

# Electric Railway Journal

Consolidation of STREET RAILWAY JOURNAL and ELECTRIC RAILWAY REVIEW

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## “Merchandising Transportation Starts at the Carhouses”

THE above headline is quoted from the words of a leading street railway manager. To carry out this thought we may say that while platform men are important factors in merchandising transportation, the real place where transportation is sold is at the carhouses and repair shops. If a company will maintain cars well, keep them clean, paint them often, wash the windows, and make running gear as nearly noiseless as possible, a big step is taken toward obtaining many satisfied riders.

Try a line of well kept cars in parallel with a line of poorly maintained equipment, and see where the traffic goes. Maintenance tells the story and “sells the goods.”

## At Last Railways Begin Purchases on Large Scale

IT SEEMS almost too good to be true, but the fact is that, after years of enforced spendlessness, the electric railways are buying. It was shown in the markets columns last week that during the first two months of this year more than a third as many cars were ordered as during the entire twelve months of 1919. As was plainly predicted in our issue for Jan. 3, deliveries are rapidly lengthening.

It is true that the purchases now being made by electric railways are either to cut down cost of operation or to make necessary repairs. The interesting part, however, is that the roads are going ahead in these necessary expenditures. The market is awakening and, like a snowball, continues to gain in volume as it passes along.

## Maintenance Costs Have Been Kept Well in Hand

THE annual maintenance issue of the ELECTRIC RAILWAY JOURNAL has developed year by year with the requirements of the industry until now it has become an epitome of the best in maintenance practice in all branches of the work. This year the editors have been unusually fortunate in getting the co-operation of men in all departments and in different sections of the country, for these men realize that they must give if they are to get. From Buenos Aires to Indianapolis, and from San Francisco to New Haven, have come the articles which make up the technical pages of this issue.

The maintenance problem is one of the most pressing that weighs upon the willing and sturdy, but sometimes over-tired, shoulders of the master mechanic, way engineer, overhead superintendent or power plant operator. He simply cannot get more money for his work to compensate for the increases in wages, the skyrocketing of material costs and the reduced efficiency of workers.

The money “ain’t thar.” He therefore deserves great credit for keeping the wheels going under present conditions, and it has been only by the exercise of ingenuity and perseverance that this has been possible. This work is reflected in the present issue of the JOURNAL which, in turn, we believe, will make possible the still more rigid control of maintenance costs. To this end new tools, new methods and new spirit may be necessary during the coming year, but they will, no doubt, materialize as necessary.

## New York City Plans to Start a Bus Line

NEW YORK CITY, which is receiving no return on some \$250,000,000 that it has invested in rapid transit construction because it refuses to permit the companies to charge an adequate fare, is now proposing to go extensively into the bus transportation business. Two hundred buses are to be purchased for \$1,140,000, and they will not only revolutionize the city’s traffic problems and eliminate the street cars, according to an interview with one of the prominent members of the Board of Estimate which appeared in the daily papers the day following the vote, but the buses “will also afford to the City of New York an additional source of revenue which is much needed.”

The latter part of the statement—that an additional source of revenue is much needed—is undoubtedly true. Teachers are leaving the New York public schools because they do not receive sufficient salaries, and real estate owners are complaining because of prospects of an increased tax rate. But we wonder how much net revenue the city expects to get from its buses with their 5 cent fares and with the rising prices for gasoline.

Why cannot New York settle its traction situation in a rational way? In other large cities in this country and abroad the fact is recognized that labor and materials have greatly increased in price and that some increase in railway fare must follow. In New York, the opposite attitude has been taken. The railway managements have been scolded in hearings and out of them; no attention has been paid to their requests for relief, and now the roads are to be “eliminated” by competition!

The idea that the city or any one else can supply a bus service at 5 cents a head under anywhere near the same conditions as regards headway, length of ride and safety as exist on the electric railways, is, of course, preposterous. It is being done nowhere else, and there is no reason to believe that it can be done in New York. In the meantime the citizens of New York are suffering from inadequate transportation because the companies which could supply these facilities are not permitted to charge a reasonable fare. Is it not time for some of the prominent civic bodies in the city to be heard in protest against this state of affairs?

### Restricted Way Department Budgets Have Not Prevented Progress

THE activities in the way departments were greatly restricted during 1919. Our statistical issue of Jan. 3 indicated that both the items of new construction and reconstruction were the lowest recorded during the past ten years. In consequence there was but a limited opportunity for development of new methods or devices. While the new work was at a standstill, there was a necessarily large increase in the amount of work classed as maintenance. In the latter field effort was concentrated upon reduction of cost by improvement in method.

The scope of the arc welder and the rail grinder was extended and many a piece of track or special trackwork, which heretofore would have sought the scrap heap, was rehabilitated for long periods of further service. But there is a limit beyond which these saving methods may not go, and when we consider the small amount of reconstruction recorded for the past three seasons, there is every reason to believe that a fairly large amount of such work must be undertaken this year. Otherwise there will soon be a rather sudden and general breakdown of a very large track mileage, which will be most likely to occur in heavily-used, congested tracks where it can be least afforded from a revenue point of view. The indications, from rail and special trackwork inquiries now being received by the manufacturers, are to the effect that the absolute need for a more extensive program of track and special trackwork renewals during the current season is becoming increasingly apparent and that the gradually bettering income situation will result in greatly increased budgets for reconstruction purposes.

Increased programs may be faced with some degree of complacency in view of the greatly increased efficiency which has resulted from the efforts of way engineers to keep costs down in face of the constantly rising costs for both labor and material. By the introduction of machinery and through closer supervision, the engineers have been able to show an increased cost for track work of but 63 per cent, while the labor rates have advanced 124 per cent when both are compared with the costs and rates prevailing in 1914. No further proof of the value of machinery in track work could be asked for than the data given in the article by C. H. Clark in the issue of this paper for Feb. 21, 1920. Such results, nevertheless, will surely serve to spur those in charge of track matters onward in their search for further achievement in cutting the H. C. W. (high cost of work) as Mr. Clark so aptly puts it.

In reviewing the work of the way departments during the year 1919 we note several developments which are worthy of attention, since they show that the activities and research work of the way engineers have not lain dormant although retarded somewhat by the greatly reduced schedules which prevailed throughout that year.

In the rail-joint field, a service test installation at Pittsburgh was made of the resurrected type of electric-weld joints, under the comparatively new Jacobs patent which had been held back during the war period. It will be remembered that the original electric-weld joints were of the butt-weld type as devised by Elihu Thomson. These were succeeded by the electric bar-weld process after a short time, as it was almost impossible in that early day (1894) to secure uniformity of result with the butt welds as then made. Meanwhile, some of the

earliest butt welds are still doing business, helping the rails wear out in operating tracks that are twenty-four years old. The new butt weld gives promise of producing the desired uniformity and the performance of the best installation will be watched with great interest by way engineers.

We have had occasion heretofore to call attention to the desirability of carefully selecting and training skilled labor. An editorial in the issue of this paper for March 8, 1919, pointed out that the training of this class of labor which is necessary for advancement must be furnished by the employer. That such educational steps are receiving increased consideration at the hands of those who are responsible for labor results, is evidenced by the inauguration of a training course for track foremen by the Denver Tramway. The need for competent track foremen has been increasingly noticeable of late. Apparently men are not born with the "track instinct" any more, and the older foremen have left the service to an extent which is tending to handicap the resumption of extensive outside work. There is no doubt that the training scheme as applied in Denver will be taken up in other quarters.

Meanwhile several large companies have been working along somewhat similar lines through the plan of holding monthly meetings of track foremen and supervisors at which track problems of an educational nature are discussed. Likewise there is a tendency toward the provision of illustrated books of instruction covering the principal methods of doing work properly, together with details of construction which are constantly used but often varied improperly through ignorance or neglect of the foremen. All this is along the line of "human engineering," an almost untried field in which there is promise of great results in efficiency and in betterment of mutual relations between the employer and employee.

### Don't Worry If Automatic, Power-Saving and Safety Devices Increase Maintenance Costs

THE past year has seen an increased use of automatic, safety and power-saving devices in connection with electric car equipment. Each has its particular field of usefulness in producing economies. The use of automatic devices gives additional comfort to passengers and makes the duties of car operation more attractive. Economies are also produced through speeding up the service by increasing the accelerating and braking rates and by decreasing the duration of stops. Safety devices have reduced accident and damage costs, and power-saving devices have produced economies by proper and the most efficient operation of the equipment. These economies necessarily increase somewhat the budget of the equipment maintenance department.

The criterion in this matter is, of course, the total operating expense as compared with the gross revenue, but so many things are now contributing to increase maintenance costs that these are being scanned more and more closely. In this line it cannot be emphasized too strongly that comparisons on a car-unit basis and without regard to the number of pieces of apparatus that constitute the car equipment are sure to be misleading.

The superintendent of equipment not only finds that maintenance costs increase as the number of pieces of apparatus is increased but he also discovers that his men are not familiar with the new classes of apparatus

and that troubles result from this lack of familiarity. This brings the cars into the shop at more frequent intervals and overtaxes its capacity, so that the work has to be done under unfavorable conditions. These added burdens are not relished by the mechanical superintendent, and when the general manager asks him to explain why his maintenance costs per car-mile are higher than those of a neighboring road operating older types of equipment he curses the advent of modern appliances which are of advantage to the operating department only and longs for a return to the old days and the old class of equipment, as was so aptly explained by a contributor in the issue of this paper for Feb. 7.

If the maximum usefulness from these devices is to be had they must be maintained in a high state of repair, and this requires enthusiasm for their use and co-operation from the men in the mechanical department. The savings resulting in directions other than maintenance are so great that the additional cost of repairs and inspection is readily absorbed. The maintenance men are quickly convinced of the usefulness of the new devices and if the men a little higher up will recognize at once that additional forces and facilities are necessary to take care of the added equipment and in making comparisons of costs will consider the number of pieces of apparatus on a car as well as the car-miles operated, a closer agreement will be reached. Any comparisons made of the efficiency of conducting the mechanical department before and after the new devices are installed must show an increase in cost per year but when the number of pieces of equipment is considered, an increased efficiency will no doubt be evident.

### Kansas City Again in the Foreground

FOR a clean, straightforward discussion and appreciation of the problems of local transportation, the report to the Kansas City Chamber of Commerce just made by its Committee of One Hundred, is certainly to be commended. As with other cities, there was a street railway problem, not only from a traffic standpoint, but from the more general situation arising from the increases in all costs of operation which made the former fare unprofitable. To Kansas City the question seemed a commercial one, and not a political matter and, as such, one in whose solution the Chamber of Commerce could and properly should take an active part. Kansas City has many hard-headed, clean-thinking and square-dealing business men and the summary of recommendations made by this committee evidences the clear analysis and hard work that has been put upon the study of the question. Kansas City tackles most of its problems from the standpoint of the city's best welfare. Its politics sometimes prevents the realization of its desires, but times are improving. The people are for fair play.

This committee states its purpose thus: "From the beginning of the investigation to the final recommendation in this report, the committee has been guided by the principle of justice. First, to the car rider through good service at a reasonable fare; second, to the street railway employee through a just wage; and last, to the street railway investor, through confidence in a just and sure recompense."

The principal recommendations are: A service-at-cost principle with a variable fare and an inverse variable return on capital with a minimum of 6 per cent; the entire remission of any charges against the railway for

paving, street cleaning, licenses, snow removal, etc.; a complete co-operation between city and company to improve service; a Kansas City chairman of the Board of Directors, and some financial details of special local interest. On the surface it seems that this platform should appeal to all fairminded folks. It is an earnest of the present day attitude in a progressive American city. We hope that the results in this case will not fall short of the anticipated satisfactory solution for all concerned and that this will prove to be another leading-forerunner of many other cases of thorough understanding of the transportation problem. The Chamber of Commerce voices this same hope and feels its responsibility, for it calls attention to the several similar investigations under way, some national in character and scope, of which this is about the first to result in a published analytical report.

### Electrification Studies Get Impetus at A. R. E. A. Meeting

AS THIS issue goes to press, the twenty-first annual convention of the A. R. E. A., is in progress with a large attendance after the detracting influences of the last two years. The volume of matter to be presented to the association through committee reports exceeds that of any previous year, and the delegates seem to be expressing their pleasure in the return to private operation by an unusual manifestation of interest. President Earl Stimson perhaps sounded the key note of endeavor for the next few years in two statements in his address. First, he pointed out that the immediate concern of the engineers is maintenance rather than construction. Beyond that, he intimated the trend of much construction work when he spoke of the great interest centering in the report of the committee on electricity, because of the "consideration being given to the subject of electrification by so many roads as a matter of economy in operation and as a means of increasing the capacity of present facilities." There is evidence also in the report of the committee on electricity that the work of electrifying the steam roads is to receive a great impetus in the next few years, for the economies that will thereby result are more necessary now than ever before, if private operation is to be made permanent.

This committee also makes the statements in its report (1) that 110,000-volt transmission line and 3,000-volt trolley potentials are practicable and reliable for electric railway service for 100 miles or over of single track; (2) that such a system of electrification will increase the capacity of a road 25 to 35 per cent; (3) that such a system will prove more economical if traffic is favorable for electric operation; (4) that electric locomotives with regenerative braking have made possible the haulage of heavier trains at higher speeds on mountain divisions with greater safety and reliability under all climatic conditions. This would seem to indicate that the attention of the steamroad engineers will be earnestly turned to the possibilities of electrification and, in fact, has already been directed to this problem on a great many roads. No greater service looking toward the conservation of the nation's resources on the one hand and the well being of the railroads on the other could be done than for the A. R. E. A. to get solidly behind this movement and bring out the full possibilities as applied to each and every railroad.

# Maintenance Practice of the Anglo-Argentine Tramway—I

Consolidation of Eleven Operating Companies Offered a Fine Opportunity for Standardization of Cars, Equipment, Tools and Maintenance Methods

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CARS LEAVING PLAZA MAYO, BUENOS AIRES, ARGENTINA

**B**UENOS AIRES has a street railway system that can compare with the best operated and largest in the world. The Anglo-Argentine tramway system presents to anyone interested in street railway work an opportunity to study and appreciate the great progress that this company in its nine years of operation has made, not only in its well-maintained physical property but also in its harmonious operating organization.

The electrification of the several street car companies that were operating in Buenos Aires began in the year 1897 and was finished in 1906. In 1908 there were eleven street car companies in Buenos Aires, but during that and the following year, eight of the most important were fused into the Anglo-Argentine Tramway Company, which resulted in the most extensive street railway system of South America. A straight fare of 4½ cents (\$0.10 Argentine money) was charged with a special fare of 2.2 cents (\$0.05 Argentine money) for workmen

during certain hours of the day. In 1911 the construction of the first of the underground lines of the company was started and these were finished in 1913.

Buenos Aires is a fairly level city and the company's tracks have very few grades. The accompanying map shows the surface and underground lines now in operation, as well as the situation of substations, carhouses, operating carhouses, etc. The Anglo-Argentine Tramway has 390 miles of single track; 368 miles located within the city limits. Of this 9 miles is used by the underground line. The gage is 4 ft. 8½ in.

With a rolling stock equipment of 1,750 motor cars, 870 trailers, and 84 subway motor cars, this system serves a population of 1,700,000, and carries 318,000,000 passengers annually on its surface lines and 32,000,000 passengers on its underground line.

The result of the consolidation was that the newly-formed company came into possession of a great variety

of car equipment, trucks, bodies, motors, control equipment, gears, brakes, etc., and as great a variety of shop equipment and maintenance methods.

At the time of the consolidation, the rolling stock of the company consisted of 1,399 open-platform motor cars, 630 trailers (of which 283 were open) and twenty-eight general work cars. In this stock we had double and single-truck cars of twelve different types, fifteen types of body of one and two decks and with a capacity ranging from 22 to 46 seats, eight types of non-ventilated motors of 20 to 30-hp. capacity, and eight types of equally as primitive controller equipment.

As we have very few cars with double trucks, and very few miles of interurban track, practically all surface double-truck cars have been changed to the single-truck type, the Brill 21-E single truck having been adopted as standard. This carries a standard body 31 ft. 2½ in. long over canopies and 8 ft. 2½ in. wide over pillars, with two operating platforms and a seating capacity of 32 persons. The car fully equipped weighs 12 tons. Accompanying illustrations give details of our standard motor car.

The motor equipment comprises two Dick Kerr 3A4, or two A. E. G.-67A motors with A. E. G.-B8gm controllers or A. E. G.-U140, or two A. E. G.-U158 interpole motors with A. E. G.-B30gm controllers. The last-named motors are of the semi-ventilated type, of 40-hp. capacity. Cars are provided with both hand and electric brakes, but the electric brake is used only in emergency.

All cars that undergo the general reconstruction, which is given to each every ten years, are rebuilt according to the standard adopted. To all cars not scheduled for reconstruction within a short time, a regular standardization process is applied during the general overhauling that takes place every eight months. This includes remodeling the braking mechanism, windows, life-guards, lighting system, and changing the position of cable hose, etc. Every year the platforms of a certain number of cars are enclosed. At present 30 per cent of the motor cars have closed platforms; of these one-fourth are new cars imported from England, and the rest are cars rebuilt or newly built in our shops.

For the first three years after the consolidation very little was done scientifically to organize the rolling stock department. At the beginning of 1912 the first steps were taken to introduce a rational system of inspection

and overhauling that would make possible the prevention of failures by detecting and repairing small defects that otherwise would have developed into larger ones. Lack of this attention would require us to keep the cars out of service for a longer time, increasing the cost of the repair and increasing the working force at the car-houses. To arrive at this result it was necessary first to organize the working forces at the operating car-houses. Previous to 1912 every carhouse had two chief



MAP OF THE ANGLO-ARGENTINE TRAMWAY COMPANY'S LINES, BUENOS AIRES

foremen, one for day and the other for night duty, since as much work was intended to be done at night as during the day. These two chief foremen with their corresponding assistants were exchanged every two weeks, with very prejudicial results to the work carried out due to the antagonism developed between them. The result of this inefficient system went even farther in the way the repairs were made, due to the lack of knowledge and of instruction of the foremen in charge of the work.

The fifteen operating carhouses, now reduced to eleven, were divided into three groups of five each. Each group was placed under the supervision of a roll-

ing stock inspector selected from among the best of the chief foremen. The inspectors visit the carhouses daily, and act as assistants of the chief of the department. They report every other day to the rolling stock chief and receive at the same time the instructions and explanations that have to be given to the chief foremen. Each operating carhouse is under the immediate direction of a chief foreman, assisted by two shop foremen, one for the day and the other for the night, who are exchanged every two weeks. The force consists also of a first mechanic who takes the place of either foreman in case of absence, repairmen, electricians, brakemen,

painters, oilmen and general repairmen, the distribution depending on the number of men in each classification and the importance of the operating carhouse. The average working force is 35 men per carhouse, excluding the car cleaners, who, although under the supervision of the rolling stock department, belong to the traffic department.

A book of rules and instructions is given to every chief foreman and assistants in which all work done at the carhouses is detailed and explained. This contributes greatly to the standardization of the maintenance work. The company has a general shop but, due to the

TABLE I—COMPARATIVE STATISTICS OF THE ANGLO-ARGENTINE TRAMWAY ROLLING STOCK OF THE SURFACE LINES ONLY

| Description  | Car Mileage—Car Pull-In—Energy Consumption |        |        |        |        |        |        |        |
|--|--|--------|--------|--------|--------|--------|--------|--------|
|  | 1911                                       | 1912   | 1913 * | 1914   | 1915   | 1916   | 1917   | 1918   |
| Motor car mileage (in thousand miles).....                   | 41,450                                     | 42,900 | 45,000 | 42,500 | 42,350 | 42,400 | 43,100 | 43,200 |
| Total mileage: motor-trailer (in thousand miles).....        | 52,000                                     | 53,750 | 57,350 | 54,600 | 53,500 | 53,900 | 55,000 | 55,800 |
| Total cars pull-in.....                                      | 14,730                                     | 7,218  | 3,128  | 3,242  | 2,140  | 1,489  | 1,206  | 1,000  |
| Cars-miles per pull-in.....                                  | 2,860                                      | 5,830  | 14,380 | 13,250 | 19,750 | 28,500 | 35,800 | 45,200 |
| Number of motor cars in service (maximum daily average)..... | .....                                      | .....  | 1,413  | 1,287  | 1,197  | 1,184  | 1,205  | 1,211  |
| Miles per motor car (daily average).....                     | .....                                      | .....  | 88     | 91     | 97     | 98     | 98     | 98     |
| Hours of delay due to cars pull-in.....                      | 968  | 722    | 284    | 270    | 198    | 136    | 150    | 145    |
| Hours of delay due to cars derailed.....                     | 530  | 863    | 625    | 343    | 120    | 49     | 45     | 40     |
| Total energy consumption per car-mile: kilowatt-hours..      | 1.125                                      | 1.1    | 1.01   | 0.977  | 0.954  | 0.954  | 0.97   | 0.98   |

\* In December of 1913 the first subway was inaugurated which justifies the drop of mileage in the following years.

