson, Tenn.—The City Commission is considering an amendment to the franchise of the Jackson Railway & Light Company which would enable the company to double-track its line on Main Street. There is some opposition on the ground that the street is not wide enough.

Spokane, Wash.—The Spokane Traction Company has asked the Council for a franchise to operate and maintain a line on Grand Boulevard from Thirty-third to Thirty-eighth Streets.

TRACK AND ROADWAY

Municipal Railways of San Francisco, San Francisco, Cal.—The construction of an extension across Golden Gate Park, according to revised plans submitted by the city engineer, has been agreed on by the public utilities committee of the Board of Supervisors. The plan provides that the extension shall begin at Tenth Avenue and Balboa Street, extending along Balboa Street to Twelfth Avenue, along Twelfth Avenue to Golden Gate Park. After crossing the park the line will extend along Fourteenth Avenue to Judah Street. The cost of the extension is estimated at \$260,000.

Georgia Railway & Power Company, Atlanta, Ga.—This company will construct an extension from the present terminus of its Brookhaven line to Oglethorpe University, about 1 mile.

***Boise-Bruneau Railway, Boise, Idaho.**—This company plans to construct an electric railway from Boise to Bruneau. D. Miller, Kansas City, Mo., president, and B. F. Olden, Boise, treasurer.

***Wallace, Idaho.**—W. H. Herrick, Wallace, reports preliminary steps have been taken toward the construction of a 10-mile electric railway from the Oregon-Washington Railroad & Navigation Company's tracks to the Constitution Mine. Financial arrangements have been completed, and construction will be begun this spring.

Galesburg Railway, Lighting & Power Company, Galesburg, Ill.—This company contemplates the construction of an extension to its North Seminary Avenue line.

Springfield & Jacksonville Electric Railway, Springfield, Ill.—It is reported that construction will soon be begun on this company's proposed line from Springfield to Jacksonville, via Berlin. Plans insuring the completion of the line during 1917 have been completed. J. H. McFarlane, Springfield, is general manager of the J. H. McFarlane Company, organized in 1910 to construct the line. [Feb. 22, '13.]

Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind.—The proposition of this company for the restoration of the Broadway Street line in Logansport, from Twenty-sixth Street to Spencer Park, has been approved by the Council of Logansport, and the track will be relaid at once. The track will be laid in a grass plot along the side of the street, and all poles to be used will be of concrete.

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.—Work has been begun by this company on the construction of an extension to its West Main Street line, Crawfordsville, about ½-mile west from its present terminus.

Tri-City Railway, Davenport, Iowa.—Work will be begun at once by this company on the construction of double tracks on Fifth Avenue, Moline, Ill.

Muscataine, North & South Railway, Muscataine, Iowa.—The stockholders of the Muscataine, North & South Railway have decided to reorganize the company and to equip the railroad for electrical operation. The road will be converted into an interurban line to operate under a traffic arrangement as a continuation of the Davenport & Muscataine Railway.

Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan.—The formal contract allowing this company the right to cross the old Kaw River bridge was signed on April 10 by the county commissioners and Karl Klemm, president of the company. The provisions of the contract are that the Kansas City, Kaw Valley & Western Railway is to remodel the bridge for its tracks at its own expense. When the new bridge is completed the company must cease to operate across the old structure and the piling must be removed.

Shelbyville & Frankfort Realty Company, Shelbyville, Ky.—A report from this company states that surveys have been completed and right-of-way obtained for its proposed line from Shelbyville to Frankfort, via Bridgeport, Grafenburg, Peytona and Clay Village, 19½ miles. Construction of the line will be begun some time during the early summer. Overhead trolley will be used. The power stations will be located at Shelbyville and Frankfort. J. W. Gudgel, Shelbyville, secretary. [April 15, '16.]

New Orleans Railway & Light Company, New Orleans, La.—This company has reconstructed its tracks on Prytania Street, from Louisiana Avenue to Robert Street, using 105-lb. rails. Creosoted wood block paving was also used.

Lewiston, Augusta & Waterville Street Railway, Lewiston, Me.—This company will repair its track between Brunswick and Bath, new ties and rails being used. The company plans to build a new bridge over the New Meadows, and will repair the Brunswick and Topsham bridge.

Winnipeg (Man.) Electric Railway.—The Board of Control has instructed the city solicitor to request this company to proceed at once with the extension of its line on Academy Road from west of Ash Street.