TABLE II—COMPARATIVE STATISTICS OF THE ANGLO-ARGENTINE TRAMWAY ROLLING STOCK OF THE SURFACE LINES ONLY

| Description                            | Electrical Equipment—Parts That Have Been Repaired or Replaced |        |        |        |        |        |        |        |
|--|--|--------|--------|--------|--------|--------|--------|--------|
|  | 1911   | 1912   | 1913   | 1914   | 1915   | 1916   | 1917   | 1918   |
| Armatures, open-circuited.....         | 1,262  | 580    | 265    | 161    | 105    | 75     | 56     | 76     |
| Armatures, short-circuited.....        | 929  | 592    | 313    | 292    | 169    | 108    | 105    | 104    |
| Field coils, burnt.....                | 2,161  | 1,557  | 277    | 186    | 106    | 51     | 38     | 69     |
| Armatures repaired.....                | 2,492  | 1,921  | 1,414  | 577    | 575    | 549    | 554    | 423    |
| Armatures rewound.....                 | 1,311  | 968    | 527    | 387    | 208    | 181    | 179    | 141    |
| Field coils replaced and repaired..... | 6,983  | 4,480  | 1,667  | 600    | 388    | 363    | 242    | 209    |
| Field coils rewound.....               | 2,823  | 1,565  | 922    | 384    | 207    | .....  | .....  | .....  |
| Circuit breakers.....                  | .....  | 1,564  | .....  | .....  | 435    | 520    | 174    | 66     |
| Power switches.....                    | .....  | 824    | .....  | .....  | 222    | 254    | 168    | 37     |
| Power fuses.....                       | 76,425   | 49,797 | 31,239 | 18,080 | 7,525  | 7,200  | 7,120  | 5,897  |
| Carbon brushes.....                    | 40,325   | 40,325 | 29,163 | 19,138 | 15,582 | 17,292 | 8,008  | 9,139  |
| Controller finger contacts.....        | 17,460   | 28,550 | 14,624 | 10,331 | 10,536 | 10,151 | 6,996  | 6,996  |
| Controller segments.....               | 20,857   | 37,499 | 20,227 | 15,849 | 12,786 | 6,967  | 7,399  | 7,399  |
| Electric lamps.....                    | 105,347  | 98,335 | 57,360 | 37,721 | 32,948 | 26,569 | 22,695 | 22,695 |
| Number of trolley wheels.....          | 8,999  | 8,841  | 10,126 | 6,918  | 3,248  | 2,071  | 2,571  | 2,904  |
| Service mileage per trolley wheel..... | 4,600  | 4,850  | 4,430  | 6,150  | 13,000 | 20,500 | 16,750 | 14,880 |

TABLE III—COMPARATIVE STATISTICS OF THE ANGLO-ARGENTINE TRAMWAY ROLLING STOCK OF THE SURFACE LINES ONLY

| Description  | Consumption of Lubricants and Bearings |         |         |         |         |         |         |         |
|--|--|---------|---------|---------|---------|---------|---------|---------|
|  | 1911                                   | 1912    | 1913    | 1914    | 1915    | 1916    | 1917    | 1918    |
| Pounds of lubricants per 1000 car-miles.....           | .....                                  | 6.7     | 5.48    | 4.69    | 3.365   | 3.01    | 2.125   | 1.9     |
| Cost of lubricants per car-miles in dollars.....       | .....                                  | \$0.341 | \$0.308 | \$0.267 | \$0.191 | \$0.169 | \$0.152 | \$0.143 |
| Motor bearings.....                                    | .....                                  | 4,003   | 2,120   | 1,373   | 876     | 1,101   | 729     | 750     |
| Armature bearings.....                                 | 15,369                                 | 19,394  | 16,134  | 8,599   | 4,914   | 3,542   | 3,919   | 4,620   |
| Journal bearings (motor and trailer).....              | .....                                  | 6,454   | 3,542   | 3,132   | 2,538   | 2,170   | 1,943   | 1,554   |
| Car-miles per motor bearing.....                       | .....                                  | 42,900  | 85,000  | 130,000 | 193,500 | 154,000 | 237,000 | 231,000 |
| Car-miles per armature bearing.....                    | 9,560                                  | 8,370   | 11,250  | 19,700  | 34,500  | 48,000  | 44,000  | 37,500  |
| Car-miles per journal bearing (motor and trailer)..... | .....                                  | 32,400  | 64,700  | 70,000  | 84,400  | 99,500  | 113,200 | 111,200 |

TABLE IV—COMPARATIVE STATISTICS OF THE ANGLO-ARGENTINE TRAMWAY ROLLING STOCK OF THE SURFACE LINES ONLY

| Description                                       | Axles, Wheel Tires, Gears, Pinions and Brakeshoes Replaced |         |         |         |         |         |         |         |
|---|--|---------|---------|---------|---------|---------|---------|---------|
|   | 1911   | 1912    | 1913    | 1914    | 1915    | 1916    | 1917    | 1918    |
| New tires.....                                    | 4,377  | 2,658   | 2,452   | 2,452   | 2,122   | 1,155   | 880     | 971     |
| Tires sent to the general shops to be turned..... | 3,294  | 3,904   | 3,718   | 3,718   | 2,798   | 1,495   | 1,912   | 2,153   |
| New axles.....                                    | 871  | 650     | 416     | 416     | 490     | 239     | 196     | 235     |
| Gears.....  | 1,212  | 623     | 585     | 585     | 426     | 305     | 222     | 230     |
| Pinions.....                                      | 3,335  | 3,459   | 2,835   | 2,835   | 1,960   | 1,204   | 1,224   | 1,186   |
| Brakeshoes.....                                   | 42,124   | 41,035  | 35,525  | 35,525  | 23,467  | 20,548  | 19,313  | 16,119  |
| Miles run per new tire installed.....             | 39,210   | 67,800  | 69,300  | 69,300  | 79,800  | 146,800 | 196,000 | 178,000 |
| Miles run per new axle installed.....             | 98,500   | 138,500 | 207,000 | 207,000 | 172,800 | 354,000 | 439,000 | 368,000 |
| Miles run per new gear installed.....             | 71,000   | 144,500 | 146,500 | 146,500 | 198,000 | 279,000 | 388,000 | 375,000 |
| Miles run per new pinion installed.....           | 25,600   | 26,000  | 30,400  | 30,400  | 44,200  | 70,400  | 70,200  | 72,800  |
| Miles run per new brakeshoes installed.....       | 4,080  | 4,380   | 4,820   | 4,820   | 7,220   | 8,260   | 8,930   | 10,710  |

TABLE V—COMPARATIVE STATISTICS OF THE ANGLO-ARGENTINE TRAMWAY ROLLING STOCK OF THE SURFACE LINES ONLY

| Description   | Most Important Works Done to the Surface Line Cars in the Company Work Shops |       |       |       |       |       |       |       |
|---|--|-------|-------|-------|-------|-------|-------|-------|
|   | 1911   | 1912  | 1913  | 1914  | 1915  | 1916  | 1917  | 1918  |
| Total number of motor cars at close of last year *.....         | .....  | ..... | 1723  | 1768  | 1800  | 1814  | 1798  | 1731  |
| Total number of trailer cars at close of last year †.....       | .....  | ..... | 790   | 818   | 835   | 831   | 853   | 889   |
| Total number of special cars at close of last year.....         | .....  | ..... | 12    | 13    | 13    | 13    | 13    | 13    |
| Total number of working cars at close of last year.....         | .....  | ..... | 78    | 77    | 83    | 83    | 82    | 82    |
| New cars bought (erected at company shops).....                 | .....  | ..... | ..... | 46    | 64    | 24    | 16    | ..... |
| Cars totally reconstructed (new body)*.....                     | .....  | ..... | 37    | 30    | ..... | ..... | ..... | 15    |
| Trailers totally reconstructed.....                             | .....  | ..... | ..... | 40    | ..... | ..... | ..... | ..... |
| Cars generally repaired without inclosing platforms †.....      | .....  | ..... | ..... | ..... | 112   | 139   | 92    | 41    |
| Cars generally repaired including inclosing of platforms †..... | .....  | ..... | 202   | 99    | 18    | 35    | 14    | 18    |
| Construction of special cars for different purposes.....        | .....  | ..... | ..... | 2     | ..... | ..... | ..... | ..... |
| Trailers generally repaired without enclosing platforms..       | .....  | ..... | 99    | 33    | 64    | 22    | ..... | 50    |
| Motor cars transformed into trailers.....                       | .....  | ..... | ..... | ..... | 20    | 10    | ..... | 77    |
| Cars painted anew.....  | .....  | ..... | 189   | 138   | 125   | 190   | 149   | ..... |
| Trailers painted anew.....                                      | .....  | ..... | 15    | 80    | 59    | 25    | ..... | ..... |
| Cars: half painted, retouched or varnished at the carhouse..... | .....  | ..... | 875   | 1066  | 863   | 644   | 913   | 668   |
| Trailers painted, retouched or varnished at the carhouse.....   | .....  | ..... | 438   | 346   | 416   | 301   | 328   | 336   |

\* These cars use the mechanical and electrical equipment of other cars, but their body is built totally anew.  
 † These cars are partially or totally dismantled, the parts in good condition are used again, advantage is taken to standardize them.

lack of organization, much work that could be done better and more cheaply at this shop was formerly done at the operating carhouses. Steps were taken to centralize as much as possible all heavy repairing and manufacturing at those shops where first-class machinery is available and where it is possible to have fewer but more skillful workmen under the immediate supervision of specialist foremen who can give all their attention to the production of better work with less labor cost.

Although the car equipment maintenance organization was established during 1912, the present organization is the result of careful experimentation and study. Modifications have been introduced from time to time to assist in keeping the rolling stock in such condition that good and efficient operation is possible and to effect the greatest economy in maintenance.

The inspection of the car equipment is done at regular time intervals. Although the mileage basis is theoretically the most rational, the regular time interval



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SUBWAY ENTRANCES, AVENUE MAYO, BUENOS AIRES

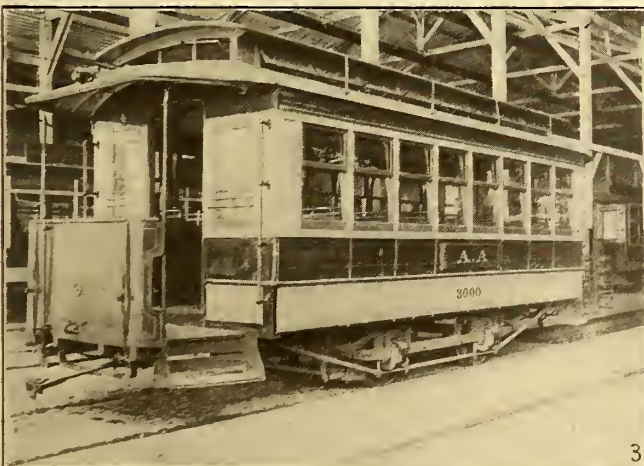
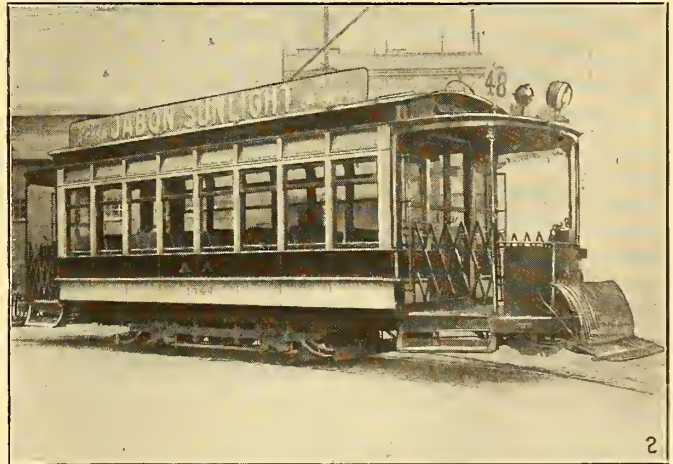
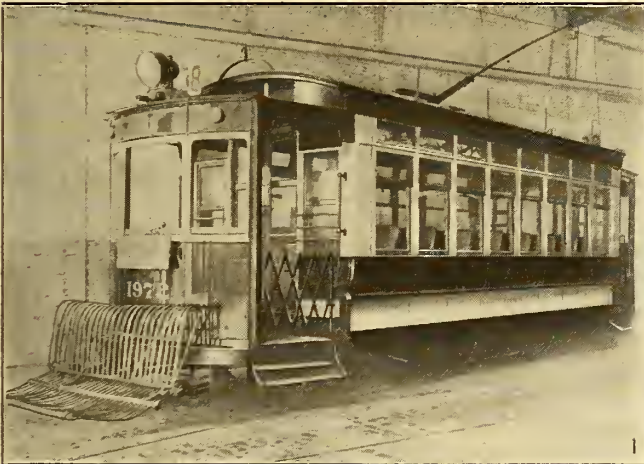
is practically the best for our conditions. The mileage run by the different cars of any of our carhouses does not vary more than 5 per cent; therefore by using the time-interval basis we get the advantages of the mileage system, and clerical economies also result.

The frequency of the inspection periods and of the general overhauling periods must be determined by the length of time that the different parts of the equipment can work in an efficient and economical manner. This frequency can be decreased by the improvement

in bearing materials and lubrication methods, by the use of modern types of motors and in general by a very conscientious inspection organization which thoroughly instructs the men how to do the work and holds them responsible for failures that could have been avoided had they done their work carefully.

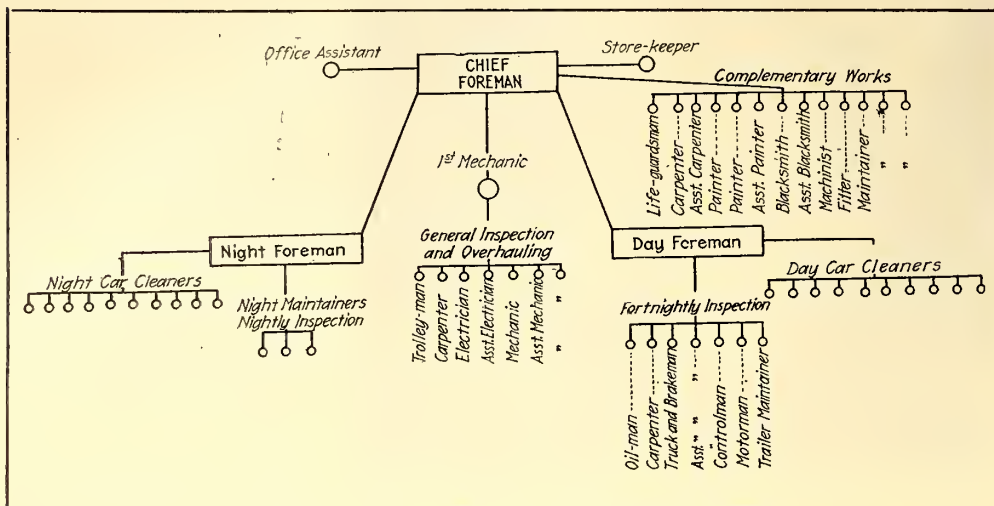
The results obtained after seven years of scientific maintenance can be judged by the statistics given in Tables I, II, III, IV and V.

The maintenance cost per car-mile has been reduced



TYPES OF THE ROLLING STOCK USED

- 1. Standard motor car, closed platform, thirty-two seats.
- 2. Open platform motor car, thirty-two seats.
- 3. Open platform trailer, thirty-two seats.
- 4. Closed platform trailer, twenty-eight seats.



CAR MAINTENANCE ORGANIZATION CHART

35 per cent since 1912, which means that our rolling-stock maintenance expenses in 1917 were \$500,000 less than in 1912. The miles run per pull-in increased from 2,860 in 1911 to 45,200 in 1918. The maintenance work done in the car shops can be divided into four general classes: (1) The general overhauling which is determined by the life of the armature bearings. By the use of better material the overhauling of the cars is now done every eight months where previously it was done every four months. (2) The lubrication inspection and brief inspection of all mechanical and electrical equipment made every two weeks. This period of time is kept for the lubrication of some of the parts of the car equipment, but it has been increased for others, as the result of the use of better lubricants and lubrication methods. (3) Nightly inspection, without repairing during the night. (4) Supplementary work, such as repairing wrecked cars, changing wheels and gears, painting, emergency call answers, etc.

The work has been planned in a very systematic way. Each man knows what he is going to inspect, how to go at it and how to repair it in accordance with the book of rules and instructions. The accompanying diagram shows the organization of an operating carhouse.

### Results With High-Speed Turbines

A writer in the current issue of the *General Electric Review*, in summarizing the present situation regarding high-speed, high-capacity steam turbines, notes that machines of 50,000 kva. operating at 1,200 r.p.m. have been built and are operating satisfactorily. Machines of 38,889 kva. at 1,500 r.p.m. have also been built and are in successful operation. In the 1,800 r.p.m. class, there are a number of machines in commercial service with ratings of 31,250 kva. at 0.8 p-f., and 33,333 kva. at 0.9 p-f., while at the highest speed, viz., 3,600 r.p.m., machines of 7,500 kva. are in operation, and two of 9,375 kva. are under construction.

The American Institute of Consulting Engineers has made a protest against the entrusting of the design of bridges by public bodies to architects. As a class, the protest says, the external architectural treatment and decorative effect in such structures is secondary in importance to the engineering design, which should provide safety, adaptability and durability of construction.

### Bureau of Standards Studies Rail Joints

THE Bureau of Standards has published a new edition of its bulletin on modern practice in the construction and maintenance of rail joints and bonds in electric railways. The author, E. R. Shepard, states among his general conclusions that the most important tendency as revealed in the investigation upon which the report is based is the attitude the companies are now taking toward the whole subject of bonding. That

it is an engineering problem deserving of as much skill and attention as any other problem in connection with the operation of an electric railway is apparently being realized by the large majority of the railway engineers. There is a marked tendency to get away from all types of soldered bonds which, even in recent years, have been installed in great numbers. A few companies who employ thoroughly experienced and capable workmen still continue to use them, but the number is relatively small.

Practically all types of standard modern bonds, when selected to meet local conditions and installed according to the best practices will give satisfactory results with an almost negligible percentage of failures on joints which are properly maintained. The problem of rail bond maintenance is largely that of joint maintenance. No bond can be expected to last continuously on a loose and poorly supported rail joint. No one type of bond can be said to be better than all other types. Each has its advantages and disadvantages, and the selection of a bond for any particular service should be governed by the type of construction on which it is to be used, the grade of labor available for installation and numerous other local conditions.

While welded joints are being used more than ever before, there is a growing tendency to adopt improved mechanical joints and various forms of special joints, several of which are a combination of welded and bolted or welded and riveted joints. These special joints seem to be meeting the demands of service with fewer failures and better results generally than any of the standard types.

It has been demonstrated that the saving of power alone would not justify the best modern practice in bonding. Such practice, however, is justified and strongly recommended from the standpoint of good voltage conditions in the return circuits, which not only make for good electrolysis conditions but also for more satisfactory operation.

Attention is again called to the fact that the problem of track bonding is still in a state of evolution. New inventions and improvements in methods and practices have been so frequent during recent years that many types of bonds and joints can still be said to be in the experimental stage. Carefully kept records and a free interchange of experiences on the part of the operating companies will do much toward the establishment of definite and standard practice in this particular field.



# Low-First-Cost Low-Maintenance-Cost Track

**Tampa Electric Company Has Had Wonderful Success With a Unique Type of Construction—The Life Is Unusually Long, Joint Repair Is Infrequent and Corrugation Is Unknown**

**T**HE Tampa (Fla.) Electric Company enjoys a unique position in connection with the character of track construction which it has employed with unusual success. While the construction is very different from that used anywhere else, in the knowledge of the writer, it is certainly justified by its low first cost of both track and paving, its low maintenance cost, the great ease with which it can be opened up and repaired when occasion demands, its freedom from corrugation and the low noise feature. The same general type of construction has been used by the company for twenty years and there are now about 40 miles of it in service. A piece of track on Ninth Avenue, between Thirteenth and Fifteenth Streets, laid with 56-lb. rail, has been in continuous regular service for twenty years. This had to be opened up once at the joints and the fish plates renewed or repaired, but the same rail and subgrade construction and the same brick paving—the first done in Tampa—are still in service. The secret of the whole track plan lies largely in the sandy character of the soil.

In general, the construction comprises 5-in. A.S.C.E. 80-lb. rails laid on wood stringers supported on cross ties, and making use only of sand for ballast and for track and paving foundations. As far back as twenty years ago, in connection with the first paving jobs done

by the street car company, the city was about to force the company to put in a concrete foundation for the track and pavement, and in fact had ordered this. It came about because, with the use of the 5-in. rail, there was not sufficient foundation material between the pavement and the top of the ties and the bricks would settle between ties, making a wavy surface along the rails. The company, however, was very desirous of retaining the 5-in. standard T-rail and to this end tried out the plan of mounting the rails on stringers. This arrangement gave a good depth of sand between the paving and the tops of the ties and apparently eliminated the objection. The city was then induced to accept this stringer construction in lieu of a concrete substructure as ordered and it has been in use ever since. Some experimenting has since been done with a 7-in. T-rail, but there was no need to put this on stringers and yet the construction seemed to be very unsatisfactory without stringers, so that the use of the high T-rail was abandoned.

## DETAILS OF CONSTRUCTION

In building this type of track, the trackway is excavated to the proper depth and 4-in. x 8-in. cypress cross ties laid at about 2-ft. centers. The stringers



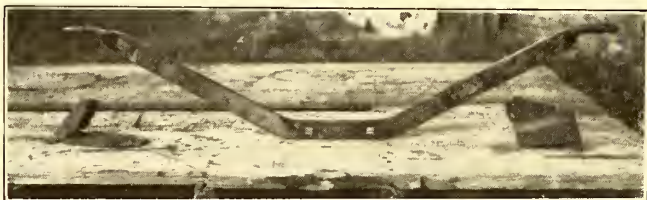
TYPICAL SURFACE APPEARANCE OF TAMPA'S TRACK AND BRICK PAVING



A STRETCH OF TRACK AND PAVEMENT ON NINTH AVE. STILL IN USE AFTER TWENTY YEARS

are then laid on the ties and four 60-dwt. spikes toenailed into each tie, two on either side of the stringer. The ties are then tamped up to grade with sand and the stringers lined up so that the rails can be spiked to gage at the center of the stringers. The stringers are 8-in. x 10-in. x 16-ft. cypress timbers and the rails are spiked to these with reverse point spikes. Six-bolt continuous rail joints are used and these are held in place by Harvey grip-nuts and bolts with no washers. Concealed soldered bonds patented by T. C. Folsom, roadmaster, installed underneath the fishplates are used on new work but not on repair work because of the cost of removing the fishplate. In repair work, therefore, an electric welded bond is placed on the head of the rail.

Among the unusual features of the track is the use of a peculiar design of tie rod, a picture of which is shown herewith. These rods are spaced every 15 ft. and used in conjunction with a special rail brace shown in the same picture. The ordinary tie rod was found to be in the way of the paving, causing a bad joint in the bricks. Mr. Folsom therefore developed this tie rod made of  $\frac{3}{8}$ -in. x  $1\frac{1}{2}$ -in. strap iron, and having a 10-in. downward offset in it. At each tie rod location one of the special rail braces is installed. This is placed underneath the base of the rail with the brace part fitting underneath the rail head on the outside of the



SPECIAL RAIL BRACE AND TIE ROD USED IN TAMPA

rail. It is held in place by two spikes driven through the casting. The base of the brace extends underneath the base of the rail and projects beyond the stringer, and the tie rod rests on and is bolted to this base. A half turn at each end of the tie rod brings the flat surface in contact with the brace at the ends, and with the side of a tie, at the center. At the center of the rod, two square holes are punched so that it may be spiked to the tie.

After the rails have been spiked to the stringers and surfaced and aligned, the track structure is filled in with sand and then flooded with water and tamped down thoroughly. No other ballast is used except in low wet places. The bricks are then either tamped by hand or rolled with a heavy roller. Thereafter, the paving and track construction are permitted to settle for some time, after which any low spots developing are leveled up and then the bricks grouted in.

In special work locations, the rails are laid on 8-in. x 14-in. pine stringers because the spikes seem to hold better in pine than in cypress. On curves, 8-in. x 12-in. x 10-ft. pine stringers are used, the 10-ft. lengths being short enough to provide for the curvature.

Cypress costs about the same as pine but lasts much longer. In damp places, the cypress will last indefinitely. Its average life is about fifteen years in closed track. The life of cypress cross-ties laid in open track on one of the company's suburban lines has been found to be from ten to twelve years. One piece of track built as described above with cypress ties and stringers was taken up after it had been in the ground ten years and

the timber was found to be all sound. It was used again and has now been in the ground ten years more, with no evidence of deterioration to date. The ties and stringers used by the Tampa company are not treated but are all heart, and locally grown.

One of the interesting things in connection with this track construction is that corrugation is absolutely unknown. Mr. Folsom also states that cases of joint trouble are very rare, and of course when there is a low joint to be repaired, the process of opening up the track and getting at the joint is so simple that the cost is very low. The entire track structure seems to hold its alignment and grade and remains in good condition with remarkably little maintenance, though subjected to a rather frequent service of large double-truck summer cars and Birney cars. The absence of extreme cold in winter and of marked changes of temperature have a bearing on this, no doubt. The initial construction cost is also very low, of course, running in the neighborhood of \$1.50 a running foot of single straight track, exclusive of special work but including paving.

## Welding Steel Poles

By G. H. MCKELWAY

Engineer of Distribution Brooklyn Rapid Transit System

THE USE of electric welding equipments has become very common on many railway properties, but their use has nearly always been confined to work either on the track or in the shops, with some little use by the electrical department in connection with the maintenance of equipment in the power or sub-stations.

The writer has never seen any description of the use of such equipments by the line department, although he knows of at least one case where it was proved that they could be satisfactorily used in the work of that department. This was in the building up of weak points in old steel tubular poles. Many poles after being in service for a number of years become rusted at the joints or near the ground line due to moisture collecting there. This is particularly true of poles on which iron collars are used at these danger points. The practice of applying such collars was at one time much more common than at present, as they were then considered to add to the appearance of the pole.

The writer was interested in some work which was done at the line department yard of this company on poles which had been removed from the ground. The job consisted of depositing a layer of metal from the welding rods in the groove which had been made by the rust and which was first cleaned out before the arc welder was used on it. While the work was entirely in the form of an experiment to see what could be done there was no doubt, at the conclusion, that it could be done satisfactorily and the life of the pole increased thereby. In fact, there seems to be no reason why such work could not be done on the poles while they were still set in the ground, although it would be difficult to perform it from ladders, and a more secure working platform would probably have to be provided for the welders.

M. O. Leighton, chairman of the National Public Works Department Association, addressed a meeting of members of the National Engineering Societies in New York on Feb. 19, on the desirability of a department of public works. A hearing on this plan was given on Feb. 11 by the Senate committee on public lands.

# Economy in Car Painting

Reduced Costs of Car Painting Do Not Result From Using Cheap Material or Labor—  
Analysis of the Causes of Paint Failure Show that Many Might  
Be Avoided by Using a Little More Care

BY DENNIS O'BRIEN  
Foreman Painter Brooklyn (N. Y.) Rapid Transit Company



CONVENIENT OIL STORAGE IS A GREAT HELP TO THE PAINTER

**T**HE high costs of paint, oil, and labor have made it necessary for railway organizations to economize in the painting of their equipment. Economy in painting does not result from buying cheap material. A manufacturer or salesman who offers a gallon of oil paint or enamel for \$2, when oil is selling around \$2.25 per gallon and who says, respecting it, that it is pure linseed oil paint, should be branded as a fraud. A good paint, well ground, whose vehicle is pure linseed oil will have a greater spreading rate under the brush, that is, it will cover more square feet of surface than a cheap, poorly ground paint the vehicle of which is a linseed oil substitute.