Boston, Mass.—Bids were opened by the Boston Transit Commission on April 11 for the construction of Section J, Dorchester Tunnel, in and near Dorchester Avenue and Boston Street, from about 80 ft. north of Dexter Street to about 30 ft. south of Ralston Street, South Boston. The contract was awarded to T. A. Gillespie, New York City, at \$346,887. [March 25, '16.]

Bay State Street Railway, Boston, Mass.—This company will relocate its tracks from the side to the center of the street on Elliott Street from Cabot to McKay Street, Beverly.

Boston & Eastern Electric Railway, Boston, Mass.—Governor Samuel W. McCall has signed a bill granting the Boston & Eastern Electric Railway an extension of time of two years in which to construct its proposed line between Boston and Lynn, Danvers and Beverly (April 15, '16).

Boston (Mass.) Elevated Railway.—The city of Boston and the Boston Elevated Railway have asked the Public Service Commission for permission to reconstruct the Brookline Avenue bridge over the Boston & Albany Railroad so that cars may operate over it. On completion of the new bridge the Ipswich Street-Brookline Avenue line will be discontinued, and the cars will operate through Brookline Avenue across the bridge and through the Boylston Street subway.

***St. Joseph, Mich.**—Plans are being considered by M. W. Stock and associates to construct a line from St. Joseph to Michigan City.

Kansas City (Mo.) Railways.—Philip J. Kealy, president of the Kansas City Railways, has worked out a plan which provides for the development of the company's system up to 1930. It embraces the construction of 87.81 miles of new track in Kansas City, Mo., in addition to that agreed upon in the franchise and 30.69 miles in Kansas City, Kan., and Rosedale. In Kansas City, Mo., 8.25 miles will be abandoned and in Kansas 1.182. Before the adoption of the franchise there were 199.3 miles of track in Kansas City, Mo. The franchise called for 25 miles in extensions immediately, making a total of 224.3 miles. Adding the 87.81 miles to be built and subtracting the 8.25 miles to be abandoned, Kansas City will have 303.86 miles in 1930. Kansas City, Kan., now has 56.04 miles. In 1930 it will have 82.40 miles.

Brooklyn (N. Y.) Rapid Transit Company.—Construction work has been begun at Parkside Avenue, by the Intercontinental Construction Company on the four-tracking of the Brighton Beach line of this company. The cut will be widened from Church Avenue to Malbone Street to permit the operation of four tracks. The cost of widening this section will be about \$1,000,000.

***Panama Traction Company, Jamestown, N. Y.**—Chapman & Graham, engineers, Jamestown, advise that location surveys will be begun this week for this company's proposed line from Youngsville, Pa., to Jamestown, N. Y., thence to Erie, Pa. R. L. Davis, Jamestown, vice-president and general manager.

New York, N. Y.—A contract will be let by Conners Brothers, 64 West Eighty-eighth Street, for 4 miles of overhead trolley work.

Manhattan & Queens Traction Corporation, New York, N. Y.—The Manhattan & Queens Traction Corporation's line will be extended from Jamaica to St. Albans by the fall. It is expected that the company's line from the Jamaica railroad station to Sutphin Road and Lambertville Avenue will be completed and in operation by May 20.

***Salem, Ohio.**—It is reported that a corporation is being organized to construct an interurban railway between Salem and Youngstown, via Canfield. John Goepfinger, Alliance, is interested.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—Work will soon be begun by this company on the reconstruction of its tracks on Wilson Avenue and East Federal Street for about 2½ miles from the eastern city limits to the Diamond. Steel ties and concrete foundation will be used. The Stone & Webster Engineering Corporation has received the contract for the construction.

Youngstown & Niles Railway, Youngstown, Ohio.—This company has applied to the Public Utilities Commission of Ohio for permission to issue \$100,500 common capital stock with which to complete its proposed line from Youngstown to Warren. J. P. Wilson, Youngstown, president. (Jan. 15, '16.)

***Baker, Ore.**—It is reported that capitalists of Spokane, Wash., and Lewiston, Idaho, contemplate the construction of an electric railway between Baker and Pine, 45 miles, and Baker and Eagle Valley, 75 miles. The initial construction proposed will be from Baker to Sparta, 40 miles. Alexander Allerdyce is interested.