In order to get longer life from the paint used we must eliminate the small defects, as it is these small defects which usually lead to larger ones. We find in the last analysis that failure is due to defects which might have been overcome had we exercised a little care and prudence.

The causes of paint failure are two-fold; unpreventable and preventable. The unpreventable causes are moisture, sulphur compounds, ammonia, acids and carbon monoxide. These are found in the atmosphere of large manufacturing cities, and it is a problem for the paint chemists to make a combative paint. The preventable causes are poor workmanship, improper mixing, improper foundations and improper drying conditions. These are directly up to the painter and the paint department.

The trade of car-painter is too often supposed to con-

sist of manual processes only. It is thought by many that a young man has only to follow others in order to become a competent workman. There is, however, an element of technique that obtains in painting as in every other trade; it is this that the foreman must impart to the mechanic and he must never consider that man an interloper who asks questions appertaining to the work.

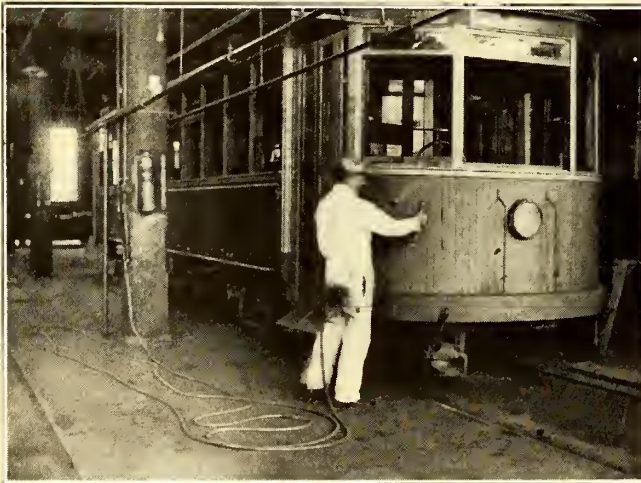
Sagging, running and wrinkling are defects that are sometimes caused by poor mechanics who apply too much paint or enamel or who have no idea of thoroughly brushing out the paint. On the other hand I have seen severe cases of this trouble which were entirely due to the manufacturer. A paint will sag, run and wrinkle where the article in question contains an excess of oil or insufficient volatile matter. Another reason for the appearance of such defects may be the lack of a proper binder. In this case the paint becomes what is known as a "fugitive paint" if there is not something present to bind together the vehicles and pigment. When paint starts to contract or shrink the oil will desert the pigment and the entire surface will be covered with ugly sags and runs.

## IMPROPER FOUNDATION IS DIRECTLY DUE TO POOR WORKMANSHIP

The prime coat is the foundation upon which the entire job is to be built. If the foundation is faulty the entire superstructure will topple over. The man who applies the prime coat should be as good a mechanic as

he who applies the finishing coat. This rule has been often neglected by foremen who trust the priming coat to helpers. The essential requisites of the prime coat are firm adhesion, impermeability and a uniformity of the layer of the thickness desired. These can only be obtained by a first-class mechanic who thoroughly understands the importance of brushing out his paint.

Nothing is more discouraging to the foreman painter than to find, after a job has been finished, that the surface is covered with minute and large blisters. This condition is far more common on cars finished with an oil enamel, which is used extensively in car painting today, than on cars painted by the older process. While it is true that in some cases blistering is due to an excess of oil or fat in the oil, in the majority of cases blistering can be justly attributed to painting over damp or moist surfaces. Blisters are more than mere blemishes on the paint film, they are serious defects which if allowed to persist will ultimately destroy the entire painted surface. In due time the blisters will



A SMOOTH DRY SURFACE IS ESSENTIAL IF BLISTER FORMATION IS TO BE PREVENTED

crack and allow water to get in under the paint film itself and thus destroy the under coats.

Where the job calls for the car to be scrubbed and enamelled, care should be taken to see that the surface is thoroughly dry before the enamel is applied. If the surface is damp or moist when the enamel is applied countless water molecules will spread over the surface under the thin enamel film. When the car leaves the shop the rays of the sun beating upon the surface of the car will draw these molecules of water together at a point where the structure of the paint film shows the least resistance.

While the paint is drying it is constantly taking on oxygen. The moisture, oxygen and oil, aided by the heat of the sun, tend to generate a gas under the film. This causes the expansion which we call blisters. Of course these factors do not absolve the paint manufacturer from all blame and it is all up to the foreman painter to fix responsibility.

#### PROPER MIXING IS MOST EFFECTUAL

Too much stress cannot be placed upon the importance of proper mixing of the paint. Many a job has failed because the paint has not been properly mixed. Paint is composed of ground inorganic matter or the pigment, the organic or liquid matter with which we mix it, or the

"vehicle", and volatile matter. The finer the pigment is ground the better the mixed paint will be because the greater the number of particles of pigment on the surface the better the protection the dried oil will receive.

In mixing the paint it is important that the oil be added to the paste and then paddled until every particle of pigment is incorporated in a close union with the oil. Under no circumstances should any tinting colors, driers or turpentine be added until this close incorporation has been effected. The paint should be mixed to a workable consistency so as not to bring about much muscular fatigue to the painter using it. The use of paint that is hard to work under the brush tempts the painter to thin it out. This has caused many paint jobs to fail, where the reason for the failure could never be traced.

#### JAPAN DRIERS ARE NOT FAVORED

Japan driers are carriers of oxygen. A paint that is supersaturated with oxygen loses its toughness and becomes brittle. Under no circumstances do I approve of using japan driers. Boiled oil, because of its peculiar manufacturing processes, possesses drying properties, and it was always intended as a vehicle to accelerate the drying of mixed paint, but not as a general paint vehicle. The foreman painter who does not recognize the true merit of boiled oil as a drier and insists upon destroying the neutral oil in the paint by adding japan driers is either incompetent or not on the level with the firm which is paying him wages. In either instance it is folly to retain him in a business where he will burn up good paint and waste money.

Turpentine, while making the paint more workable, should ever be used conservatively and should be added only in quantities sufficient to aid the paint to penetrate the under coats. It should never be used to thin out or extend the paint after it has been mixed. Up to the present time nothing has been found to equal linseed oil as a paint vehicle. While Tung oil or China wood oil is superior to linseed oil in resisting water, it has never made any marked impression as a general paint vehicle.

Care should be taken to see that the oil used is pure. Adulteration of oils is frequently the cause of failure of an expensive painting job. I have seen paints that possessed neither drying nor binding qualities because of the oil foots. Oil should be tested for its drying qualities. Any man who has been handling oils for any length of time can detect adulterated oil by smelling and tasting it. When placed in a test tube and held to the light a cloudiness and a heavy precipitation will give evidence of oil foots.

Boiled oil flowed on a piece of glass and placed in a vertical position in a room of about 70 deg. temperature, should dry free from tackiness in thirteen hours. A simple and fairly accurate test for pure turpentine is to place a drop on a sheet of white paper. Rapidity of evaporation without any pronounced greasy residue will prove the purity of the article.

Paints dry by absorption, oxidization and evaporation. In order to facilitate these the shop should be warm, well ventilated and free from dampness and obnoxious gases. Another important feature in painting is not to use any soap, cleaners or renovators which contain acids, ammonia, free lime or any other alkali. Careful cleaning and proper drying are necessary.

# Overhead Practice and Experience in Atlanta

Iron Trolley Wire Used With Success on City Line—Special Construction Practices Which Have Materially Reduced Maintenance Costs



BACKBONE CONSTRUCTION ON CURVES AND CATENARY CONSTRUCTION OVER STRAIGHT TROLLEY IN FRONT OF ATLANTA CARHOUSE



CROSS CATENARY SUPPORT FOR OVERHEAD, ALONG FRONT OF CARHOUSE CAN BE SEEN IN THIS VIEW OF "PERMANENT" OVERHEAD CONSTRUCTION

FOR the past three and one-half years, T. F. Johnson, superintendent of transmission and distribution, Georgia Railway & Power Company, Atlanta, Ga., has been making a more and more extensive use of iron trolley wire until about 25 miles have been installed to date. As this company has had very satisfactory results from the use of iron wire on its city lines, its experience is enlightening.

The use of iron wire was originally tried in Atlanta as a means of reducing the rapid wear and consequent need for very frequent replacement of certain sections of the copper trolley. It was not gone into as a means of reducing the investment required or to get away from the use of copper for other reasons although the very high price of copper during the war, coupled with its scarcity, undoubtedly influenced a greater use of the iron wire than would naturally have followed without these unusual conditions.

There was a viaduct where the copper trolley wore out so rapidly that it had to be replaced every six months and it was at this point that the iron wire was first installed. This original wire has now been up three and one-half years and upon a recent inspection it was declared to have a remaining life of at least two and one-half years. The wire used on this first installation as in the later ones, was of No. 000 round section. In the catalog of the manufacturer, the John F. Roebing's Sons Company, it is loosely termed "iron wire", but in reality is a mild steel, or a steel having a very low carbon content. This wire is galvanized so that the rust will not fall down on the roof of the cars as they pass. The galvanized surface wears off quickly on the under side of the wire which becomes bright like a steel rail but remains on the top and sides of the wire to protect it from rusting.

The iron wire having demonstrated its adaptability for service on this initial installation, the Atlanta com-

pany began the practice of installing it on curves. At these locations copper trolley wears rough, whereas the iron wire becomes polished and smooth, seemingly indicating that the wear on trolley wheels is much less. The iron wire is also desirable at these locations because of its greater strength.

On straight line work the iron wire has been installed in Atlanta only in those locations where there was sufficient capacity in the feeder cable along that street to carry the full load without including any of the conductivity of the trolley itself. However, it was stated that on this basis iron wire could be used on 60 per cent of the whole Atlanta system with the present feeder installation. No wire has been installed, however, in the down-town section, except for that on the curves, because of the large number of cars which pull current from a short section of the wire at a time. It would take too much feeder copper to make the use of iron wire in this district possible, and furthermore the company does not have the poles to carry such feeder. The practice followed in the down-town section is to use ring feeders and to have also special work inside the ring of iron wire.

Iron wire is installed under a tension such that it is practically without sag in the winter and has a 3-in. sag in summer. Taps from the feeder to the trolley are cut in at every other span, using the ordinary feed-in ear for connecting to the trolley wire. One of the difficulties in connection with the use of iron wire has been that for some reason not fully determined the brass ears used with it burn off very rapidly—much more rapidly than with the copper trolley. To eliminate this defect, an effort has been made to secure iron ears, but a satisfactory design had not yet been secured at the time of this writing.

W. A. Wilder, general foreman of trolley work, states that the linemen like to work with the iron trol-

ley wire because it is much easier to handle than hard-drawn copper wire. When a break occurs in the iron trolley, the ends simply fall down but do not snap and fly as the hard-drawn copper does. For this reason, it is easier for the men to repair the break, an ordinary mechanical splicing ear being used. Also, if the iron wire touches the rail in falling, it burns off but does not anneal, so that all of the wire that is left intact can be used in making the repair and there is no waste.

In connection with trolley breaks it is interesting to point out that the annealing of copper trolley for considerable distances back of a break has led the Atlanta company to install an equalizing connection between the two trolleys at every fourth span over the entire system. It has been found that with these cross connections a trolley coming in contact with the rail will anneal back to the equalizer only. Apparently the combined conductivity of the two trolleys from this point gives sufficient current carrying capacity so that the heating does not reach the annealing temperature. These equalizer wires are made from old pieces of trolley and connected by means of Ohio Brass feed-in ears. It is claimed that their presence saves a great deal of trolley. The overhead system in Atlanta is not sectionalized.

The only thing the line department has against the use of iron wire is that it has found that there seems to be a rather frequent splice in it as it is unreel, and that frequently there will be a kink at the splice. If it is attempted to hammer out the kink the wire frequently will snap, seeming to be very brittle at that point. It is understood that in the process of manufacture it is necessary to have about forty-two such splices on a full reel holding about  $4\frac{1}{2}$  miles of wire. These splices are made by butt-welding and it is possible that the unfavorable experience of the Atlanta linemen resulted from these welding points being cooled too rapidly and thereby hardened. The manufacturing process is such that each splice is supposed to be thoroughly annealed to prevent brittleness at the splices.

#### PRACTICES DESIGNED TO REDUCE MAINTENANCE AND CAR DELAYS

The practice of backboning curves is not a new one but it has probably been carried further on the Atlanta property than in nearly any other city. For all curves in the entire system have been rebuilt in the manner illustrated in accompanying photographs. The result has been that the delay of a car on account of a break at a curve is practically unknown, for with the present construction if a break does occur, only a very short piece of the wire hangs down and the car can coast by the break without being delayed. Because of this assurance of not tying up the cars even if a break does occur, it is possible with the back-bone con-

struction to leave the trolley up until it is completely worn out. In other words, early replacement of the wire does not have to be made as an insurance against breakage.

The messenger cable forming the backbone is put up to parallel the trolley all the way around the curve. If it is a double-track curve, both trolleys are backboned. But the backbone is not made in one continuous wire but is turned back and served up at each pull-off, so there is a short piece between adjacent guy wires. The backbone is separated from the trolley only by the hanger arm and wood strain insulator. At each end of the backbone, the guy wire is made to pull off as nearly tangent to the curve as is possible, considering the possible locations of a pole or other anchor. With this backbone construction the pull-off guys are so arranged that should any one of them become detached from the trolley, it will not hang down far enough to obstruct the street.

One place where this backbone type of construction has proved to be particularly effective is at the carhouse. Here there are twenty-seven tracks entering the building, seventeen turning in one direction and ten in the other, with an overhead trolley over each one. Before the present overhead construction was installed it was an unusual day that the line crew was not called to the carhouse to repair the overhead. The present construction, which is quite clearly pictured in two accompanying halftones, has



BACKBONE REINFORCEMENT OF TROLLEY CURVE AT BUSY DOWNTOWN CORNER WHERE ABSENCE OF ANCHOR POLES BROUGHT BULL-RING CONSTRUCTION INTO USE

now been up two years during which time the line crew has been called to the car house very rarely.

All of the trolleys turning into the car house are of iron wire while the wire over the straight track along the street in front of the building and that inside the barn is copper. A circuit breaker was placed in each bay of the car house to localize any short circuit disturbance.

The straight wire along the street is supported by a long catenary messenger cable which is attached to each trolley switch by means of a wood strain insulator and a piece of trolley wire looped through the two side eyes of the switch and the eye of the insulator. Another catenary messenger cable was strung parallel to the front of the car house and about 15 ft. in front of it. It was installed to provide an additional support for the twenty-seven trolleys as they straighten to enter the carhouse. This catenary was fastened between trolley wires to the span wire by means of a hanger and three-bolt clamp and clevis.

Each curve is backboned and switch guys and backbone guys are installed for each curve. Thus very large number of guy wires was distributed among seventeen anchor poles placed along the street. The backbone tangent guys were fastened to a pole at one end and to the building at the other end. In the latter case, a bolt and nut in the top frame of the Kinnear doors which

held the latter to the steel column was removed and a bolt with a female eye head used instead, thus serving the double purpose of bolting the Kinnear frame and as an anchor for the guy. A No. 504 O.B. porcelain strain insulator was inserted in these guys as a double safeguard against grounding, the woodstrain insulator between the trolley and the backbone cable providing the ordinary insulation.

#### NOVEL INSTALLATION OF TROLLEY PROTECTORS

In using trolley protectors in 5-ft. and 6-ft. lengths at the approach to switches it was found that the trolley wire wore out very rapidly just in front of the first end of the protector. After some experimenting it was found that if about 6 in. of the first end of the protector were cut off and this section inverted so that it was placed on top of the wire instead of underneath, the wear at this point was practically eliminated. Placing a short piece of protector in this position apparently makes an approach to the section of the protector placed in the usual position such that there is no bump to cause any arcing.

The Atlanta company saved \$2,700 for the first ten

months of 1919 by handling overhead junk material in a manner to realize the greatest junk value. For example, the trolley ears turned in for junk are sent to the repair shop where one man continuously employed on this work separates the copper wire from the brass ears and removes the iron set screws. If the ears were sold as they come in, without separating the different metals, they would bring the scrap value of the lowest valued metal, or about 10 cents a pound. By separating them, the copper can be sold for say 18½ cents a pound, the brass for 10 cents or 12 cents. Further, if in reclaiming these metals, the workman finds a dozen good ears in a day which may be saved with a little repair work, it means a saving of twelve times \$1.25 or \$15. In handling this work, the storekeeper charges out 1,000 lb. of scrap at 10 cents a pound to this workman, who makes his returns to the store room in about these proportions: 500 lb. of scrap brass, 400 lb. of copper, 100 lb. of good ears. The workman's time is charged to the work order on which the reclamation work is done, the net saving totaling up a surprisingly large profit as indicated from the figures given above.

## Remote-Control Sectionalizing Switch

A Saving of More than \$400 per Month Resulted from the Installation of This Simple and Inexpensive Device

BY H. P. BELL

Electrical Engineer San Francisco-Oakland Terminal Railways, Oakland, Cal.

THE San Francisco-Oakland Terminal Railways have recently installed a novel economy in substation operation and insurance for continuity of power service in its Richmond substation. The installation as shown in the wiring diagram is an adaptation of an automatic sectionalizing switch with the GE-DB-276 contactor remodeled to take care of the special conditions encountered in this case.

The limiting conditions calling for this particular installation were as follows: On account of power contract relations it was necessary and desirable to serve power to the cars of this division entirely through the conversion apparatus at Richmond substation during the time when there was any appreciable load in this district. Incidentally, Richmond substation is fed on the alternating-current side under contract from one of the larger power company's 11,000-volt lines from hydro-electric sources. Although it was desirable to shut down this substation between the hours of 1:30 a. m. and 5:30 a. m. in order to eliminate the no-load losses in the plant and the cost of the station attendance, it was necessary to keep the district-current lines "hot" to provide for moving, repairing and testing on cars in the yard and carhouse, and also to take care of the necessary street and crossing lights. It was also true that the alternating-current source of power for the district just south of the section insulator which separated that district from the Richmond district was much more reliable than the alternating-current power to Richmond substation. Therefore, from all angles of economy and continuity of service it was desirable to have a connection with another 600-volt direct-current

source of power which could be operated at will from the switchboard of Richmond substation, and which would also provide protection from shorts and overloads as between the two sections.

The only source of 600-volt direct-current power reasonably available other than from Richmond substation was located 4.2 miles from that station.

After looking over the available apparatus on the market which could be installed at a reasonable cost and which would come anywhere near performing the desired functions, it was decided to remodel and adapt a General Electric automatic sectionalizing switch for our use. The relay of this switch in its standard commercial form is provided with two coils, one shunt and one series, operating a contact which is closed in the normal "down" position. This contact is in the contactor operating-coil circuit. An excessive flow of current through the series coil from one section to another will open the relay contact and drop out the contactor. The shunt coil, being connected across the two sections, will hold the relay contact open so long as there is sufficient difference of potential between the two sections. It can be seen from a study of our requirements that the relay shunt coil was not a desirable feature, in fact its use would rob us of manual control of the contactor. The coil was therefore eliminated. The negative side of the contactor operating coil was carried over an iron wire line to the substation switchboard. The negative side control was used to eliminate the expense of a two-wire line which would have been necessary for the positive side control. Iron wire was used for economy both in the line and as a substitute for other resistance.

The switchboard installation at the substation as shown in the wiring diagram consists of a knife switch F, an indicating lamp G, a 600-volt push-button switch K and a relay H-J, operated on three parallel circuits which contain the necessary fuses and resistances. Upon the closing of the knife switch F, an indication is received through the indicating lamp G, as to whether or not there is power on the 600-volt direct-

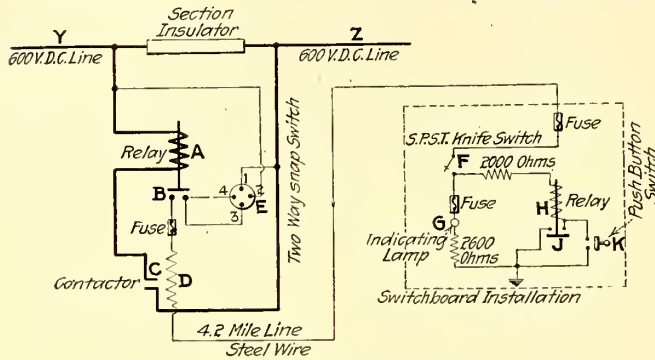


DIAGRAM OF CONNECTIONS FOR REMOTE-CONTROL OPERATING SWITCH

current lines in the section Z, into which it is proposed to tie. Then when it is desired to tie into this section Z, the push button switch K is closed energizing the coil H of the switchboard relay which closes the contact J, completing the control circuit to ground, and energizes the contactor-closing coil D, thus tying the two 600-volt systems Y and Z together.

WHAT HAPPENS WHEN A "SHORT" OCCURS

If a short should occur on the Richmond 600-volt system Y, an excessive flow of current would energize the series coil A of the switch relay and open the control circuit contact B, which would allow the contactor C to drop open, separating the systems. The opening of the control circuit at B would also de-energize the switchboard relay coil H, opening its contact J so that the systems would not automatically tie themselves together again as soon as the contactor C opened and interrupted the rush of current through the series relay coil A at the switch. The circuit would remain open until the night foreman of the carhouse, upon entering the station, could determine where the trouble was by observing the indicating light and trying the push-button switch once to see if the systems again separated after being closed. If they again separated the emergency lineman would be called as usual to clear up the grounded line.

A two-way snap switch E is cut into the positive side of the control line to provide for reversing the control in case it is ever desired during emergencies to provide power on section Y and at the same time feed into section Z.

This installation has been in service for about six months, has proven entirely satisfactory, and has developed no failures whatever. The only maintenance required has been a monthly inspection and cleaning of contacts. It has yielded a saving of \$412 per month, and the longest power interruption in the 600-volt direct-current service to this district since the installation has been four minutes, although we have had several severe interruptions in the alternating-current service to the substation of from sixteen to fifty-seven minutes' duration.

Coal Heaters Electrically Equipped for Intermittent Use in Spring and Fall

THE Sioux City Service Company is installing on each of its cars Peter Smith forced ventilation hot-air heaters equipped with four electric heating coils. The object is to provide this ready means of securing the small amount of heat needed only for an hour or two at a time during the fall and spring months.

The electric heater coil equipment is very simply incorporated into the coal heating system by installing four 500-watt coils, one in each corner of the outer steel casing of the stove, between the outer and inner casings. The cold air taken in through the floor of the car is drawn up over the four heater coils by the blower and forced down through the inner casing into the distributing duct along the side of the car.

The four coils are permanently mounted in a vertical position and are so connected electrically that current cannot be turned on through them until after the blower switch has been closed. This circuit is used to prevent any possibility of burning out the inner casings or coils if there were no circulation of air. During the winter months when the coal heat is required, the fuse in the circuit of the four heater coils is removed so that they cannot be used. The wiring diagram taking care of these two provisions is illustrated in an accompanying drawing.

It is claimed that this auxiliary electrical equipment in the coal heater system overcomes an objection which

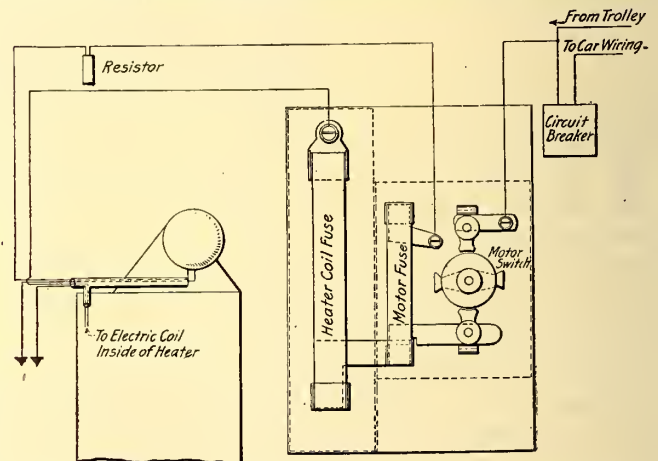


DIAGRAM OF CONNECTIONS FOR COMBINATION ELECTRIC AND COAL CAR HEATING SYSTEM

some railway men have expressed, that it made the cars too warm at times in the fall and spring; or that it was necessary to build a fire which would last for many hours in order to supply heat needed for perhaps only an hour. The additional cost of the system with the four electric coils incorporated is small.

Car conductors have a habit of leaning against the coin box supports. The backs of their coats wear out at the point of contact with the support. New coats cost money nowadays, so any device that will save them from wear will be appreciated by trolley men. An inventive genius has solved the problem. A reinforcing strap of leather, leather substitute or heavy rubberized fabric about three or four inches wide is sewed all the way across the back of the coat at the point where it rubs against the support.



# Rehabilitating an Overhauling Shop

By Utilizing the Space Formerly Occupied by Carpenter and Blacksmith Shops, the New York State Railways, Utica Lines, Was Able to Increase Their Facilities for Overhauling Equipment and Rebuilding Cars

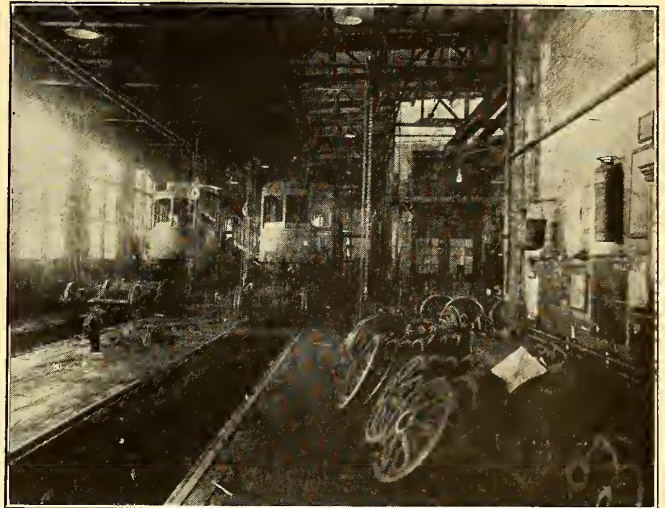
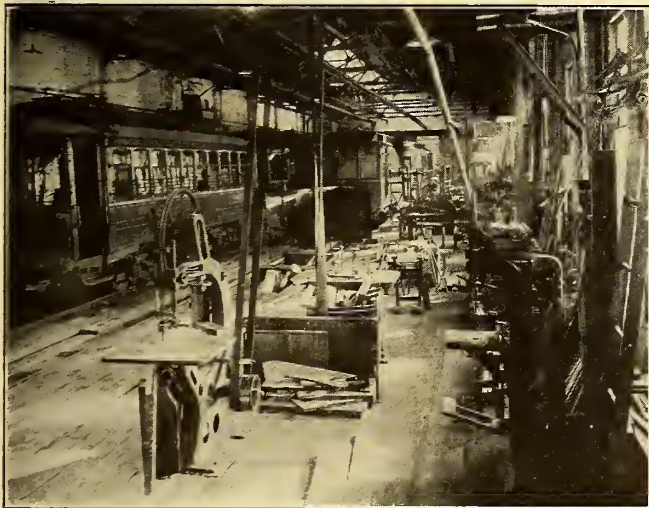
By H. S. SWEET,

Master Mechanic New York State Railways, Utica Lines

THE Utica Park shops of the New York State Railways take care of the car equipment necessary for operating the Utica, Rome and Mohawk city lines, as well as an interurban line which runs from Rome to Little Falls. The growing business of the company and facilities required for carrying out a car rebuilding program which had been undertaken by the company made it necessary recently to obtain increased space, as the previous arrangement of the shops so limited their capacity that this additional work could not be taken care of properly.

The principal point of congestion was in the overhauling shop. With the old layout it was possible to

be seen that at the side of the carpenter and truck shops, which occupy the central part of the building, were located the electrical department and armature room, a mill room, a blacksmith shop, a machine shop, a store room and the main office. In the layout as rearranged the armature room was left in its old location, but the controller and resistance work formerly taken care of at a bench in the rear of the armature room was moved to a balcony built in the rear of the room. This gave increased space of approximately 17 ft. x 15 ft. A commutator slotting saw of General Electric make was installed in the armature room to take care of this work which was previously done on a planer.



AT LEFT, NEWLY ARRANGED CARPENTER SHOP. AT RIGHT, TRUCK SHOP

hoist but three cars at a time, and as all of the wheel and armature changes for both the city and interurban lines were taken care of here, this overhauling shop was necessarily very greatly overloaded. During the winter months, when car repairs reached their maximum, it was almost impossible to take care of the equipment.

## SLIGHT CHANGES ALMOST DOUBLE OVERHAULING CAPACITY

A drawing on page 568 shows the layout of the shop, both before and after the changes were made. The carpenter shop, which was formerly located in the rear of the truck shop, was removed to an adjacent car-house which was formerly used for storage purposes, and an annex, 45 ft. long x 12 ft. wide, was built at the center of the overhauling shop for use as a blacksmith shop. This was the only additional building necessary and the location of the blacksmith shop opposite the truck overhauling section provided a very convenient location for carrying on the work. The carpenter shop was located close by. By these changes the capacity for overhauling was practically doubled.

By referring to the former layout of the shop it will

The location of the machine shop was changed from a point just in the rear of the store room to the space previously occupied as a mill room. All of the machines except a wheel press and boring mill were removed into this space; then, by rearranging the wheel press and boring mill, additional room was provided for motor overhauling. A hoist for handling the work conveniently, and a number of benches were installed in what was formerly the machine shop.

The space previously used as a blacksmith shop was fitted up as a welding room and an acetlyene generator was installed just outside this room. This location right back of the space used for motor overhauling and adjacent to the truck overhauling part of the shop was chosen as being most convenient.

In the rear of the truck shop where the carpenter shop was formerly located, car hoists were installed for use in overhauling. Cranes were set up in front of these in such a location that they would swing from each side to do the work necessary in overhauling the trucks. One of three hoists which was formerly used for wheels and armature work was also made available for overhauling by the equipping of two carhouses with

the facilities necessary to enable them to change their own wheels and armatures. This diminished the work of this class which it was necessary to take care of at the Utica Park shops.

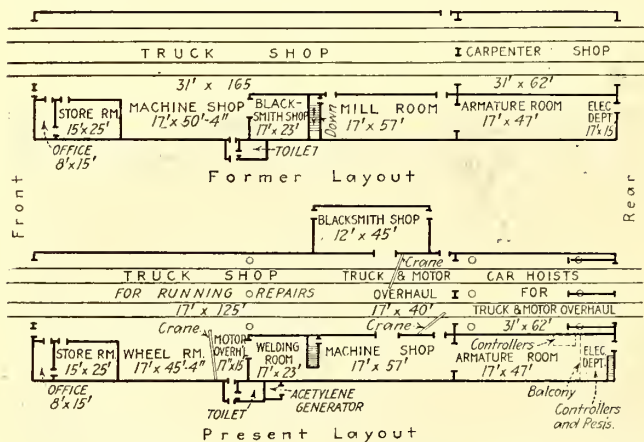
In the previous arrangement the hoists used for the wheel and armature work were on travelers running on beams hung below the trolley wire. This arrangement was very unsatisfactory as it necessitated the pulling off of trolleys whenever cars were moved around the truck shop. This location also resulted in many minor accidents. In the rearrangement the hoists were raised so as to run on beams above the trolley wire which was arranged with narrow gaps so that the trolley wheels could run over without making it necessary to remove the trolley from the wire. This gap allowed a thin iron plate from which the hoist hangs to be installed.

As will be seen from the revised layout the truck and motor overhauling is done now in the center of the shop, the car hoists used in this work are located in the rear formerly occupied by the carpenter shop and the

### Old Tie Rods Made Over Practically Without Waste

**T**HE RODS saved from old track have accumulated rapidly in the yards of the United Railroads of San Francisco and an effort was made to find the best plan for making them again fit for service. As piled up in the storage many of the rods were badly bent, and practically all of them were deeply pitted by rust or electrolysis. The threaded ends were unfit for further use. A glance at the pile strongly suggested the scrap heap. The rods are being made over, however, so that they will serve their purpose practically as well as when new.

The first operation is to cut off the threaded ends, making one of these cuts an angular or scarf cut so that the end has only to be heated to be ready for welding. The rods are then straightened and piled up beside a preheating furnace. After preheating they are passed into an adjacent furnace where they are brought up to welding heat. Beside this furnace stands a power hammer into which special dies for welding rods can be fitted. The actual welding is done so quickly that a blacksmith and one helper handle the rods through the two furnaces and complete the weld at an average rate of one rod per minute. In fact, this rate can be maintained throughout the working day. After thus being extended to suitable length, the rods are re-threaded and fitted with new nuts. In this condition they are as easily handled and are thought to have almost the same life as new rods.



PRESENT AND FORMER LAYOUTS OF UTICA PARK OVERHAULING SHOPS, NEW YORK STATE RAILWAYS UTICA LINES

### Reinforced Concrete in Railway Work

**I**N THE *Bulletin of the International Railway Association*, Vol. 1, p. 207, is an elaborate "note" on the use of reinforced concrete in England for railway work other than bridges and buildings, by L. Weisenbruch, chief engineer and administration manager in charge of railway signaling of the Belgian State Railways. In view of the comprehensive plans for electrification of the railway lines of Belgium, this paper is of unusual interest. The author covers the use of concrete for signal masts and telegraph poles, posts and ties.

He concludes that owing to the increasing scarcity of wood, and the present high prices of wood and steel, reinforced concrete can be economically applied at once on railways for signal masts and telegraph poles, fencing, supports for pulleys, etc., and ties for sidings and inspection pits.

Among suggestions regarding concrete ties he says that the best fastenings for securing the rails to the concrete ties are bolts going right through the latter. It seems advisable to interpose between the rails and the ties, in addition to a layer of bituminized card, a sole plate made of compressed maple 1 in. thick. The length of the tie should be as nearly as possible that of a wooden tie. It must be packed firmly under about 36 in. at each end, leaving in the middle an unpacked space of about 24 in. to prevent the formation of cracks. Hollow ties have, besides the advantage of lightness, that of having a large seat for a given weight.

front part of the shop is used for running repairs. By having the truck and motor overhauling done in the center of the shop, the necessity for turning cars when but one end requires raising is avoided and as the overhauling tracks run entirely through the shop the work can be arranged so as to be carried out without interference.

Two additional illustrations show views of the truck shop and carpenter shop so rearranged. The carpenter shop and mill room are now located in front of the paint shop which takes up a space of 195 ft. in the rear of a 500-ft. carhouse. In this rearrangement, all that was necessary was to put up a partition near the end of the carhouse, lay floors and install heating and lighting fixtures. The paint shop, which has a capacity of ten cars, was not enlarged as it was considered ample to handle the present work.

The shop changes and additions have enabled the company to carry out its extensive motor and truck overhauling program which would have been impossible under the old arrangement, and this thorough overhauling of the electric equipment has proved of great value during the severe winter months through which the company has just passed. The shop changes and additions described were carried out under the writer's supervision together with advice and help from J. F. Uffert, superintendent of equipment of the New York State Railways.

All track joints are being double bonded by the Birmingham Railway, Light & Power Company as a means of making doubly certain of the continuity of the track return circuit. A 4-0 pressed terminal bond is placed under the fishplate and an Elrico bond on the head of the rail.

# Track Construction From the Paving Maintenance Standpoint

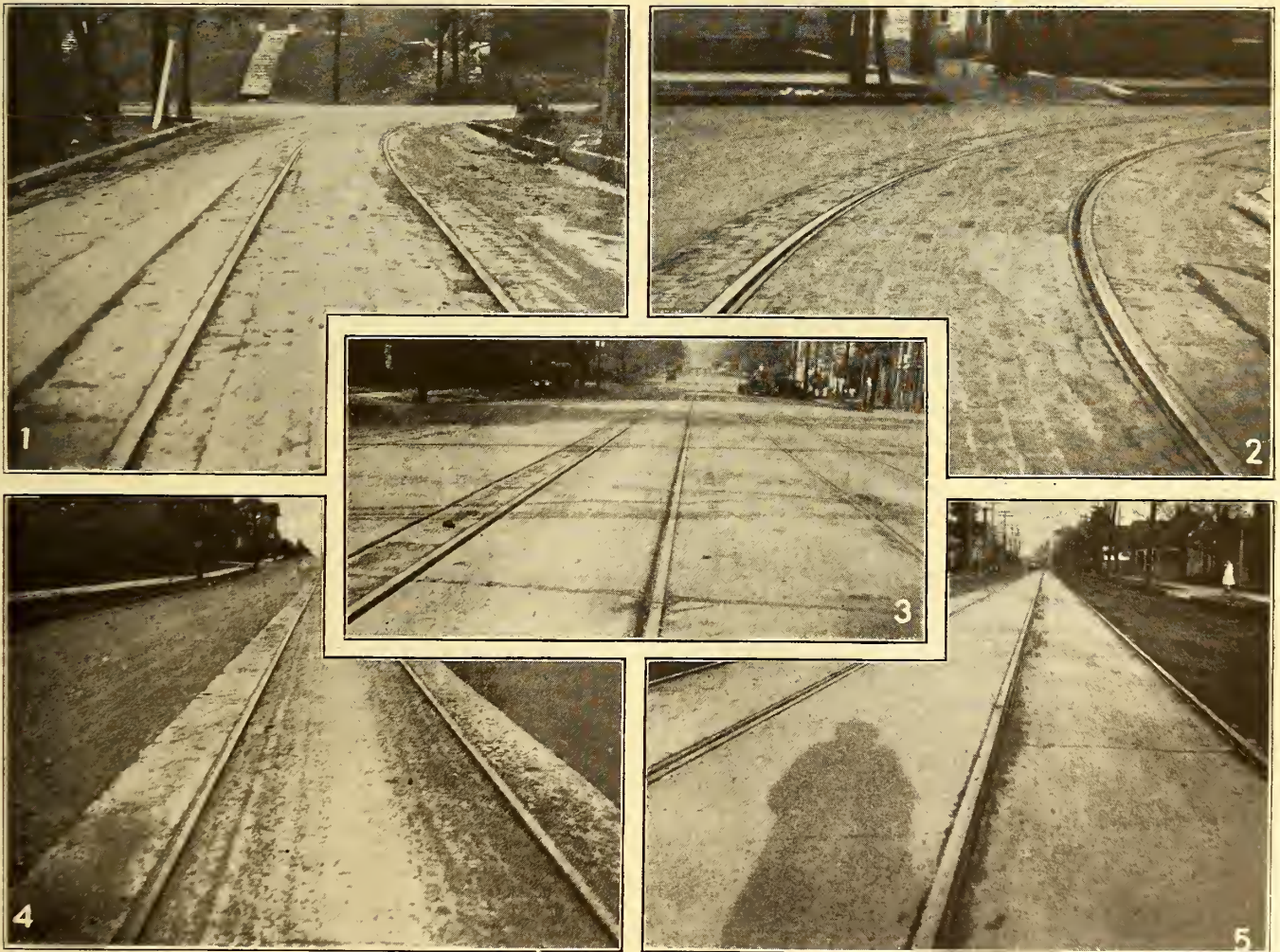
The Birmingham Railway Has Tried a Number of Types of Track Construction in an Effort to Reduce the Surface Maintenance Expense—Its Experiences Are Related in the Following Paragraphs

THE maintenance-of-way engineer's work on a street railway property is devoted in no small part to the problem of devising a type of track and paving which will minimize the expenditures necessary for the surface maintenance. Along this line of endeavor, L. L. Newman, vice-president and chief engineer Birmingham (Ala.) Railway, Light & Power Company, has experimented with a variety of types of construction and thus obtained valuable information as to the merits and weaknesses likely to be found.

The most satisfactory service in Birmingham has probably been obtained with a rigid concrete substructure and a vitrified brick paving, wherein the paving between rails is so crowned that the bricks adjacent

to the rails fit in underneath the heads of the T-rails, avoiding the use of any nose blocks. This construction is shown in an accompanying drawing. The substructure is made with 1-3-6 concrete which is carried from a distance of 6 in. below the wood ties up over the base of the rails to the paving level, less 1 in. A form board of the proper contour is used to smooth off the concrete between the rails and to provide the proper foundation contour for the brick surface. The bricks are laid on a 1-in. cushion of sand and the space between bricks and that along the rails is grouted in. The level of the paving is brought up even with the rail heads on the outside.

It has been found that this manner of paving to form



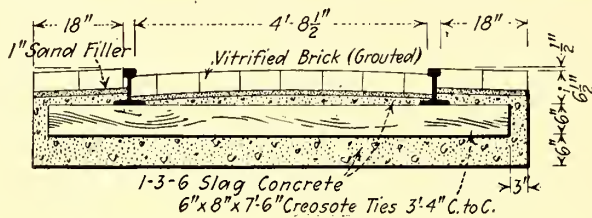
TYPES OF TRACK CONSTRUCTION USED IN BIRMINGHAM

- No. 1—One row of bricks adjacent to each rail is laid crosswise while those between are laid longitudinally.
- No. 2—All bricks between rails are here laid longitudinally. The rows can be carried around the curves in the same manner without complication.
- No. 3—Earlier concrete paving showing deterioration at the formed flangeway and at the expansion joints; also note the

- groove worn in at the joint between company and city paving.
- No. 4—Concrete crowned underneath the rail head. Some deflections in the flangeway can be seen and also the noticeable joint between city and company paving.
- No. 5—Monolithic construction without expansion joints and poured only between the outside rails, leaving the 18-in. outside for simultaneous pouring with city paving to avoid bad joints.

the flangeways has resulted in a much slower deterioration of the brick adjacent to the rails than was experienced with special nose blocks (other than Belgian blocks which are considered too expensive in this locality) which chip off badly. It will be noted that the substructure of this track is a monolithic slab of concrete, poured complete in one operation.

Two or three plans of laying the bricks in the above construction have been tried. The majority were laid with the length of the bricks across the track and staggered in the usual manner. On another stretch the row of bricks adjacent to the rails was laid crosswise of



SECTION THROUGH CONCRETE TRACK WITH BRICK SURFACE WHICH HAS GIVEN EXCELLENT SERVICE IN BIRMINGHAM

the track, while the bricks between were laid longitudinally. On still another stretch, all of the bricks were laid longitudinally between rails. The latter two plans have the advantage that the bricks can be laid much faster and with much less labor, since they do not have to be broken except at the starting point. The pavers can continue the brick right along on straight-away and on curves without any fitting. It was thought that with the bricks laid longitudinally, that is, parallel with the directions of travel, grooves would be likely to develop between rows, but this has not occurred after two years' use. These latter two schemes of laying the bricks are shown in two accompanying photographs.

EXPERIENCE WITH CONCRETE PAVING

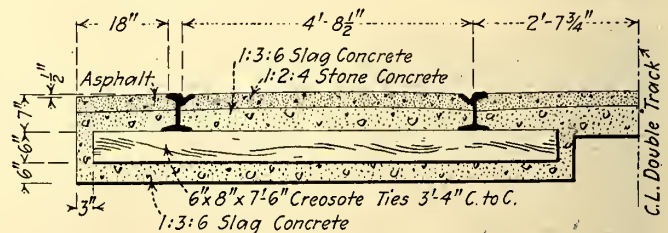
A number of different construction plans have been followed in Birmingham looking toward the development of a concrete substructure and paving which would give a satisfactory service, but while considerable improvement has been realized, a structure has not yet been produced which has overcome the tendency to crack. In the later construction work of this type of track and paving construction, the substructure concrete and the paving slab have been poured practically at the same time as a means of securing a monolithic construction. This avoids the seam between layers where the paving slab is poured separately after the substructure has hardened. The two-slab construction has shown a greater tendency to crack and it seems to be more noisy. The monolithic construction, on the other hand, tends to expand and contract as a unit, and there seems to be less likelihood of trouble from the seasonal temperature changes.

This monolithic type of construction, which is illustrated in an accompanying drawing, is poured in the following manner: The excavation is made to a depth of 6 in. below the ties, which for a 7-in. rail means a depth of 19 in. The ties are then laid and the rails spiked to them to gage. The structure is then brought to grade and alignment by using double wedges made from 4-in. x 6-in. rectangular blocks sawed in two diagonally. These wedges are 18 in. long and are placed directly on the ground if this is hard, otherwise on boards. The concrete mixer is then put onto this track

and arranged to pour behind itself. It is first moved forward a distance of from 50 to 100 ft. and a course of 1-3-6 mix poured up to well over the base of the rail. The mixer is then moved back and the 1-2-4 paving mix poured up to the surface level. This makes the pouring of the two courses not over an hour apart, so that the entire structure sets as a monolith. Where the pouring is stopped at the end of a day, the concrete is permitted to run off in a natural taper. The next day the new mix is poured in over the taper, forming a kind of beveled joint, the presence of which cannot be detected in the finished work.

When girder groove rail is used the level of the paving slab is brought up even with the rail top on both sides. With T-rail, however, the paving surface is crowned down to below the rail head, rather than to form a flangeway in the concrete adjacent to the rails. Formed flangeways were used on some of the earlier concrete paving, but it was found that it chipped off very badly and gave an unsightly appearance after being subjected to traffic for a time.

The crowning of the concrete between rails down to below the head has not been altogether satisfactory, either, though an improvement. Under the punishment of truck and wagon wheels, the concrete along the flangeway has been found to break down to a certain extent, probably due to imperfections in getting the mix thoroughly tamped in under the head of the rail and against the web. This breaking down can be seen in an accompanying photograph which also shows another objectionable feature of concrete paving which has been eliminated in the most recent construction of the Birmingham company, namely, the seam or joint between the paving built by the railway company and that built by the city. In this latest construction, which is also illustrated herewith, the street railway company poured its paving slab only in the area between the outside rails of the two tracks. Paving of the 18-in. strip which the company is compelled to install outside of the rails was deferred until such time as it could be poured simultaneously with the city's paving, thus eliminating the joint. The picture shows the company's paving prior to the installation of the city's portion outside the



SECTION THROUGH MONOLITHIC SUBSTRUCTURE AND PAVING

rails. The street was left in this condition for about a year, and while the outer rail had no lateral support on one side, the concrete inside the rail did not seem to be deteriorated under traffic, as a result.

The city has always forced the company, previous to the time of this last construction, to build its 18 in. of pavement outside the rails in advance of the city's work. This has invariably resulted in the wearing of a bad groove at the joint, and so the city's engineers have finally been prevailed upon to permit the pouring of the entire area outside the rails at one time, thus avoiding the joint altogether.

On the first installations of concrete track and paving construction, where there was a seam between the sub-structure and paving slabs, an expansion joint was put in every 16 ft. Despite this precaution, cross cracks developed and the expansion joints wore low and made unpleasant, regularly spaced bumps in the paving. On subsequent pieces of construction the expansion joints were put in 33 ft. apart, then 50 ft., then 100 ft., and finally eliminated altogether. On some of the monolithic types of construction built without any expansion joints, and which have now been down for two years and over, no defects have developed which could be attributed to their absence. About two miles of this type of construction is in use.

The cross cracks continue to make their appearance after the track has been in use a comparatively short time, despite all efforts to overcome this defect. They often develop into bad holes under heavy traffic and require patching. Regardless of the distance between expansion joints, in the earlier constructions, one or two cracks would develop between joints in almost every section. In the latest type with the expansion joints eliminated, the cracks have also developed, in some places, with a noticeable regularity. However, these cracks are often very small and do not wear to any extent for long periods of service, so that the maintenance expense is fairly low and the life of the paving quite long.

## Repairs to Car Seats and Curtains

A Summary of the Work Being Done and the Apparatus Used by Several Electric Railways in the Maintenance of These Simple but Important Furnishings



THE CURTAIN REPAIR DEPARTMENT IS A BUSY PLACE

**S**PEED, safety and comfort are looked upon as the three chief fundamentals in electric railway transportation and the repair of seats and curtains forms a considerable part of the work necessary to keep cars in attractive and comfortable condition for the traveling public. The following summary of the maintenance practice of several electric railways has been arranged in order to give those interested as much information as possible regarding their several practices in this work.