Southern Oregon Traction Company, Medford, Ore.—It is reported that if the report of the city attorney and the Bar of Medford, regarding the legal status of the proposed bond issue for building an electric railway to the Blue

Ledge mine, is favorable, the Council will call a special election to present the matter to the voters. Under the new arrangement, however, the city, instead of building the railroad from Jacksonville to Ruch, 15 miles, will buy the present Jacksonville line, from Medford to the county seat, and also the line operating in Medford, for \$300,000. S. M. Bullis, president of the Southern Oregon Traction Company, in return has agreed to build an extension of the line from Jacksonville to Ruch, thence to the Blue Ledge mine. Mr. Bullis also promises to keep up the interest payments on the Jacksonville Railroad's mortgage of \$57,000, and at the end of five years buy back the Jacksonville and Medford lines for \$300,000. According to reports, the city, as a unit, is in favor of the scheme, provided legal obstacles can be removed.

Oregon Electric Railway, Portland, Ore.—C. O. Jenks, general manager of the Oregon Electric Railway, reports that construction will be begun immediately on stockyards to be built near Junction City.

***Phoenixville, Pa.**—Plans are being considered for the construction of an electric railway from Phoenixville to Norristown via Mont Clare, Oaks, Audubon and Jeffersonville. Thomas E. O'Connell, president of the Phoenixville-Valley Forge & Strafford Electric Railway, is interested.

Beaumont (Tex.) Traction Company.—Work has been begun by this company on the construction of an extension of its Sabine-Magnolia line to the Magnolia Petroleum Company's plant, about 4500 ft.

Intermountain Traction & Power Company, Tacoma, Wash.—This company, which was recently incorporated, reports that it proposes to do an industrial lighting and power business. No railway construction is contemplated in the immediate future. Alfred B. Iles, Valdez, Alaska, manager. [Jan. 15, '16.]

Monongahela Valley Traction Company, Fairmont, W. Va.—A report from this company states that contracts will be placed within the next few weeks for the construction of an extension between O'Neil and Wolf Summit, 2½ miles, and 1700 ft. on Limestone Creek.

Lewisburg & Ronceverte Electric Railway, Lewisburg, W. Va.—This company reports that contract will be let during the next six weeks for the construction of an extension of about 3000 ft. to its present line.

Wheeling (W. Va.) Traction Company.—A third-rail is being laid by this company between the Top Mill and Richland coal mine on the Panhandle division. This work is being done preliminary to operating the Benwood and North Wheeling cars through to Warwood.

SHOPS AND BUILDINGS

Massachusetts Northeastern Street Railway, Haverhill, Mass.—This company reports that it expects to build a brick carhouse at Merrimac, 100 ft. x 160 ft., the roof to be of mill construction.

Lewisburg & Ronceverte Electric Railway, Lewisburg, W. Va.—A report from this company states that it expects to build a car shed and extra station facilities.

POWER HOUSES AND SUBSTATIONS

New Orleans Railway & Light Company, New Orleans, La.—This company recently installed a new generator in its power plant and constructed an extension to house the equipment. The cost of the improvements was \$450,000.

Morris County Traction Company, Morristown, N. J.—A report from this company states that it expects to purchase one 500-kw. rotary converter.

Burlington County Transit Company, Mount Holly, N. J.—This company has contracted to purchase energy from the Public Service Electric Company of New Jersey and will hold its equipment for generating power in reserve.

Brooklyn (N. Y.) Rapid Transit Company.—This company has placed an order with the Westinghouse Electric & Manufacturing Company for a 30,000-kw., single-unit, turbo-generator set to be installed in its Williamsburg generating station. The turbine will operate at 1500 r.p.m. on steam at 200 lb. pressure and 115 deg. superheat and will exhaust into a 28.5 vacuum produced by a 40,000 sq. ft. Westinghouse surface condenser.

Manufactures and Supplies

HIGH PEAK IN RAILWAY MOTOR DEMAND

An enormous demand for railway motors has attended the great boom in electric car orders during the last several months. The increase in demand over the same period last year is readily shown by the fact that according to our records approximately 1500 electric cars equipped with motors have been ordered in the United States and Canada from the beginning of 1916 up to the present time, as compared with only about 300 motor cars, or only one-fifth as many, for the same period in 1915. In all large territorial divisions of the United States, excepting that of the Southern states, where a small decrease seems to have taken place, the market has widened and intensified tremendously. During the period above stated Western states ordered about ninety cars as compared with about twenty cars in 1915; Central states, about 410 as compared with about 140 last year, Eastern states about 650 as compared with about sixty and New England states about 310 as compared with about twenty-five. Thus the ratios of orders for the Eastern and New England states for the two periods were about 11 to 1 and 12 to 1 respectively. The increase in demand for motors is by no means confined to the railway field but is paralleled by the demand for industrial motors.