The practice followed by the Detroit United Railway in connection with the maintenance of cane or rattan-covered seats is to shellac and varnish with two coats all new seats before placing them in service. The shellac is put on with a brush while the varnish is sprayed on. After the cane becomes dirty from use the seats are scrubbed with soap and water and then cleaned or bleached with a solution of oxalic acid which removes the varnish and dirt with it.

This solution of oxalic acid is made by dissolving 1 lb. of crystals in 5 gal. of water. Both are placed in a 5-gal. crock and boiled by means of an electric heater dropped into the crock, until all crystals have gone into solution. After the solution has been painted

on a seat and allowed to remain for about one-half hour the rattan is wiped dry with rags and the seat is painted with a coat of straw-colored cane enamel.

About once a year thereafter the cushions are washed with linseed-oil soap and water and if the enamel is in bad shape the cushions are painted with a new coat of enamel. Before the re-enameling, any small holes are repaired by weaving in new cane. In washing the seats, a stiff hair brush is used.

### PLUSH SEAT RENEWAL

Plush-covered seats used by the Detroit United Railway in interurban service are cleaned with vacuum cleaners frequently by the regular car cleaners. About once a year, when the car is shopped for painting, the seats are renewed, if not in bad shape, simply by cleaning with gasoline. If the plush is faded, use is made of the Wilson Paint Company's cleaning and renovating preparations. One of these preparations draws the color slightly and the other fixes it. These solutions can be used, of course, only on solid-colored seats. If the plush is worn, new sections are put on if the seats are sectionalized, otherwise a whole new cover is necessary. This is done by hand work and three upholsterers are

able to do all of the rattan and plush seat repair work for the entire system. The painting and cleaning of the rattan seats requires practically the entire time of two painters.

Hugh Savage, general foreman of the Detroit United Railway shops, states that the renewal or reclamation of the pantasote curtains used entirely by the company has been very unsatisfactory. He has had them washed with soap and water and cleaned with gasoline, and has tried various other methods but has found none of them of much avail in renewing the faded fabric. Water and dust stains can be washed out, but if the colors have run or the curtain is faded, practically nothing can be done. Some curtains were sent to a Detroit shade-cleaning company as an experiment, but the curtains came back stiff and not clean, and the job was considered generally unsatisfactory. The practice of washing the curtains with soap and water about once a year is now followed. As they become faded they are taken off and the rolls and ends are changed. By this means a life of seven or eight years is secured.

A hand press which makes the work of putting on new rattan covers on car seats a much easier task and a better job, has been devised by William H. Sanders, employed in the carpenter shop of the Newport News & Hampton Railway Company. This press consists of a 24-in. x 40-in. frame into which the rattan and then the seat cushion are placed, and above which are two yokes providing a clearance of about 12 in. Five  $\frac{3}{4}$ -in. jackscrews, two at the front side of the frame, two on the top and one at the end, are then screwed down against 4-in. x 4-in. timbers placed on the top, end and side of the cushion which lies in the frame, bottom side up. As these three screws are tightened, the rattan is pulled tight and finally is tacked over the bottom of the cushion frame. With the help of this hand press a seat can be covered easily by one man in forty-five minutes or less, it is done without injuring the hands and the rattan is evenly and securely fastened.

In the two accompanying photographs the seat cushion is wrongly shown with the cane side up. In actually using the press, the cushion is put in bottom side up and forced down against the rattan sheet.

#### CHICAGO ELEVATED AND NORTH SHORE LINE PRACTICES

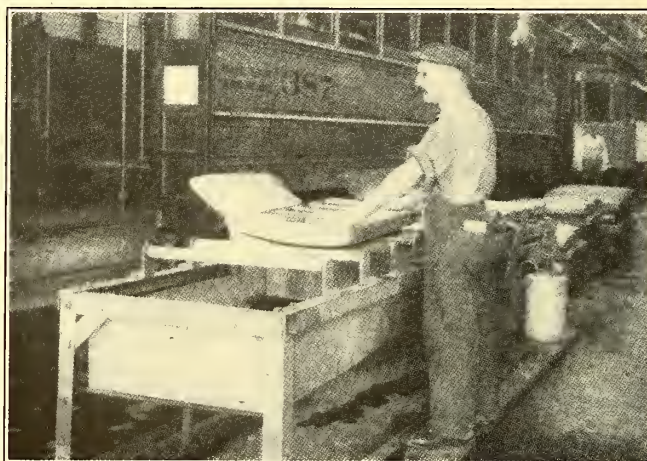
In cleaning and reclaiming rattan-covered seats the Chicago Elevated Railways are making use of one of the Wilson Paint Company's rotary brush scrubbing machines and the bleacher or varnish remover solution which that company supplies for this purpose. Water and a small amount of the bleaching liquid are forced through the brush from the inside of the cylinder. This process has proved very effective in removing the dirt. If the cane is blackened, a coat of Wilson cane enamel or varnish is painted over the cushion. This process brings out the natural cane color and makes a very satisfactory job.

The above practice is used only when the cars are shopped for painting, the ordinary cleaning being done simply with soap and water.

For cleaning the plush seats used mostly on the Chicago, North Shore & Milwaukee Railroad, just soap and water and a drying process have been used thus far. In speaking of this, H. A. Johnson, superintendent of equipment, said that it would probably be necessary soon to make use of a good dye to restore the color on some of the most faded cushions.

Like the Detroit United Railway, the Chicago Elevated lines and North Shore line have not found any satisfactory means of reclaiming the fabric on one side of the pantasote curtains. For this reason all curtains purchased during the last year or two have been specified to have the pantasote on both sides.

At the South Side shops of the Chicago Surface lines, whenever a car is shopped for a complete overhauling, the seats are put through a cleaning and renewal process. They are first taken to a cleaning tank and there thoroughly scrubbed by hand with a special bristle scrub brush, making use of a soap-and-water solution to which has been added a preparation of much the same character as "Gold Dust" or "Dutch Cleanser." This scrubbing is continued until all dirt is removed, no bleacher being used. The cushions are then rinsed off, dried and given a coat of varnish. No enamel is



SEAT SCRUBBING MACHINE

used on the seats at all. When they are new, they are given two coats of half body and half finish varnish.

In connection with car curtain maintenance, the experience of the Chicago Surface lines has been much like that of the Detroit United Railway. Nothing has been found which is effective in brightening the fabric on pantasote curtains when it becomes faded. The Chicago company cleans the curtains by thoroughly washing them with a brush and soap and water, and the pantasote side is coated with pantasote glaze which renews its finish. After four or five years' service, the curtain is reversed on the roller, bringing the unfaded top into the exposed lower position and thus improving the appearance.

#### NO VARNISH OR ENAMEL USED

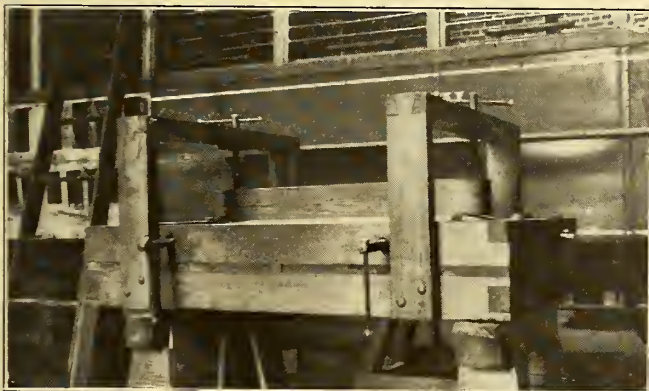
The practice followed at the West Side shops of the Chicago Surface lines is simple and yet the results obtained seem to be very effective. The seat cushions and backs are merely washed with a rather strong solution of laundry soap and water, making use of a rather stiff brush and sponging the soap off and rinsing the cushions thoroughly, though drying promptly so that the canvas backing does not get wet. No oxalic acid or other bleaching fluid is made use of. One point in which the seat maintenance practice of these shops differs from that of most roads is that a great majority of the seats have never been varnished or enameled at all, not even when the seats were first put into use, except for what little varnishing may have been put

on by the manufacturer. Dependence is placed simply on the natural luster of the cane. Some of the newer rattan which is coming through from the manufacturer recently seems to be drier, softer and whiter than the rattan received on seats heretofore. On this a coat of rattan varnish is sometimes put to protect the surface, but after this first coat no further varnishing is done after the periodical cleaning process.

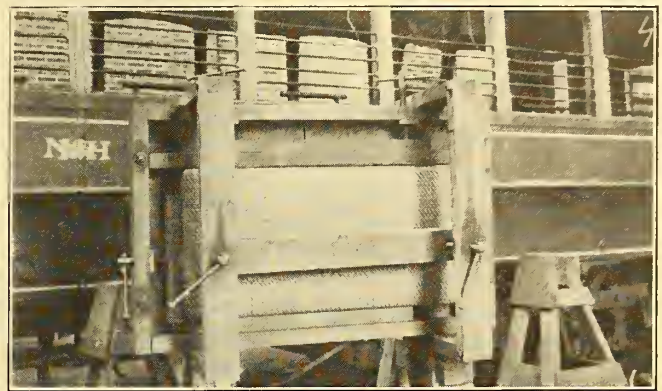
In cleaning the curtains, use is made of soap and water only, on both sides. Sometimes a little neatsfoot oil is used on the pantasote side to remove any stain and soften the material. No satisfactory process of brightening the fabric after it has become faded has been found.

In Brooklyn the work necessary for keeping seats and curtains in repair is centralized at two of the principal shops. All curtain repairs are taken care of in the curtain department of the 39th Street repair

shop. leather articles which are used on the railway system, such as money bags, mail bags, hand bags, fire extinguisher straps, hand straps, canvas aprons for snow sweepers and the like. The work of manufacture and repair of curtains done in this department has been so successful that the company no longer buys complete curtains except where they form an integral part of a bid for new cars. In addition to the repairs necessary to the damaged parts of the curtains a systematic cleaning and painting is also carried on. Previously it was the custom to use two coats of paint to secure a glossy finish but it has been found possible now to obtain the same result with one coat by adding a thin solution of Japan drier. The freshly painted curtains are hung on rollers and are permitted to dry for ten hours. An important feature in connection with this curtain department is the scrap collecting and handling. All inspection and maintenance shops are required to



RATTAN SEAT COVER PRESS, SHOWING THE FIVE JACK SCREWS



RATTAN COVER STRETCHED TIGHTLY OVER THE SEAT IN THE PRESS

shop and seat maintenance is done at the Eastern Division elevated shop. Modifications and improvements have been made in the older type of seats to overcome minor difficulties and troubles in operation. A particular source of trouble was that nails would gradually work their way up and eventually penetrate the rattan and project so as to tear the clothing of passengers. Another source of annoyance was the breakage of the steel springs. To overcome these difficulties strips are riveted to the spiral springs and are carried only to within one-half inch to one inch of the side frame. The edges of these strips are bent back by a special machine so that there is no possibility of the sharp edges cutting through the seating. A strip of canvas is riveted over each spring steel strip and this canvas is glued to the framework and carried around and nailed to the bottom of each side piece. The locating of the nails in the bottom of the framework prevents their working out and doing damage. When the seat is ready for its covering of rattan it is placed in a press with a bed of proper size. One end and one side of this bed frame are adjustable and are operated by means of a pair of screws. The seat covered with loose rattan is placed upside down in the bed and the screws are applied while the seat springs are compressed from above by hinged levers, which press against a cross-bar placed over the seat slats. The entire seat is thus placed under compression which permits the rattan to be properly tightened for nailing.

The curtain department not only takes care of the repairs to car curtains but also makes other canvas and

send all discarded curtain material or damaged curtains, no matter what their condition may be, to this shop. In this way it is possible to reclaim many springs, rollers, screws, pieces of curtain cloth, etc.

The Auburn & Syracuse Electric Railroad cleans its curtains thoroughly and washes all water stains out with soap and water. The curtains are then drawn through a vat containing  $12\frac{1}{2}$  lb. of paint of any color desired in oil,  $\frac{3}{4}$  gal. of turpentine, 1 pint of Japan drier, 1 lb. drop black in oil and  $\frac{3}{4}$  gal. of raw linseed oil. After the curtains are thoroughly saturated they are allowed to drain for about two minutes and are then laid over a bench and brushed thoroughly while the fabric is still wet. This operation raises the nap of the cloth and prevents the linseed oil from leaving the cloth stiff. After brushing, the curtain is hung up with the roller end down for stretching and is allowed to dry for twenty-four hours. The cost of this process is about 18 cents per curtain. Curtains made up of leather on one side and fabric on the other are not dipped, but the paint is brushed into the fabric while it is laid flat on a bench.

In the shops of the Beaver Valley Traction Company, New Brighton, Pa., the following formula is used as a mixture for cleaning the seats in the shop. Aqua ammonia, 2 oz.; soft water, 1 quart; saltpeter, 1 large teaspoonful; Ivory soap, shaved, 1 oz. The soap is thoroughly dissolved in hot water and then the saltpeter and ammonia are mixed in. This is applied with the ordinary scrubbing brush, after which the seats are scrubbed with clear water.

# Arc Welding in Car Equipment Maintenance

**Building Up of Worn Armature Shafts, Welding of Broken Motor Shells, Filling in of Flat Spots on Wheels and Welding of Large Variety of Broken Steel Castings Used on Cars Have Produced Far-Reaching Economies**

**T**HE growing possibilities of electric welding processes in connection with the maintenance of rolling stock and other railway equipment have been a source of amazement to every electric railway man who has come into contact with the practice. This began with the repair of broken members of the various parts of electric car equipment and has led to its use in a still larger field, which includes the building up of worn surfaces of steel parts which previously would have been headed for the scrap heap. The accompanying illustrations show some parts of electric car equipment which have been reclaimed by electric welding in the shops of several electric railways. This work was begun at a time when it was very difficult to obtain railway equipment parts and it has resulted in large savings and has enabled the equipment to be returned to service so quickly, that the work is being extended and used for defective-part repair which previously would not have been considered.

The United Traction Company, Albany, N. Y., constructed a special concrete building for its electrical repair work a year ago. A separate room was built at one end of this building and arranged particularly for



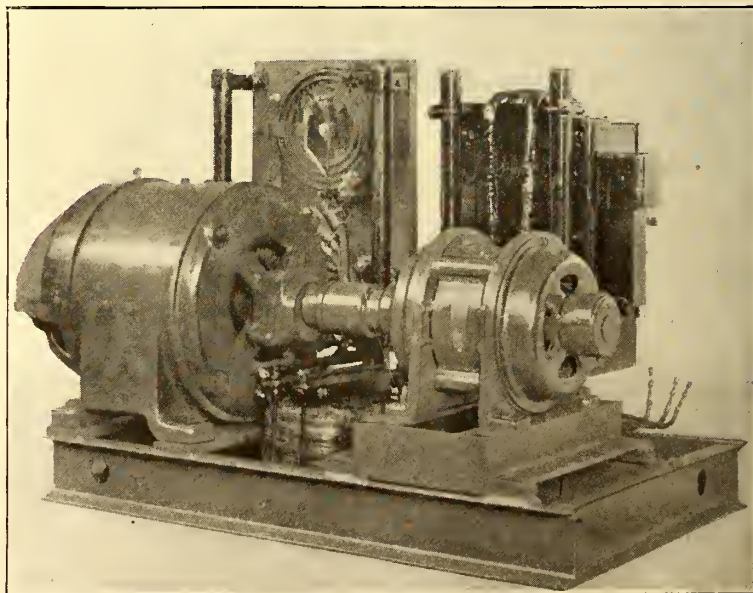
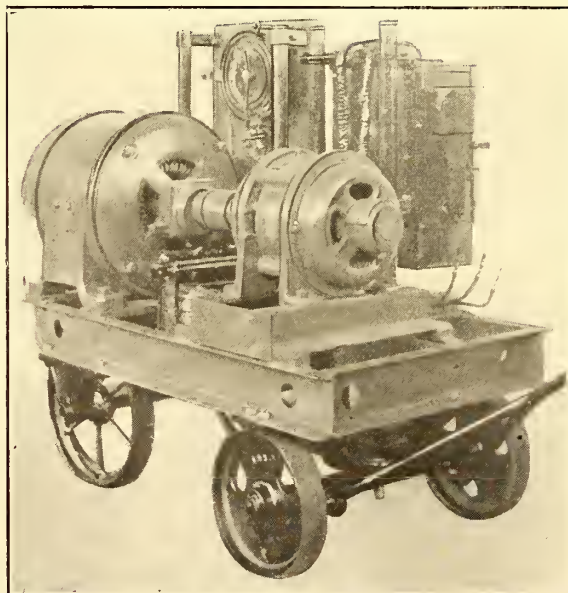
WELDING SPLIT GEAR INTO SOLID ONE

electric welding, and all important details were incorporated in the design to fit this room for the purpose to which it was to be put. The building is a concrete structure throughout and the floor of the welding room is also of concrete. In dimensions this room is about 10 ft. x 30 ft. and it is entirely inclosed and separated from the rest of the building.

As a safety precaution no one is allowed to enter the welding room while work is in progress. Two observation windows are provided on either side of the entrance door, in which colored glass has been installed as a protection to the eyes of the observer. Any one having business in the welding room can see when welding work is being done and thus avoid the danger of any harmful effect

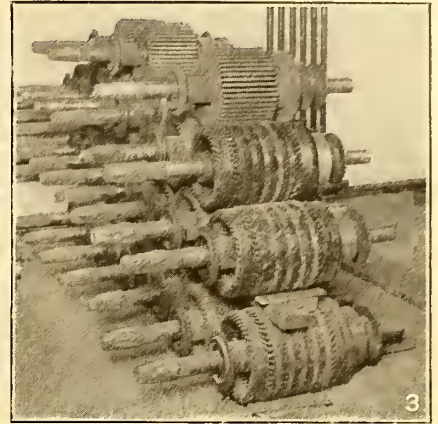
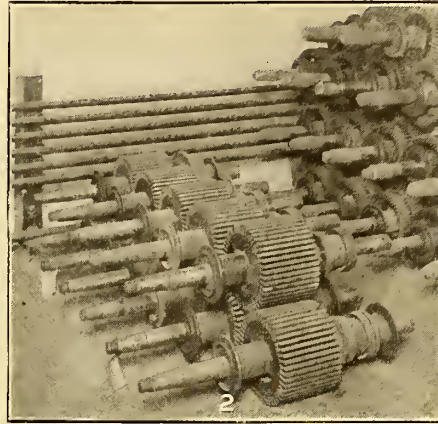
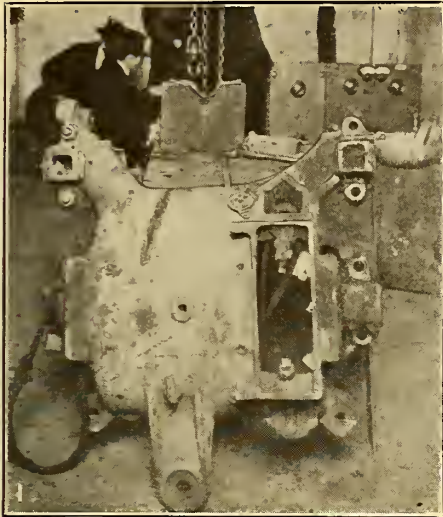
from the light of the arc.

The equipment at present in use in the welding room consists of a General Electric motor-generator set and an oxyacetylene welding outfit, a welding table, convenient holders, masks and other welding equipment, and a chain hoist which travels on an I-beam the length of the room and also outside the entrance to pick up heavy work and facilitate the handling of heavy parts. Since the instal-



AT LEFT, PORTABLE WELDING OUTFIT FOR ELECTRIC WELDING. AT RIGHT, GENERATOR DIRECT CONNECTED TO MOTOR WITH CONTROL HANDLE AND STARTER





NO. 1—BROKEN CAST-IRON MOTOR SHELL RECLAIMED BY WELDING.  
NOS. 2 AND 3—WORN ARMATURE SHAFTS BEFORE AND AFTER WELDING

lation of this equipment the General Electric Company has developed a self regulating welding generator which constitutes a part of its single-operator metallic electric arc welding equipment. This can be either stationary or portable and as it is self-contained it makes a very desirable combination. The generator has a two-pole armature, in a four-pole frame, with commutating poles, and generates sixty volts, open circuit. Bucking the shunt field is a series field, with taps brought out for different welding currents. As current flows from the main brushes through the series field windings it reduces the generator voltage to the proper welding value. Accompanying illustrations show some of the different types of welding equipment.

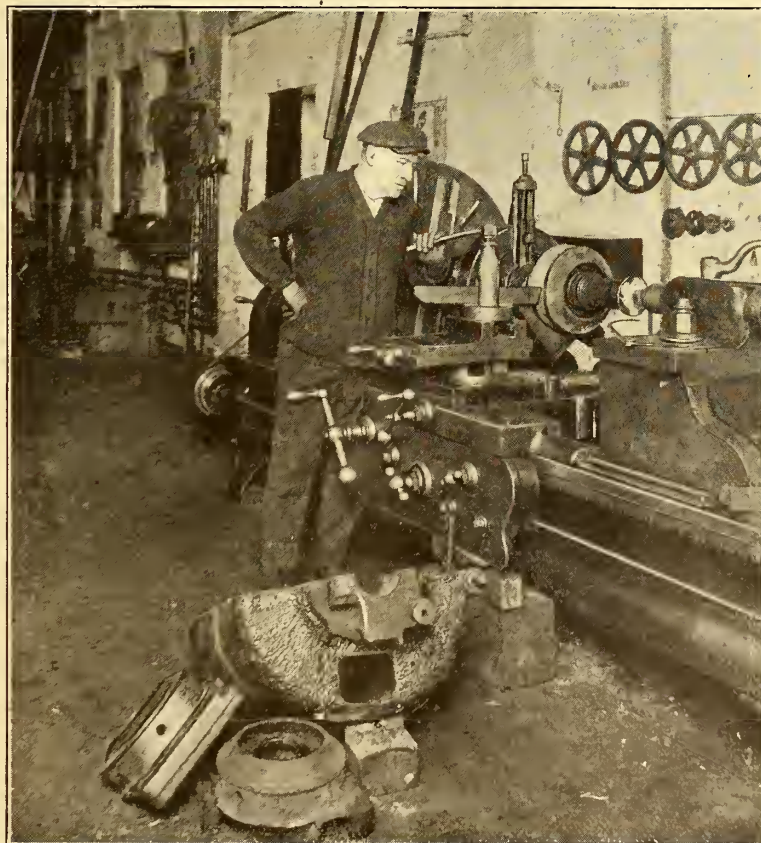
One of the most important operations and one which shows far reaching economies in the work undertaken by the United Traction Company is the building up of worn armature shafts. Accompanying illustrations show a number of these armature shafts before and after welding. The pinion ends of the shafts were "chewed up" due to the wear of the keyways for the pinions. The defective ends of the shafts which were to be repaired were carefully cleaned of all oil and dirt and sufficient metal was welded on so that the shafts could be remachined and rethreaded. A large number of these armatures were all right except for the damage to the keyways, so that they were returned to service as soon as the shafts were remachined and fitted. Others had damaged

coils or grounded insulation and where it was necessary to rewind an armature this was stripped before the welding operations took place. For welding operations of this character where a large amount of work is to be done which is similar in character the General Electric Company has developed an automatic welding outfit. This was described in the *ELECTRIC RAILWAY JOURNAL* for Feb. 21. Its chief advantage lies in the increase in speed which is possible and the uniformity of welds which results. In the work done at Albany the building up and remachining of the shafts cost from \$3 to \$4 each, which was only about one-tenth of the cost of a new shaft. As local conditions as to labor costs as well as the cost of energy vary to quite an extent detailed costs for the various operations are not included, but on roads which are performing this work and which have actual data

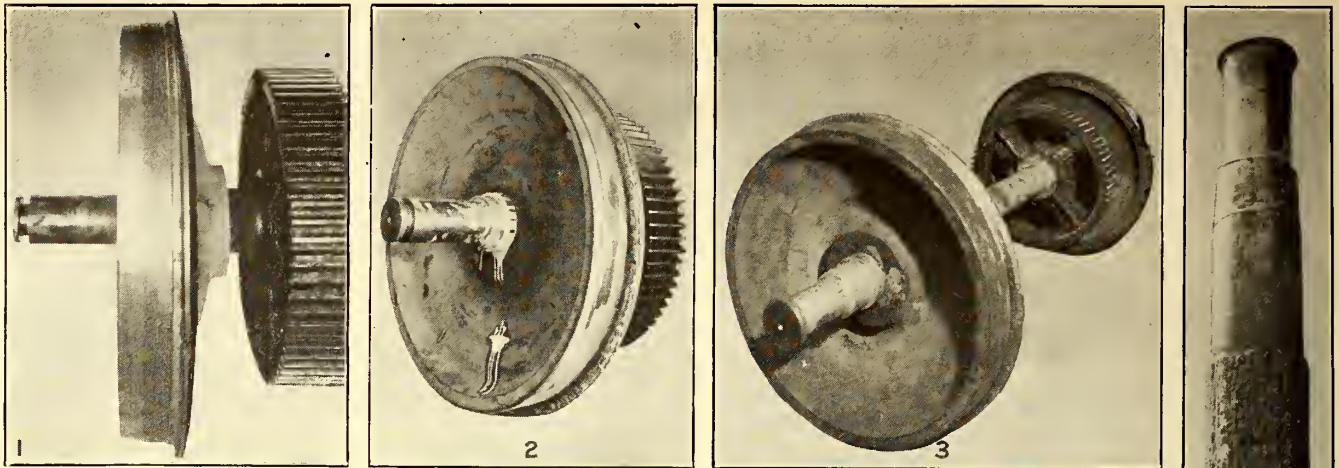
regarding the purchase cost of the various parts, the savings which result offer convincing proof of the economies which can be effected with the use of electric arc welding in this reconstruction period through which we are now passing.

Another illustration shows a pile of motor cases in the yards of the United Traction Company. Before the advent of the welding equipment many of these motor shells were intended for scrap due to various breakages and excessively worn parts. By the use of the welding equipment a large proportion of these have already been reclaimed.

The method employed in welding broken lugs or broken ends of motor shells



BROKEN CAST-IRON MOTOR SHELL AND AXLE HOUSINGS REPAIRED BY ELECTRIC WELDING (CASE BROKEN IN TWELVE PIECES)

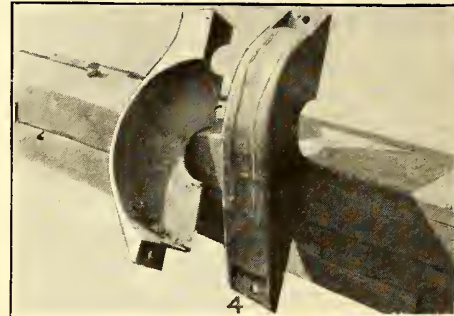


No. 1—Wheel turned down ready for welding. Note thinness of flange.  
 No. 2—Flange built up ready to be shaped in wheel lathe.  
 No. 3—Finished wheel ready for service.  
 No. 4—Gear cases with patches welded on.  
 No. 5—Axle enlarged by welding for use with solid gears.

consists first in fitting the broken parts together and lining them up in their correct position. The pieces are then welded at a few points so as to hold the broken parts in position and, where necessary, the fracture is cut out "V" shape to provide additional space for the welding metal. Much of the success which has been obtained in his class of work at Albany is attributed to the use of studs for interlocking the metal which is added to the broken parts. Holes for the  $\frac{5}{8}$ -in. studs are drilled and tapped at several points adjacent to the break and the studs are so inserted as to extend above the motor shell to about the same height as the thickness of the studs to which additional metal is to be added. The deposited metal is then allowed to bridge over these studs in welding and so obtains additional support which helps to strengthen the weld. In the illustration showing repairs made to a broken gear-case suspension arm, one of these studs can be seen projecting from the casting.

As an example of what can be accomplished, in repairing broken shells, the illustration showing a welded end of a motor shell alongside a lathe is an extreme case. This motor shell was broken in twelve pieces and from the illustration it will be seen that nearly the entire end was welded.

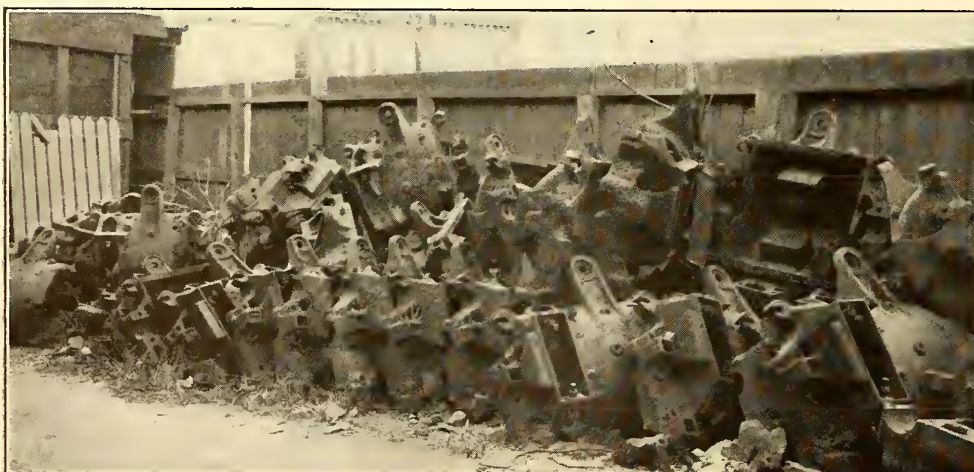
Another record job made in the shop of the United Traction Company was the welding of a truck bolster.



The car, under which was a truck with a broken bolster, was brought to the shop and placed on a track adjacent to the welding room. The car body was jacked up and the bolster was repaired in approximately eight hours. The work was started at 9 o'clock after the morning rush hour and the car was ready for service again at 5:15 p.m.

In addition to the class of work illustrated as being done by the United Traction Company other interesting work is reported from various electric railways showing what has been accomplished. The Spokane & Inland Empire Railroad has done some work in reclaiming wheels with sharp flanges. Three views are given to illustrate the methods used. The first of these shows a wheel with the flange turned down ready to receive new metal. The second shows the flange with a new layer of welded metal. The third shows the finished wheel after it has been shaped up. After the new metal has been added the flange is merely shaped up with a forming tool. It is left quite rough in some

cases, but as the practice has always been to put on new brake shoes when the wheels are repaired, the company has had no difficulty in wearing down the tread to a smooth contour. A number of steam railways are at present reclaiming all of their cold rolled steel wheels which are slid flat or have flaked-out places, as well as those with sharp flanges. This operation creates quite a saving in itself as often the car is merely placed over the drop pit and the work can then be taken care of with the car



MOTOR SHELLS WHICH WERE RECLAIMED BY WELDING

fully equipped. By this method the car is withheld from service but a short period. In the welding of sharp flanges it is not contended by those who have had extended experience that the metal deposited will give the life of the parent material, but they agree that savings are created as a result of maintaining the car in service until such time as it is necessary to shop it for major repairs.

Another example of reclaiming electric car equipment is shown in the repairs to gear cases. One of the illustrations shows a fair sample of the repairs that are frequently found necessary. In this case patches are made of No. 10 sheet iron. In welding these patches on, the operator first determines the size of the patch and outlines it with chalk on the old case. He then builds up a layer of metal just outside the chalk mark. The patch is then laid on and welded to a layer of metal. In this way a tight and secure joint is made. As gear cases are frequently covered with oil when they are brought in for repairs, they should be cleaned off as much as possible. In making a patch that requires a bend, as in the case illustrated, the operator first welds the patch to the bottom of the case, then heats the patch with his tool and bends it into shape.

#### SPLIT GEARS MADE SOLID

Some electric railways which have split gears have found it advisable to change these to solid gears by welding and then to press them on the axles. Accompanying illustrations show a gear which is being welded in this manner and also an axle which has been built up so as to increase the gear seat. The method employed in welding the gears consists, first, of cutting a "V" along the joint of the gear down to the bolts with a carbon electrode. The operator then builds up with new metal and welds each bolt. In order to increase the size of the gear seats on the axle, the operator welds a layer of new metal about 8 in. in length and fills up the old keyways. This seat is then remachined and a new keyway is cut. Broken teeth in gears have also been repaired by welding.

Another use of welding which has been of benefit to electric railways is in the maintenance of housings for the bearings of railway motors. Constant vibration and heavy jarring causes the fit in the motor frame to become badly worn and many railways have used shims to take up this wear. A small layer of metal deposited by the electric arc and then machined to the desired dimensions provides a more serviceable job than that of the shims, and when a tight fit is once secured, the wear is eliminated.

The filling in of bolt holes in various parts of the car equipment is another use which is showing far-reaching results. Heavy duty and constant vibration cause the holes to become worn, and the bolts then readily become loose and often fall out. The filling in of these holes and their redrilling takes very little time and the cost is extremely low.

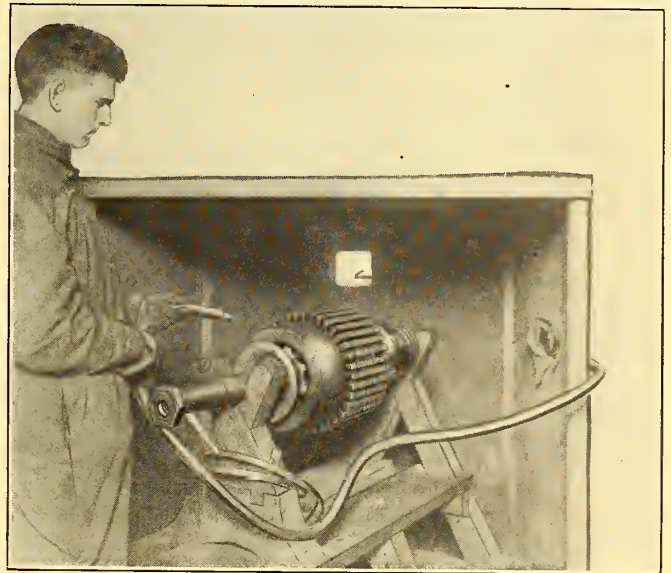
Some other welding operations which have been carried out with success are these: side bearings which have become badly worn have been built up, brakeshoe heads and hangers have been welded and truck side frames have been repaired in numerous cases. A large number of uses for electric welding are constantly presenting themselves to all railways. Enough instances have been cited to demonstrate the fact that the art of welding has greatly increased the resources available for lengthening the life of equipment.

## This Makes Armature Cleaning a More Pleasant Job

**A Home-Made Air Ejector Serves Admirably to Remove Dust-Laden Air from the Armature Cleaning Hood**

THE Connecticut Company has in its Grand Avenue, New Haven, repair shops a simple and ingenious arrangement for carrying off the dust filled air around an armature which is being cleaned by compressed air. Similar devices were described in the *ELECTRIC RAILWAY JOURNAL* for March 15, 1913, page 485, and July 20, 1918, page 120. Everyone knows the discomfort of having to breathe this dirty air and of being covered with a layer of armature cleanings. Also, the whole shop after a while gets a deposit of this sticky and annoying dirt.

The arrangement referred to, and shown in the accompanying illustration, consists of a canvas-covered cubical compartment, open on one side and contracting



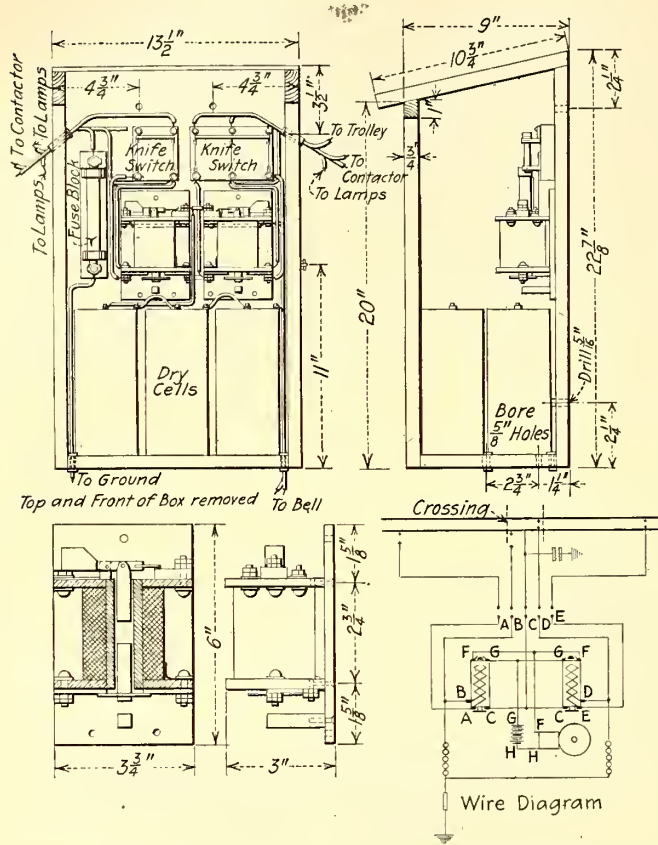
CHAMBER FOR CLEANING ARMATURES BY COMPRESSED AIR

on the opposite side to a sort of flue or horizontal pipe which leads out doors through a wall or window. Whenever compressed air is turned into the hose and nozzle used by the operator to blow out the armature, compressed air is also turned into a branch pipe which is in the center of the flue and thus causes a draft through the flue. This draft can draw only from the compartment and so carries away the dust filled air.

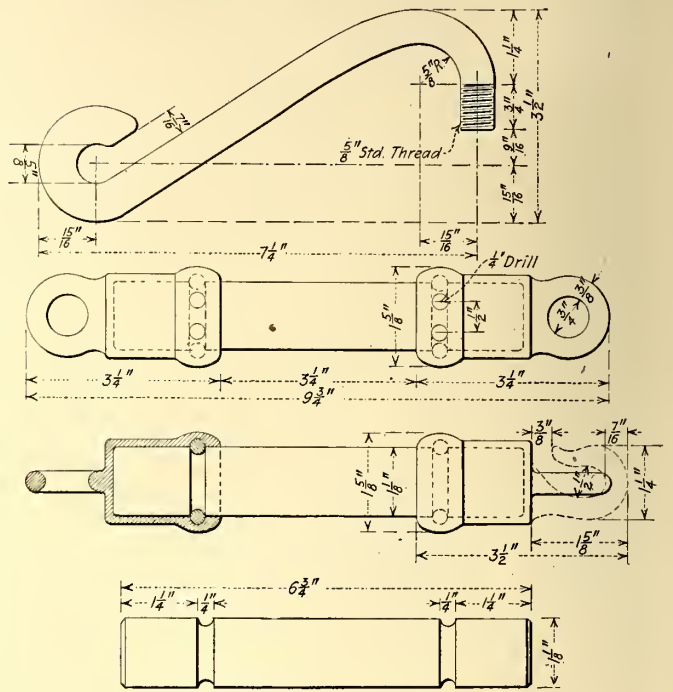
This "ejector" for creating a draft out of the hood is used here in place of a fan on account of its simplicity. While for continuous service an electrically-driven blower would undoubtedly be more efficient, this scheme serves well here, because the apparatus is used only intermittently. It is another illustration of the utility of compressed air in and about the shop.

The construction is simple and inexpensive. The compartment is about five feet cube — merely a wooden frame covered with canvas. The flue is about ten inches square and eight or ten feet long. Armatures are wheeled into the open side of the cube on the usual wheeled horse or rack and cleaned in the usual manner by air blast. This particular installation has been in satisfactory use for several years.

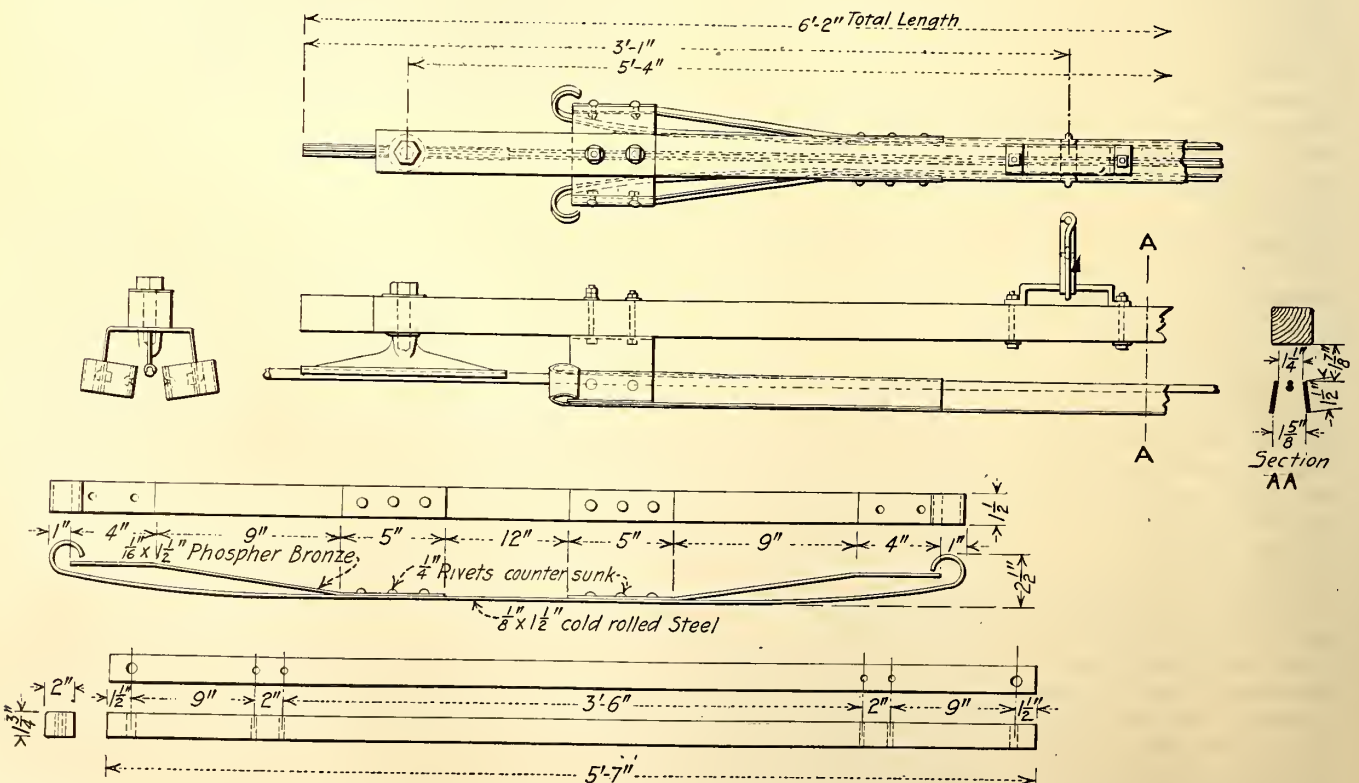
### Detail Drawings Illustrating Signal Maintenance and Overhead Kinks



CONSTRUCTION DETAILS OF DOUBLE TRACK CROSSING SIGNAL RELAYS AND BOX

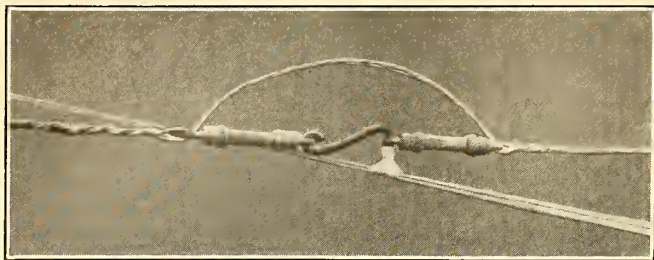


CONSTRUCTION DETAILS OF STRAIN INSULATOR AND NEW GOOSE-NECK



DETAILS OF CONSTRUCTION OF CROSSING SIGNAL CONTACTOR





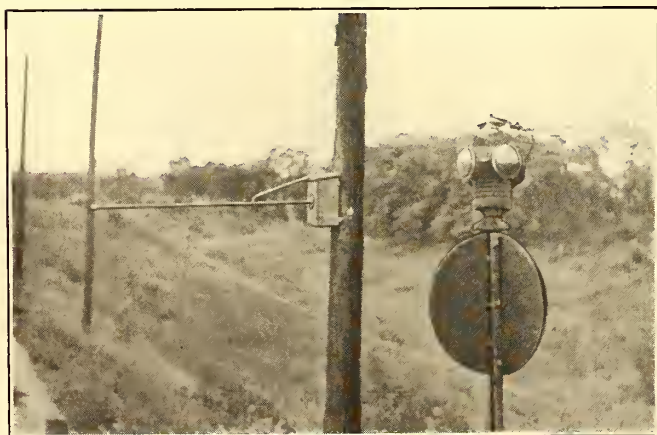
PULL-OFF GOOSE-NECK IN SERVICE

eye in the strain insulator is shown with the goose-neck threaded through it, so that the span wire can be hooked into the end of the insulator without the necessity of undoing the ends of the span wire. A photograph shows the new goose-neck with the two insulators attached to it and with the safety jumper over the top, so that in case either of the insulators is broken the span wire will not hang down from the trolley on the opposite track or from the pole. In the same way of substitution, one of these insulators with the hook on one end can be used as in the case previously described.

The advantage of the new goose-neck is that it will be necessary to carry in stock only the wood strain insulator with the eye in each end and the one with the eye in one end and the hook in the other. This will permit doing away with the insulator which has the eye in one end and the other end blank and tapped to allow the old goose-neck to be screwed into it as shown in the illustration.

An accompanying photograph shows an electrically-lighted switch lamp. A short distance away from the switch lamp is a box attached to a pole with a long arm reaching out from the pole toward the track. This arm is to enable the motorman to turn the switchlight on and off without leaving the cab of his car. The lamps are in series with other lamps on the pole, thus making up the necessary number for a series-burning circuit. At some of these switch locations, part of the extra lamps have been installed in the telephone booths at various places along the line where the motorman stops to get his orders from the dispatcher. Thus at night he is furnished with light to see that he makes proper notation of the dispatcher's orders.

In the box on the pole is a 3-amp. switch. The extension arm is ordinary  $\frac{1}{2}$ -in. pipe of the desired length, fastened to the box by a floor plate and with a bracket as an additional support. Inside the pipe is a rod connected to the button on the switch and with a handle on



OIL TYPE OF SWITCH LAMP WIRED FOR ELECTRICITY

the outer end with which to turn the switch on and off. There is no indicator to show the position of the switch as it is a simple matter, if the lamps do not light, to give the handle an additional turn. The lamp on the switch stand is one of the old pattern of oil switchstand lamps with the tank and burner removed and a wall socket attached to the inside of the cover. Thus the incandescent bulb hangs in a vertical position and by opening the cover of the lamp, the bulb is conveniently inspected.

## Electrification Considered in Chicago

At a joint meeting of the Chicago sections of the A.I.E.E. and A.S.M.E. and the electrical and mechanical sections of the Western Society of Engineers, held at the Western Railway Club on March 4, S. T. Dodd, General Electric Company, Schenectady, presented an illustrated talk giving "some comments on the present status of steam railroad electrification." In pointing out the extent to which trunk line electrification has advanced to date, Mr. Dodd stated that 1,239.59 miles of route and 2,706.45 miles of track in the United States are now electrified. There are 364 electric locomotives and 1,020 motor cars in use on these roads.

The theme of the paper was the tremendous saving in coal that could be realized through a complete electrification of the steam roads, this tending to show the economic necessity of early electrification. The speaker gave figures to show that practically 15 per cent of the total ton-miles of steam road operation is of a non-revenue character, a waste which could be eliminated through electrification. The immense consumption of coal by the railroads was emphasized by pointing out that 24 per cent of the total coal production of the United States and 5.8 per cent of the total oil marketed in the United States in 1918 were consumed by the steam locomotives. The total saving in coal which could be brought about through the elimination of the non-revenue ton-mileage under steam-road operation, and the more efficient burning of the coal in large generating plants as compared to the inefficient burning in steam locomotives, would be 122,500,000 tons per year.

## N. F. P. A. to Hold Public Hearing

THE electrical committee of the National Fire Protection Association, on which the American Electric Railway Association is represented by Martin Schreiber, will hold a public hearing and committee meeting in New York City on March 23 and 24, at which the revision of the rules regarding carhouse wiring will be considered. The standing committee on cars and railways, consisting of Mr. Schreiber, R. C. Bird and Ralph Sweetland, will recommend the revised rules for carhouse wiring, which were approved by the Engineering Association at the Atlantic City convention.