In describing an underlying cause for the unusual activity the following explanations find credence among the manufacturers: (1) Greater need for transportation in manufacturing centers, owing to the war industries which have been developed; (2) recovery from the general financial depression of the previous year, (3) the purchase of extra amounts of rolling stock to compensate for the period of retrenchment, (4) anticipation to some extent of future needs on account of fear of delayed deliveries.

Needless to state the conditions in the motor market also reflect this condition of increased demand, increased prices of raw material, and delayed deliveries to the motor manufacturers because of the war demand. The tardy shipments of raw material have in turn wrought procrastination on the deliveries of the finished motors. One manufacturer reports that shipments of smaller motors ranging from 30 to 70 hp. are still fair, being made within three to five months. Deliveries of such smaller motors are not greatly in arrears because the parts required for them are small and can be easily maintained in stock. Orders for larger motors for heavier electric traction, however, have been badly delayed and have taken from five to eight months to complete. In one plant this delay is occasioned partly by the difficulty in obtaining large quantities of such materials as copper bars for commutators from the copper companies, which are already overcrowded with war orders, and some of them are said to require about three months to make copper bar deliveries. Shipments for steel for armature shafts are also extremely sluggish. The delay in the case of the larger motors is also due to the trouble in obtaining additional machinery required for the manufacture of the larger sizes. Another motor manufacturing company's output is being retarded, not so much by the delay in obtaining raw material, as by the congestion caused by the piling up of castings in its own plant, later orders being forced to await their turn. However, efforts are being made by the manufacturer to anticipate the demand by placing orders for castings ahead of time so that prompt deliveries can be made.

The motor manufacturers find it difficult to predict with any degree of confidence what market conditions the future may develop. According to one opinion, the peak in motor orders has now been attained by the larger railway companies, many of which have already closed contracts for their year's requirements, although a strong buying movement is expected to continue among the smaller properties.

The demand for railway motors has been necessarily accompanied by a corresponding need for power station and substation equipment, required by the loads imposed by additional rolling-stock equipment. As in the case of rail-

way motors, great difficulty is experienced in obtaining raw material and shipments are subject to extended delay. The larger units, such as turbo-generators of 10,000 kw. and over, are taking from twelve to eighteen months to deliver. Rotary converters are averaging about six to eight months, switchboard apparatus, five to seven months.

Collections on sales are reported as satisfactory in general, payments being made promptly.

ROLLING STOCK

Oklahoma Railway, Oklahoma City, Okla., expects to purchase about three interurban cars.

Hutchinson (Kan.) Interurban Railway is reported as expecting to purchase additional cars.

New York (N. Y.) Railways have issued specifications for sixty-five new standard type storage-battery cars.

Monongahela Valley Traction Co., Fairmont, W. Va., has purchased for August delivery eight single-truck, all-steel cars.

Goldsboro (N. C.) Electric Railway has purchased two summer cars from the Electric Equipment Company. A 100-kw. motor generator set has also been purchased.

Cleveland (Ohio) Railway has applied to the City Council for permission to purchase during 1916 fifty more of the front-entrance, center-exit type motor cars for city service.

Boston (Mass.) Elevated Railway is in the market for fifty-two articulated center sections for use with 25-ft. car units. The design is substantially like previous similar equipments ordered.

Butte, Anaconda & Pacific Railway, Anaconda, Mont., has ordered six additional electric locomotives from the General Electric Company, the type being exactly similar to that described in previous issues of this paper.

Lewisburg & Ronceverte Electric Railway, Lewisburg, W. Va., has purchased one center-entrance, double-truck, combination car from the G. C. Kuhlman Car Company, to be equipped with Westinghouse 323-V four-motor equipment.

Bay State Street Railway, Boston, Mass., is in the market for ten baggage and express cars, similar to previous equipment, about 40 ft. over all, capacity 20 tons, equipped with four motors and multiple unit control and with steel underframes.

International Railway, Buffalo, N. Y., will award contracts shortly for twenty all-steel passenger coaches for the new Buffalo-Niagara Falls express line, delivery to be made in nine months. The cars will be 54 ft. over all and equipped with four 60-hp. motors. The car will weigh 60 000 to 65,000 lb. The side entrance will be 20 ft. from the motorman's cab. The seating capacity will be sixty.