The committee will report that the subject of carhouse wiring was given consideration because Rule 41 of the "Code" had become out of date, but that it was the desire of the committee to preserve as far as possible the intent of the old N. E. C. rules, but to put them in a form that would meet the wishes of the various parties interested. As the new section 41 was printed by the Engineering Association and distributed in advance of the Atlantic City convention, it will not be necessary to reprint it here.

# Handling Wet Sand From a Hopper

The Writer Describes How the Daily Output of a Sand-Drying Plant Was Increased and the Cost of Operation Decreased

BY HOWARD H. GEORGE

Assistant Engineer, Public Service Railway of New Jersey,  
Newark, N. J.



PANORAMIC VIEW OF PUBLIC SERVICE SAND PLANT

**P**RACTICALLY every street railway company is obliged to provide dry sand for one purpose or another in the operation of its system. Where comparatively small quantities are required the problem is of course very simple, but as the total requirements increase, the ordinary equipment, which generally consists of a stove surrounded by a perforated cylinder within which the wet sand is placed, or some similar arrangement, fails to turn out dry sand in quantities sufficient to meet the demands. Recourse must then be had to the rotary type of dryer and the experience described in this article may prove of considerable interest to railway men who are facing the problem of increasing the efficiency of their plants and decreasing the operating costs.

All of the sand used on the Public Service Railway in this section is dried at a central plant located on a river front at our main material storage yard. The sand is received on scows and unloaded on the dock immediately adjoining, by means of a stationary stiff-leg derrick equipped with a grab bucket. The sand-drying house is located within easy reach of the swing of the boom of the derrick.

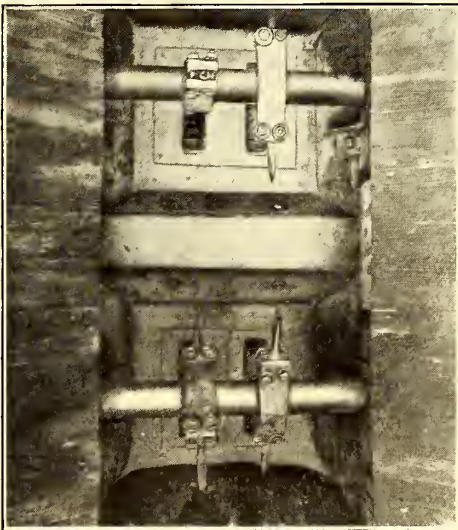
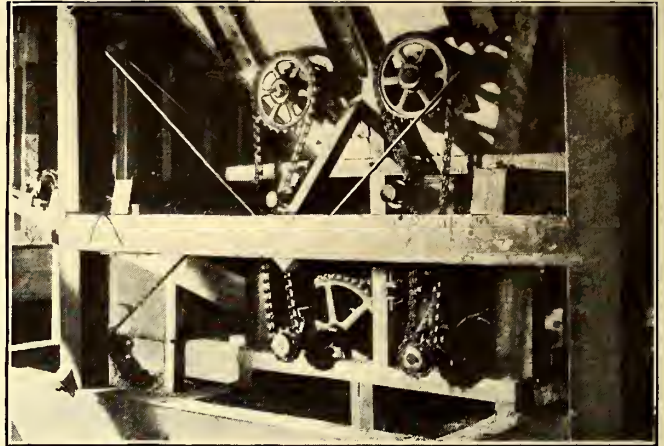
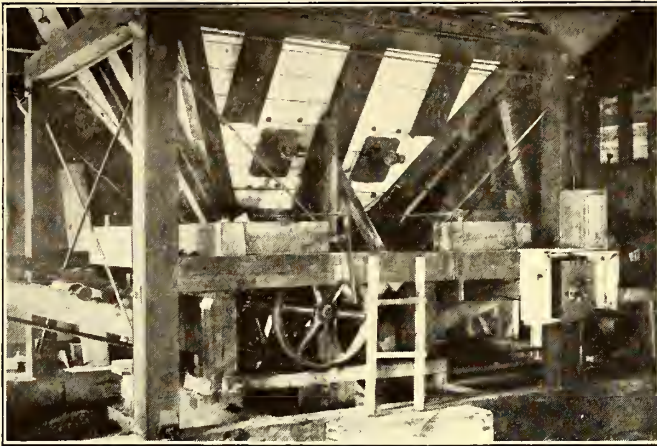
A few years ago the writer was assigned the work of studying the operation of the plant, to determine what improvements could be made in its operation. The first step was the determination of the actual output, and for this purpose arrangements were made to run a test of the plant as it stood, over a considerable period of time.

Before discussing these tests, I shall explain the operation of the plant as it was conducted at the time. The equipment consisted of two electrically-operated revolving drying drums, hard coal being used for fuel with forced draft. In front of these dryers was a floor space in the center of which the wet sand was deposited by bucket through an opening in the roof. Belt conveyors led from each side of the sand pile and fed into the upper end of the drums. Upon rejection at the far

end of the drums, the dry sand dropped into small pits where it was picked up by bucket-chain conveyor elevators and raised to the storage bins. Each half of the equipment was entirely independent of the other. One man was required to attend to the fires and operate the machinery and another had to devote a part of his time to operating the clam-shell bucket. A minimum of four laborers were required to shovel wet sand from the pile to the belt conveyors when both units were in operation, which was ordinarily the case. If it was desired to work the plant to its capacity it was necessary to have additional laborers shoveling sand in order to keep the delivery to the drums reasonably uniform, for, although a man can shovel at a lively rate at the beginning of a day's work, his efficiency falls off rapidly as the day approaches its end, until it is not unfair to him to say that it is probably only about 25 per cent at the end of the day.

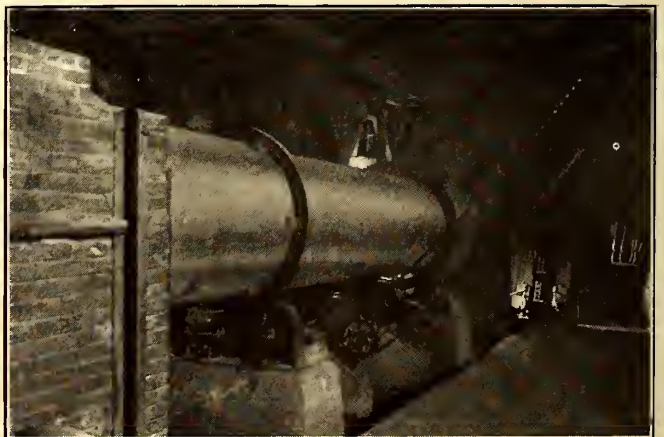
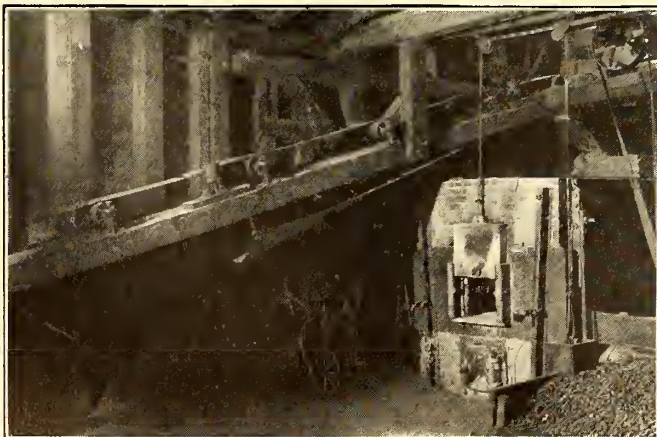
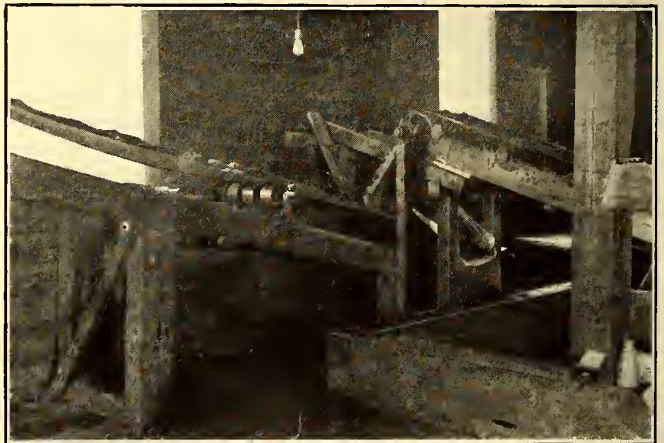
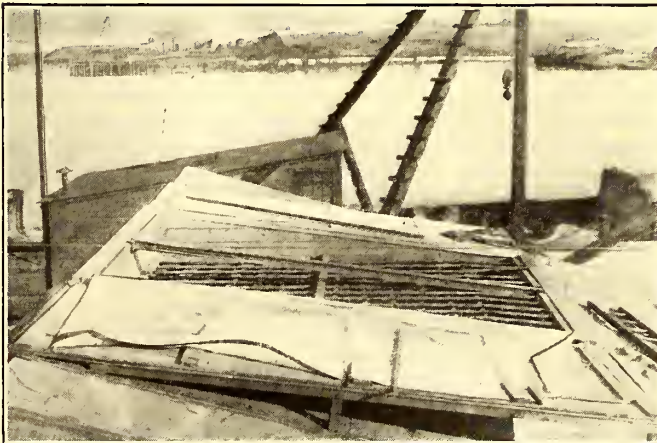
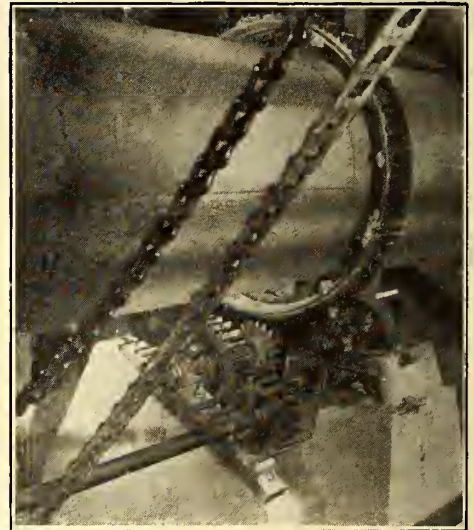
## CAREFUL RECORDS MADE

In order to obtain the necessary data for a fair analysis of the existing conditions, a number of forms for use in the tests described below were prepared and used with excellent results. The dry sand storage bins were measured and carefully gaged and during the test all sand was leveled in them at the end of each day's run. Every sand car which took dry sand for delivery to carhouses or for direct application to slippery rails was also measured, and its capacity was registered against it and a record was kept of the number of times it called each day for sand. A part of the dry sand was bagged for delivery to points where the sand storage bins were not within shoveling distance of the car, and a record was made of the quantity of sand bagged each day. Determination was also made periodically during the day of the weight of a given volume of wet sand, the measuring box being filled in a manner approximating as closely as possible the condition of the wet sand in the pile. This sand was then



**Plant for Handling Wet Sand**

At top, front and rear views of sand hopper. At left, looking down into hopper. At right, gear and pinion drive for drum. Below at left, grating and hinged doors over hopper. Below at right, main and auxiliary belt conveyors. At bottom, left, one of the main conveyors with fire-box at head of drum. At bottom, right, revolving drum with dry sand bucket elevator.





carefully dried and again weighed to determine the loss in weight due to evaporation of moisture and the sand was also remeasured to determine its shrinkage in volume. The coal in each bin was weighed at the beginning of each day and again at night, together with any additions during the day's run. Watthour-meter readings gave the power consumption. This showed a total of 79 kw.-hr. for the 530 cu.yd. of wet sand dried during the first test period, the total coal consumption for the same period being 22,973 lb. The test showed that there was an average evaporation of 2.32 lb. of water per pound of coal consumed and that the coal consumption averaged 1.90 lb. per cubic foot of dry sand. Note was also made of all other materials used in the operation of the plant, such as oil, grease, waste, etc. The test covered a period of eight working days, the actual operating time being 62½ hours.

TABLE I—RESULTS OF TESTS OF SAND-DRYING PLANT

|   | Before Making Changes | After Making Changes |
|---|-----------------------|----------------------|
| Total cubic yards of wet sand dried.....              | 529.71                | 467.40               |
| Total cubic yards of sand after drying.....           | 452.38                | 399.17               |
| Total duration of test, hours.....                    | 62.75                 | 31.50                |
| Weight of coal burned, pounds.....                    | 22,973                | 11,595               |
| Labor, man-hours.....                                 | 300                   | 105                  |
| Water evaporation per pound of coal, pounds.....      | 2.32                  | 4.165                |
| Coal consumption per cu. ft. of dry sand, pounds..... | 1.90                  | 1.075                |
| Total energy consumption, kilowatt-hours.....         | 79.0                  | 61.4                 |
| Output of dry sand per 10-hr. day, cubic yards.....   | 72.09                 | 126.72               |

With the information thus obtained it was possible to state with reasonable accuracy the actual output of dry sand per day and the various items entering into its production. In studying the problem and analyzing the results of the test, it was at once evident that the big leak was in the delivery of the wet sand to the drying drums. The necessity for keeping the belt conveyors running full emphasized the necessity of some mechanical device for feeding the wet sand. Investigation was accordingly made of the possibility of satisfactorily handling wet sand from a large hopper or receiving bin and the best method of delivery from such a bin to the main belt conveyors, so that the flow of sand to the drums would be continuous and uniform. Any one who has had any experience with wet sand knows how it packs and arches when dumped into a hopper, the extent of such action varying considerably with the degree of moisture in the sand. Also they have probably experienced difficulty in handling such sand during freezing weather.

NEW HOPPER HELPS CONDITIONS

The result of our study of the problem was the development of the machine shown in two accompanying illustrations, which also show the chain drives for operating the two agitator shafts referred to later.

Experiments which we made determined the practical minimum slope with which the bottom of the hopper had to be designed in order to insure free slippage as the wet sand was run out of the bottom of the hopper. Two parallel openings were provided in each half of the bottom, each pair feeding to one of two short auxiliary belt conveyors which in turn delivered the sand to the main belts. The size of these openings could be made larger or smaller as the needs required depending upon the degree of moisture in the sand. Arching was prevented by running two large shafts through the hopper over the valve openings and just below the point where the arching would take place. Keyed into each of these shafts were two cutting blades set at right angles to each other, each rotating so as just to

cut through their respective openings when in the lowest position. These blades or agitator bars cut through any sand that might arch above and keep it churned, and in addition keep pushing it through the valve openings onto the belts. At the end of these blades where the wear is greatest, they were finally reinforced by doubling their section. The view looking straight down into the hopper from the top shows the two shafts, the four agitator bars and the openings through which the wet sand is fed to the two auxiliary belt conveyors.

No difficulty is experienced in controlling the flow of sand perfectly during ordinary weather. In the winter when the sand is apt to contain large frozen lumps, these lumps are rejected by a steel rail and pipe grating which was constructed across the top of the hopper. The openings are of such a size that any lumps passing through them will be handled through the valve openings below without any trouble. In the view showing this grating the hinged doors by which the opening is closed during freezing or very rainy weather when the plant is not in operation can be seen. It is, of course, necessary for a man to climb up and break such larger lumps as remain on the grating. The only precaution which must be taken in freezing weather is to see that the hopper is run until empty at the end of each day's work.

The apparatus is driven by a 10-hp. motor, controlled from a starting rheostat. The size of the openings is regulated by sliding plates connected to levers located in the center of the mechanism, one of which appears on each side of the small ladder in the center of the view of the hopper. These levers move the valve plates forward and backward.

FORCE OF THREE MEN USED

One man operates the hopper and also breaks up any lumps which may collect on top of the grating. Another man tends the two fires and operates the other machinery, and the services of still another man are required a part of his time to keep the hopper filled, the remainder being devoted to operating other machinery around the yard. In this way the services of a minimum of three men were dispensed with in the operation of the plant and it was possible greatly to increase the production through the constant and uniform feeding of wet sand into the drying drums.

This steady flow is evident in the illustration which shows sections of both the main and auxiliary belt conveyors at the point where the sand is transferred from one to the other. When two men were feeding each belt it was our observation that there would be about one shovelful of sand to every 6 or 8 ft. of belt. The hopper machinery was so designed that either one or both sides could be feeding at the same time, and either side could be shut down when not required.

At the time the tests were first run, the drum was rotated by a friction drive. It was noticed that any attempt to feed wet sand into it beyond a comparatively low rate resulted in stopping its rotation, although in ordinary operation, with two men shoveling on each belt at their regular rate, this point was never reached. As the result of this observation, and in view of the fact that it was planned to have the belt conveyors running full, it was decided to change the drive, and a gear-and-pinion drive was substituted. This appears in detail in another illustration.

The work was started late in the fall and completed

the first of the following year, including the time required to make certain changes from our original design which experience later proved to be necessary. The remodeled plant has now been in regular operation for several years during which repairs have been limited to an occasional replacement of a worn gear, pinion or broken link in the chain drive, and an occasional replacement of a worn agitator bar.

When the construction was first recommended we estimated that it would save more than its first cost in reduced operating expenses the first year. The tests run after the plant had been in operation after all the changes had been completed proved that it would do even better than this. Actual costs have not been given for the reason that the plant was remodeled at a time when the cost of both labor and material was quite low and these costs would mean practically nothing now, when the items composing them have advanced anywhere from 100 per cent to 400 per cent, but the data given in the accompanying table show very well what was accomplished in this particular case.

### New Cars in Atlanta

**T**WO views of one of the new cars recently placed in operation by the Georgia Railway & Power Company, Atlanta, are shown herewith. The new cars are of the center entrance and exit type but built without a well in the center. The floor level of the cars is reached by three fixed steps inside the car of 15½ in., 12 in., and 11 in. heights. The center double-door opening is 48 in. wide and the conductor's position is opposite the entrance. A 30-in. folding door at each end of the car equipped with one folding and two fixed steps and having the same step heights as prevail at the center entrance is provided for the use of the motorman only. All seats except those in the two vestibules and the folding seats at the center of the car are of the cross-seat type. In general, the car is of semi-steel construction, measures 44 ft. long overall, 8 ft. wide over the side plates, and weighs 34,000 lb. It is equipped for double-end operation and the platform at



INTERIOR VIEW OF ATLANTA CAR

each end measures 5 ft. to the bulkhead. The cars are mounted on Brill 39-E maximum traction trucks equipped with General Electric 201-1 motors, and K-35 control, and General Electric straight air brakes. The trucks are mounted on 23-ft. centers and the wheelbase is 4 ft. 10 in. The cars seat fifty-one passengers. The height of the cars is 10 ft. 10 in. from rail to top of trolley boards, and 7 ft. 6 in. from floor to headlining. The cars were built by the American Car Company, St. Louis, Mo.

The Public Service Railway of New Jersey, which made a highly creditable record for good service during and after the recent heavy snows, reports excellent results from the "Detroit drag-board" described last in the issue of this paper for Aug. 31, 1918, page 371. To quote a high official of the company they proved a "life saver." They will be put on old single-truck cars for emergency snow fighting. At Camden the local master mechanic has applied the boards to some double-truck cars.



NEW TYPE CENTER-ENTRANCE AND EXIT CARS RECENTLY INSTALLED IN ATLANTA, GA.

# Reclamation Shop Effects Saving of More Than \$86,000 in 1919

Centralization of Maintenance, Special Construction and Salvage Work on Connecticut Company's System Results in Large Economies

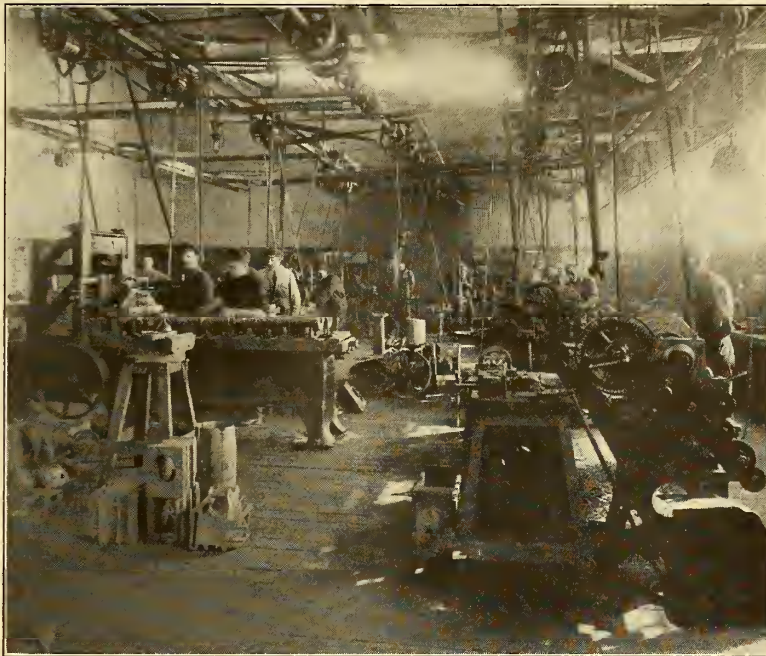
**N**EARLY two years ago, the officials of the Connecticut Company believed that large economies could be realized in the maintenance of rolling stock by centralizing in one shop the reclamation and special construction jobs and all except the routine maintenance work for the entire system. Thus, as was described in the issue of the **ELECTRIC RAILWAY**

**JOURNAL** for Aug. 31, 1918, a reclamation shop was installed at New Haven, Conn., about January, 1918, in what had formerly been an old paint shop and storage house. Since the publication of that article, the shop has been in continuous operation, and figures and facts are now available to show what has actually been accomplished.

The work of the reclamation shop might very properly be divided into three classes; maintenance, special construction and salvage. The maintenance work covers those jobs which can be done in quantity, such as boring and babbitting armature and axle bearings and rewinding armatures, and such work as overhauling compressors, repairing headlights and trolley catchers, refilling fuses, etc. In fact all but the light routine repairs are handled in this shop. Probably the largest single item of maintenance is the rewinding of armatures.

Since the previous article appeared, the armature department has been moved from the main floor and a special room constructed, forming a second story over the welding shop. This department now employs eight men and seven women and handles practically all of the armature and coil work for a rolling-stock equipment of some 2,000 motor cars. The equipment in this department includes an armature-coil winding machine, a field-winding machine, two banding lathes, a lathe for turning commutators and equipped with an attachment for slotting commutators, and a special lathe for winding contact magnets and other cylindrical coils.

Under the heading of special construction jobs which



GENERAL VIEW OF MACHINE SHOP OF CONNECTICUT COMPANY'S RECLAMATION SHOP

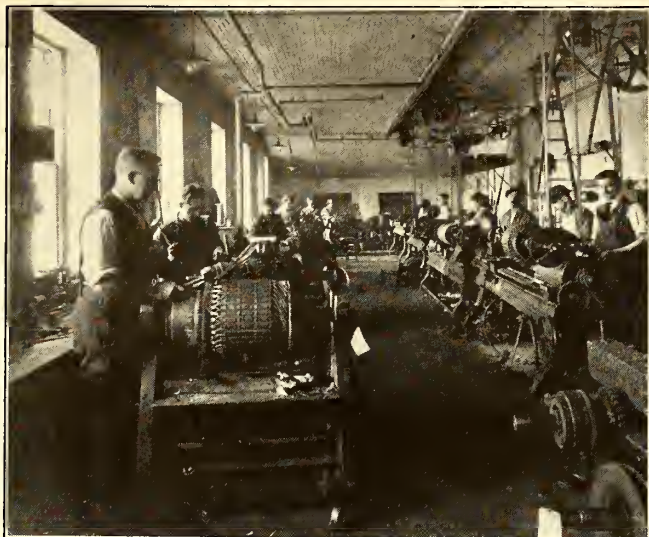
are handled in the reclamation shop might be included those items which are manufactured, such as trolley wheels and harps, axle bearings and collars, door castings, truck axles, brakeshoe heads, armature-coil winding, turning down axles from the rough, etc. In addition to these should be mentioned such special jobs as the construction of a steel ash car welded

throughout and a 900-gal. underground oil storage tank.

The equipment in the machine shop for handling these diversified jobs includes three engine lathes, turret lathe, boring mill, axle lathe and keyseater, two drill presses, hacksaw machine, two emery grinders, 100-ton wheel press, axle straightener, 24-in. shaper, 26-in. x 8-ft. planer, babbitting machine, small sensitive drill, small speed lathe and bolt cutter. For use with this equipment in handling maintenance work, many special jigs have been planned and built. Several of these were covered in the previous article on the reclamation shop. A few of the others are described in the following paragraphs.