Detroit (Mich.) United Railway has recently placed orders for a large amount of rolling stock equipment, listed below. Some of these orders were previously reported, but are mentioned herewith again in order to avoid confusion. These orders as listed are classified by manufacturers. The Niles Car & Manufacturing Company has received orders for eight 58 ft. 3½ in. single-end interurban cars for fast limited service, arranged to run in trains, seating capacity of fifty and equipped with four 100-hp. motors; two heavy motor cars for freight service, 50 ft. long and with a capacity of 25 tons, equipped with heavy motors to pull loaded freight trailers; three line cars for the power department, underframe of steel and wooden body; one motor car for track department construction work and snow-plow work, 48 ft. long, steel underframe with wooden cab, and equipped with M.C.B. radial drawbar. The G. C. Kuhlman Car Company has received orders for eight motor cars, 53 ft. 11 in. long, and eight trailers of the same length for Detroit-Pontiac suburban service. The motor car will seat fifty-four and the trailer will seat sixty. No smoking compartment will be placed in trailers. The bottom framing is of steel and the body of wood. From this manufacturing company has also been ordered fifty double-truck all-steel trail cars for Detroit city service similar to trailers purchased from the same company and now in operation. The Cincinnati Car Company has received an order for eight freight trail cars, 50 ft. long, capacity 25 tons. The American Car & Foundry Company

will build thirty all-steel flat cars, 40 ft. long and equipped with M.C.B. radial couplers on each end and trucks of standard steam road type. The Differential Car Company, Nashville, Tenn., has received an order for eight electrically operated dump cars for track construction, equipped with M.C.B. radial couplers at each end.

TRADE NOTES

Elliott Switch and Frog Company, East St. Louis, Ill., has opened a Western sales and engineering office in Room 516, Central Building, Los Angeles, Cal., where the company is represented by H. W. Renick.

Perry Ventilator Corporation, New Bedford, Mass., has received orders to equip with ventilators the 150 new cars now being built by the St. Louis Car Company for the Pittsburgh (Pa.) Railways.

Holden & White, Chicago, Ill., have been made agents for the Miller trolley shoe, manufactured by the United Utilities Company, Boston, Mass., for Indiana, Illinois, Iowa, Wisconsin and Michigan.

F. J. Petura, purchasing engineer of Henry L. Doherty & Company, New York, is one of the committee appointed by the Merchants Association of New York, which is inaugurating a campaign for additional members.

Woodman Manufacturing & Supply Company, Boston, Mass., manufacturer of ticket punches, speed indicators, seals, wires and presses, badges, buttons and car pushers, has moved its offices and factory from 63 Oliver Street to larger quarters at 82 Sudbury Street.

Roller-Smith Company, New York, N. Y., has added to its list of agents the Barber-James-Dwinnell Electric & Manufacturing Company, 600 East Fifteenth Street, Kansas City, Mo. This new agent will handle the Roller-Smith Company's instruments, meters and circuit breakers in the territory comprising the States of Kansas, Oklahoma, Nebraska, Iowa and part of the State of Missouri.

Spray Engineering Company, Boston, Mass., reports that the first three months of the present year were the best since the company was organized. Among the recent orders received are included orders for cooling ponds for a number of large industrial companies. Air washers have been sold to three plants operated by H. M. Bylesby & Company, Chicago. The company is now figuring upon an installation with a capacity of 63,000 gal. per minute.

Holden & White, Chicago, Ill., general agents for the Wasson Engineering & Supply Company, have received an order from The Milwaukee Electric Railway & Light Company for eight air-retrieving trolley bases for interurban service. This firm has also made a contract with the Specialty Device Company, Cincinnati, Ohio, to handle the sale of Bierce anchors and guy-wire protectors in Indiana, Illinois, northern Kentucky, northeastern Iowa and southern Wisconsin.

Ohmer Fare Register Company, Dayton, Ohio, has offered cash prizes, amounting to \$100, to be divided among the three railway divisions or branches of the Southern Public Utilities Company, Charlotte, N. C., which attain the highest fare register efficiency during the year of 1916. The branch attaining the highest record of efficiency of its conductors will receive a cash prize of \$50; the second highest, \$30; and the third, \$20. These prizes are offered on the condition that the general average of all divisions for 1916 exceeds the general average of all divisions for 1915.

ADVERTISING LITERATURE

Ohio Brass Company, Mansfield, Ohio, has issued a folder entitled "Hard Luck for the Junk Man," in regard to its trolley bases, which have renewable bushings in every bearing.

Cleveland Twist Drill Company, Cleveland, Ohio, has issued a bulletin entitled "Drill Chips," which illustrates its various types of drills, including taper shank drills, three-fluted drills, straight shank drills, oil tube drills, blacksmith's drills, bonding drills and "Paragon" forged drills.

E. I. du Pont Nemours & Company, Wilmington, Del., have printed a clay blasting booklet. It is the first booklet ever issued on this subject and contains valuable and interesting information. Some of the phases covered are

"Digging Clay," "Stripping," "Blasting Down Shale," "Digging Plastic Clays," "Mining Flint Clays," "Draining Clay Pits," as well as full information on the use of explosives.

Rudolph Guenther, Inc., New York, N. Y., has issued a booklet entitled "What Advertising Can Do for Public Utility Securities in Awakening the Public to Their Values as Investments." The subject is discussed under the following headings: "Economy in Public Utility Production," "Growth in Service and Revenue," "The Investor and Public Utility Securities," "Investors' Need of Information" and "To Derive Greatest Efficiency from Publicity."

General Railway Signal Company, Rochester, N. Y., has issued bulletin No. 132 describing the details of its 2 B and 2 C electro-mechanical interlocking machines. The company has also issued Bulletin No. 128 A describing its absolute permissive block system for single-track railways. This system is shown to be in use by the Fort Wayne & Northern Indiana Traction Company; Indiana Railways & Light Company; Lehigh Valley Traction Company; Puget Sound Electric Railway; New York State Railways, Rochester Lines; Terre Haute, Indianapolis & Eastern Traction Company and Union Traction Company of Indiana, the electric railways using this system thus comprising a total trackage of 309 miles, as well as 2014 miles on steam railroads.

Messer & Company, Philadelphia, Pa., have issued a catalog describing and illustrating their oxy-acetylene apparatus. This company has standard sizes of "automat" type generators, ranging from 5 lb. to 100 lb. of carbide per charge, but is prepared to build sizes ranging up to 2400 lb. and over. This company also furnishes a portable tank equipment which embodies a compact unit for welding and cutting, using acetylene and oxygen compressed in tanks. Regulators are attached to the tank and reduce the gas pressure. Two lengths of tubing connect the regulators with the welding or cutting blow pipes. The welding blow pipes are designed for use in either high or low pressure acetylene generator or tank equipment. The cutting blow pipes are designed to make a clean, narrow cut, consuming the least possible amount of oxygen. The adjustable guide keeps the proper distance between tips and cuts and makes it easy to cut straight as well as in any angle.

International Oxygen Company, New York, N. Y., has issued Catalog No. 3 describing its bipolar oxygen and hydrogen generators. Their efficiency of generation is rated at 4 cu. ft. of oxygen and 8 cu. ft. of hydrogen per kilowatt-hour, using caustic potash as the electrolyte. Oxygen produced is claimed to be at least 99.6 per cent pure and hydrogen at least 99.8 per cent. Patented bimetallic electrodes are used, giving long life and high efficiency. Wear and tear on diaphragms, owing to the rapid circulation common in ordinary filter-press-type generators, is eliminated. Oxygen and hydrogen off-takes are independent and isolated, so that any leakage escapes to the open air and cannot mingle with the other gas. Water feed to the generator is automatically controlled by and proportioned to the rate of gas generation. Each machine is externally protected against grounding and loss of current by means of glass insulators. Purgers on each generator automatically free the gas from water or caustic that might be entrained.

Chicago Fuse Manufacturing Company, Chicago, Ill., has issued Catalog No. 28 describing the "Union" line of electrical supplies. This company has previously published separate catalogs, one for fuse material and one for switch and outlet boxes, but the present No. 28 edition combines both under one cover, making an attractive book of 132 pages, divided into four sections and profusely illustrated. All descriptions have been carefully revised and many new features introduced with a view of making the book a handy reference guide for the buyer's desk. N. E. C. fuses, cut-outs and fittings are shown in Section 1. The corresponding catalog numbers of other manufacturers are given on the pages opposite the listings, where they can be readily consulted. Section 2 is devoted to "Old Code" fuses; Section 3 to automobile fuse material, telephone and open fuses, and Section 4 to stamped steel outlet boxes and covers and switch boxes. Four styles of mounting ears and clamps are shown. Descriptive and numerical indexes complete the book.