In the line of salvage work handled at the reclamation shop, welding is the main item. This includes building up axles at the journal and the axle bearing seat, welding motor frames, building up and welding of Westinghouse 101 armature housings, repairing truck frames and line tools, building up and welding together broken armature shafts, welding gear cases and journal boxes, etc. Steel wheels have also been successfully built up and switch tongues and switch parts are repaired for the track department. Occasionally also the welder is called out on special jobs such as welding boiler tubes, stoker parts and engine cylinders at the power plant. Probably the one item which forms the largest percentage of the work handled in this department is the repair of gear cases.

Another item which forms a large part of the welding work is the repair and rebuilding of journal boxes from Standard 0-50 trucks. When these boxes come into the shop the outer shell on the back side is badly



HALF OF THE FORCE IN THE ARMATURE DEPARTMENT ARE WOMEN

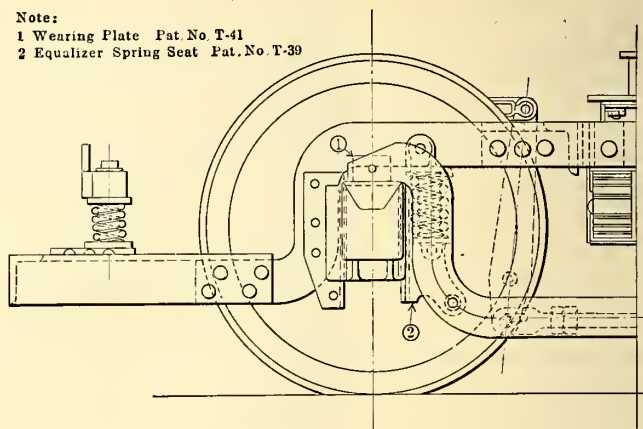
worn and often worn entirely through by the wheel, as shown in an accompanying group illustration. The boxes are also badly worn on the top by the equalizer bars and the equalizer spring seat is often cracked or badly worn. In the latter case the first step is to knock this seat off with a cold chisel. The various steps in the rehabilitation of these boxes are shown in the group illustration referred to.

After the spring seat is knocked off both the sides and the top of the box are planed off in the big planer. The top is smoothed and the sides are made 5 3/4 in. between faces with the equalizer bar guides 3/4 in. deep. If the shell is only badly worn on the wheel side it is built up with the electric welder, as is also the worn surface on the top. If, however, the shell is worn entirely through, a piece of 3/8-in. or 1/2-in. boiler plate is welded over the face and the hole is later cut out either by means of the arc or the acetylene torch.

A special spring seat and wearing plate have been made up to replace the parts planed off. These are shown in an illustration and their application to the truck is also illustrated. The cost of repairing the boxes depends upon the amount of work which has to be done upon them, in other words upon how badly worn they are. On various jobs the cost has been anywhere from \$1.99 to \$4.25 per box with a general average of perhaps \$2.25. Sometimes as many as fifty boxes per month are repaired in the foregoing manner.

The various jigs which have been built are simple in construction but greatly simplify the operations for which they have been designed. An accompanying photograph shows the attachments made for use on the bed of the 24-in. x 26-in. x 8-ft. Woodward & Powell planer. These attachments, which are plain castings with two V-shaped rests, permit the simultaneous planing of eighteen axle-bearing halves, of the same size. For this work a special head was also made up in two parts and mounted on the standard head of the machine. This special head provides for adjustment of the cutting tools laterally so that the four tools will always be cutting simultaneously regardless of the size of bearings being planed. The head rests against two adjustable supports which hold it in a vertical position and relieve the strain when the tools are cutting.

The supports which hold the axle bearings in place are dovetailed to the bed of the planer and the bearings

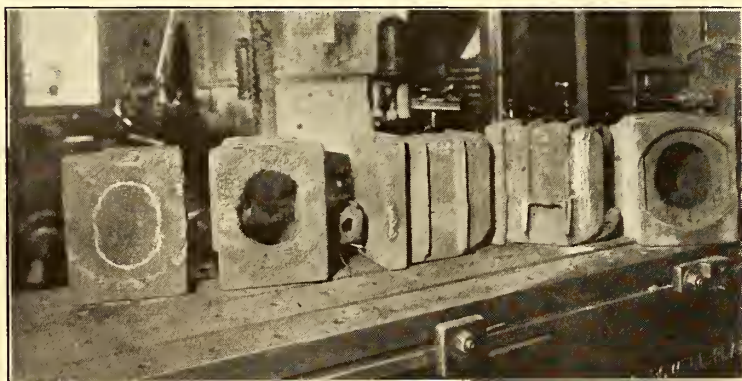


Note:  
 1 Wearing Plate Pat. No. T-41  
 2 Equalizer Spring Seat Pat. No. T-39

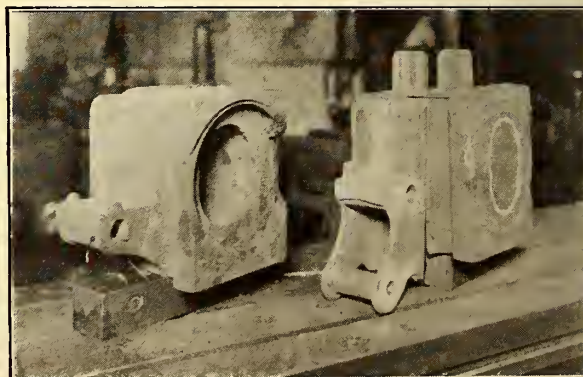
APPLICATION OF REHABILITATED JOURNAL BOX TO TRUCK SHOWING NEW SPRING SEAT AND WEARING PLATE IN POSITION

are held in position by clamps which are bolted down, a single clamp holding the adjacent ends of two bearings. With this equipment it is possible to plane off eighteen axle-bearing halves in approximately forty minutes.

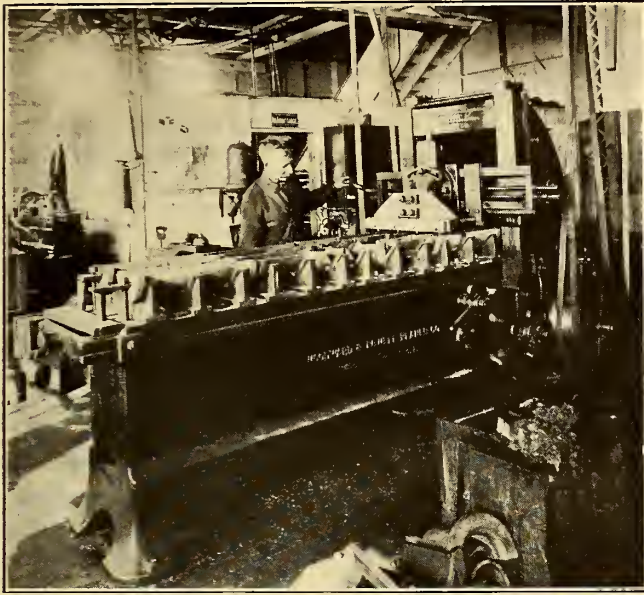
Another jig, which is illustrated, facilitates the correct and speedy drilling of axle bearings. This box-shaped device is made of steel, the several pieces being held together by steel dowel pins. The construction details are shown in the accompanying illustration. This jig is adjustable to accommodate any size of bearing and the bearings may be so easily and quickly inserted and removed that approximately forty halves can be drilled per hour. The segment marked "A" on the illustration



SUCCESSIVE STEPS IN REHABILITATION OF WORN AND BROKEN JOURNAL BOXES—STEPS PROGRESS FROM RIGHT TO LEFT



SPECIAL SPRING SEAT AND WEARING PLATE WHICH REPLACE PARTS BROKEN AND PLANED OFF



ATTACHMENTS TO LARGE PLANER PERMITTING SIMULTANEOUS PLANING OF 18 AXLE BEARING HALVES



THIS JIG MAKES IT POSSIBLE TO DRILL ABOUT FORTY AXLE BEARING HALVES AN HOUR

is that part which is interchangeable to accommodate the various sizes of bearings.

For the drilling operation the bearing is slipped into the box until the fillet rests firmly against the segment "A." The thumb screws are then tightened to hold the bearing firmly in position and the hole is drilled. The adjustable segment is held in the box by the four screws. All segments have these four screw-holes so arranged that the length of the segment beyond the box brings the one or two dowel holes, as the case may be, in the proper position for the particular bearing for which the segment is designed.

A third device which is illustrated is that for drilling dowel holes in armature bearings and is quite similar in operation to that already described for the axle bearings. Because of the shape of the armature bearing,

the box in this case has a hinged top and a cam lever to hold the cover firmly shut when the bearing is in position. In the bottom of this box there is an interchangeable lug which fits into the window of the bearing and prevents any rotating movement. The adjustable segments are made and used on the same principles as those already described and are held in position by two screws. The two illustrations, one showing the box closed with the bearing in position ready for boring and the other with the lid raised, show clearly the details of construction. With this jig about forty bearings per hour can be drilled. In both of these jigs the drill holes are lined with tool steel bushings.

A special arrangement which greatly facilitates the babbitting of armature bearings is also illustrated. The device consists of a working stand through which is



ALL BEARINGS WHICH ARE BABBITTED ARE BROACHED RATHER THAN BORED



WITH THIS MACHINE ONE MAN CAN BABBITT 100 BEARINGS A DAY



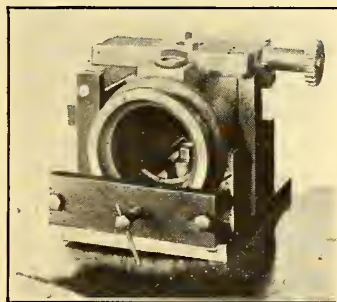
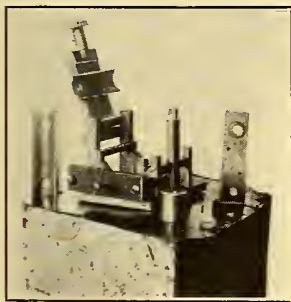
TABLE I—ESTIMATED MONTHLY SAVINGS FROM WELDING AND REPAIR JOBS DURING 1919

| Class of Work | January    | February   | March      | April      | May        | June       | July       | August     | September | October    | November | December   | Total       |
|---------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------|------------|----------|------------|-------------|
| Welding.....  | \$3,555.32 | \$3,650.50 | \$3,057.95 | \$2,423.63 | \$5,512.19 | \$2,015.08 | \$3,653.50 | \$3,055.15 | 2,189.10  | \$2,697.58 | \$902.20 | \$2,078.42 | \$34,760.62 |
| Repairs.....  | 2,469.16   | 1,618.57   | 2,521.78   | 1,952.48   | 2,454.11   | 2,424.09   | 3,258.40   | 2,169.92   | 1,923.37  | 2,061.65   | 868.47   | 2,269.47   | 25,991.47   |

inserted the plunger of a 16-in. air cylinder. The piston of this plunger is removable and any diameter of piston can be used to suit the desired interior diameter of the babbitted bearings. The outside cylindrical form is bolted to the table top and has a hole in the base slightly larger than the largest piston which may be used. This form is interchangeable for the various sizes of bearings.

In the babbiting operation a ring, whose outside diameter is the outside diameter of the bearing to be babbitted and whose inside diameter fits snugly the piston to be used, is placed in the bottom of the outside form and over the piston. The semi-cylindrical plates shown are then placed around the bearing, one plate having an interchangeable lug which fits the window of the bearing. These plates are also long enough so that when this equipment is placed in the cylinder over the piston, the plates surround the ring already in place. This insures the proper centering of the piston.

As soon as the babbitt is poured the piston is withdrawn. This piston is hollow and is water-cooled as withdrawn. The babbitt cools and shrinks so quickly that the piston can be almost immediately raised and lifts the bearing with it. This is then placed at one side and the operation repeated. With this device approxi-



THIS TYPE OF JIG IS USED TO DRILL ARMATURE BEARINGS

mately 100 bearings can be babbitted in a day by one man.

All bearings which are babbitted are broached rather than bored, the same machine being used. The broacher is illustrated and consists of a reduced section piston with a shoulder and a threaded end. Over the end of the piston and down against the shoulder is placed a brass ring and then a heavy washer. Upon this is placed the broaching tool which is held firmly in position by a heavy nut. To broach the bearing the piston is lowered and the tool is pulled through, making the babbitt compact and free from air pockets and leaving the inside diameter correct.

Another jig of interest is that used for boring trolley harps. The harp is placed in the jig and held in position by a screw. The jig is placed on the drill press and one boring forms the trolley pole hole. The jig is then turned on its side and a second boring forms the trolley-axle hole in each arm. The jig is next reversed from its first position and the trolley axle cotter pin holes are drilled in two more operations. This jig is built of 3-in. mild steel and the holes are lined with tool steel bushings.

When the reclamation shop was first installed, it was thought that for some of the items handled in the shop a premium system of payment would be put into effect.

This was tried out during the past year on welding and on the manufacture of various articles, but did not work out well and has since been abandoned. The total force in the reclamation shop now includes thirty-six persons, seven of whom are women, and two of whom are employed in the office. All of the women, with the exception of one office clerk, work in the armature room. They make coils, including the coils for air compressors, do banding on all kinds of armatures and rewind armatures.

At present there is adjoining the armature room a small electrically-heated bake-oven used for compressor-

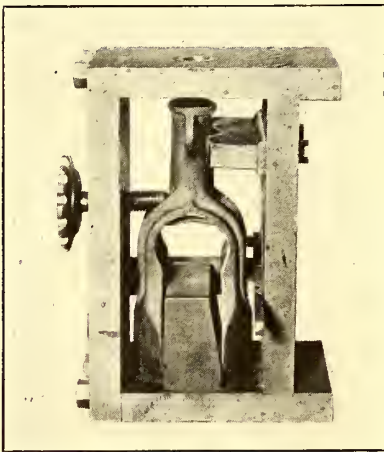
TABLE II—TABULATION OF MATERIALS REPAIRED AND RECLAIMED DURING JULY, 1919

| MATERIALS REPAIRED  |  | Total Cost | Net Saving |
|---------------------|--|------------|------------|
| No.                 | Description                              |            |            |
| 3                   | Air armatures repaired.....              | \$40.82    | \$19.18    |
| 3                   | Air armatures repaired.....              | 9.47       | 20.53      |
| 3                   | Air armatures repaired.....              | 16.53      | 13.47      |
| 4                   | Air armatures repaired.....              | 32.03      | 7.97       |
| 1                   | Air armatures repaired.....              | 4.71       | 5.29       |
| 14                  | Air armatures rewound.....               | 304.88     | 255.12     |
| 1                   | Air armatures rewound.....               | 18.25      | 21.75      |
| 21                  | Air armatures rewound.....               | 422.78     | 417.22     |
| 1                   | Air armatures rewound.....               | 17.25      | 22.75      |
| 1                   | Air armatures rewound.....               | 20.05      | 19.95      |
| 6                   | Air armatures rewound.....               | 149.04     | 90.96      |
| 8                   | Air armatures rewound.....               | 141.17     | 178.83     |
| 1                   | Motor armatures repaired.....            | 31.06      | 8.94       |
| 19                  | Motor armatures repaired.....            | 135.14     | 149.86     |
| 2                   | Motor armatures repaired.....            | 18.75      | 11.25      |
| 14                  | Motor armatures repaired.....            | 97.81      | 112.19     |
| 2                   | Motor armatures repaired.....            | 14.66      | 15.34      |
| 1                   | Motor armature repaired.....             | 11.63      | 3.37       |
| 3                   | Motor armatures rewound.....             | 136.24     | 88.76      |
| 3                   | Motor armatures rewound.....             | 132.17     | 92.83      |
| 5                   | Motor armatures rewound.....             | 248.03     | 126.97     |
| 1                   | Motor armature rewound.....              | 65.00      | 15.00      |
| 8                   | Motor armatures rewound.....             | 773.99     | 226.01     |
| 6                   | Fare registers overhauled.....           | 5.73       | 9.27       |
| 8                   | Fare registers overhauled.....           | 18.44      | 21.56      |
| 3                   | Fare registers overhauled.....           | 4.72       | 2.78       |
| 3                   | Fare registers overhauled.....           | 2.07       | 5.43       |
| 5                   | Air compressors overhauled.....          | 217.57     | 157.43     |
| 1                   | Air compressor overhauled.....           | 66.42      | 8.58       |
| 6                   | Air compressors overhauled.....          | 264.20     | 185.80     |
| 3                   | Air compressors overhauled.....          | 109.37     | 70.63      |
| 3                   | Squires track magnets rewound.....       | 68.57      | 21.43      |
| 2                   | Squires track magnets rewound.....       | 24.57      | 15.43      |
| 1                   | Squires track magnet rewound.....        | 5.86       | 4.14       |
| 1                   | Squires track magnet rewound.....        | 13.62      | 6.38       |
| 1                   | Cont. switch box repaired.....           | 11.78      | 3.22       |
| 53                  | Field coils repaired.....                | 34.26      | 230.74     |
| 2                   | Field coils repaired.....                | 9.73       | 2.27       |
| 34                  | MS 46 switches repaired.....             | 51.23      | 118.77     |
| 2                   | Crank cases overhauled.....              | 59.78      | 10.22      |
| 1                   | Truck grinder repaired.....              | 5.66       | 1.84       |
| 1                   | Trolley base overhauled.....             | 6.61       | 3.39       |
| 1                   | G. E. Eng. valve overhauled.....         | 3.60       | 3.40       |
| 1                   | K6 controller repaired.....              | 26.05      | 8.95       |
| 1                   | Switch tongue repaired.....              | 3.70       | 1.30       |
| 2                   | Engine slide valves repaired.....        | 8.59       | 7.41       |
| 1                   | N. H. Squires Register overhauled.....   | 2.65       | 2.35       |
| 4                   | Wilson trolley catchers repaired.....    | 2.17       | 37.83      |
| 7                   | Wilson trolley catchers repaired.....    | 32.92      | 37.08      |
| 12                  | G. E. 80 armature bearings repaired..... | 32.00      | 64.00      |
| 3                   | D coils rewound.....                     | 12.07      | 11.93      |
| 2                   | Pit jacks repaired.....                  | 25.38      | 4.62       |
| 1                   | Cheatham track magnet rewound.....       | 6.79       | 33.21      |
| 1                   | 62-tooth gear repaired.....              | 3.62       | 14.38      |
| 1                   | Type K motor repaired.....               | 55.72      | 24.28      |
| 6                   | D coils rewound.....                     | 27.10      | 12.90      |
| 5                   | D coils rewound.....                     | 11.10      | 12.90      |
| 44                  | Fare registers overhauled.....           | 120.64     | 55.36      |
| 61                  | Fare registers overhauled.....           | 298.07     | 61.93      |
| 6                   | Pit jacks overhauled.....                | 77.94      | 72.06      |
| 20                  | Pos. journal bearings repaired.....      | 100.34     | 49.66      |
| Total.....          |  | \$4,762.10 | \$3,238.40 |
| MATERIALS RECLAIMED |  |            |            |
| 161                 | Half gear cases.....                     | \$188.49   | \$2,548.51 |
| 3                   | Axles.....                               | 41.78      | 78.22      |
| 1                   | Axle.....                                | 21.04      | 18.96      |
| 6                   | Axles.....                               | 93.87      | 146.13     |
| 4                   | Armatures.....                           | 104.92     | 45.08      |
| 5                   | Armatures.....                           | 23.62      | 51.38      |
| 1                   | Armature.....                            | 12.62      | 12.38      |
| 1                   | Armature.....                            | 6.16       | 18.84      |
| 1                   | Armature.....                            | 2.64       | 22.36      |
| 1                   | Wilson trolley catcher.....              | 0.59       | 0.91       |
| 1                   | Bearing for coal elevator.....           | 1.33       | 3.67       |
| 4                   | Standard 0-50 equalizing bars.....       | 14.59      | 35.41      |
| 2                   | Standard 0-50 brake beams.....           |            |            |
| 105                 | Standard journal housings.....           | 273.32     | 671.68     |
| Total.....          |  | \$784.97   | \$3,653.53 |

motor armatures and coils. Plans are being prepared, however, to extend the armature room on out over the receiving room and to install a dipping tank and large electrically-heated baking oven which will accommodate thirty-six armatures at once. The tank will be placed in the floor and reached by a trap door.

#### CAREFUL COST RECORDS ARE KEPT OF ALL WORK

The procedure of handling equipment which comes into the shop for repair insures that a careful record is kept of the piece until it is again returned to the division, and makes possible accurate cost records of repair work. As an example of how this is accomplished, consider a simple piece of equipment such as an armature. When this is placed on the supply car at the division



WITH ONE SETTING OF THE TROLLEY HARP IN THIS JIG ALL HOLES ARE DRILLED BY CHANGING THE POSITION OF THE JIG

point it is accompanied by a "Shipped by Supply Car to Reclamation Shop" order, in duplicate.

Everything coming into the reclamation shop is received at the store room. Here the armature receives a tag to which in turn is attached a small tin disc bearing a number. This number follows the article through the shop and against it is charged the cost of the work. At the same time the armature is tagged,

a shop order is made up in four copies, one being sent to the master mechanic's office together with a copy of the "Shipped by Supply Car to Reclamation Shop" order. One copy of the shop order is retained by the stockroom accountant, one by the storeroom and the fourth is sent to the foreman performing the work.

When the master mechanic's office receives the shop order, a "Foreman's Requisition for Material" order is filled out for the necessary material to perform the repair work. When the job is completed, the foreman fills out a form describing the work which was done and the materials used in the job. This form also shows credits which should be deducted for scrap salvage. There is also for this purpose a separate form which the foreman fills out and sends to the storekeeper, covering not only the scrap salvage but any unused material.

When the equipment is repaired and ready to go out to the division, a shipping order is made up in four copies, two of these go with the piece of equipment and two are retained in the master mechanic's office. One of those which accompanies the piece of equipment out of the shop is signed by the individual receiving it at the division point and later returned to the master mechanic's office. From the employee's time slip and the credit and charge forms the cost data are made up and recorded on the reclamation shop "Cost Card." All of the various forms mentioned above are reproduced in an accompanying illustration.

Some of the results actually attained at the reclamation shop should be of interest. During the year 1919 the estimated monthly savings in welding and repair jobs were as recorded in Table I. The total savings for

the year are estimated at \$86,442. An example of the work done and savings accomplished during a representative month is given in the tabulation of the report of materials repaired and reclaimed as shown in Table II.

## Electric Lighting of Railroad Signals Discussed

### Illuminating Engineering Society Takes Up Theory and Development of Electrically-Lighted Signals

AT A meeting held on March 11, 1920, one of the subjects discussed by the New York section of the Illuminating Engineering Society was "The Electric Lighting of Railroad Signals." L. C. Porter, Edison Lamp Works of the General Electric Company, and F. S. Stallknecht, Thomas A. Edison, Inc., Primary Battery Division, presented the subject. An abstract of the discussion follows:

Along some sections of railroads, electrically lighted lamps have been operated from local power circuits and in remote cases gravity and storage batteries have been used as the source of energy. In the majority of cases, however, the caustic soda primary cell is rapidly coming into general use for this purpose.

It is believed that the one factor which has done most to hasten the installation of electrically-lighted signal lamps is the increasing cost of labor. The electric lamp practically eliminates this item and also eliminates the frequent failures which occur with oil lamps. The electrically-lighted signal lamp has a higher cost of initial installation, but the cost of maintenance is considerably lower.

The fundamental principles of projection were explained in some detail by the assistance of slides and exhibits of the various types of lamps experimented with. The adapter blocks and focusing devices developed and the equipment now in most general use were also illustrated. The filament finally decided upon as a result of exhaustive tests was the C-2 form. This type gives a high beam candle power, a good spread, and is easy to locate at the focal point. Also as a result of the tests a G-12 bulb double-contact bayonet base with a 1½-in. light center length was determined upon as the standard.

It is believed that the lamp should be renewed every time the battery is renewed, thus preventing interruption of service through lamp failures, and it is estimated that the batteries and lamps will need attention under average railroad service not more frequently than twice a year.

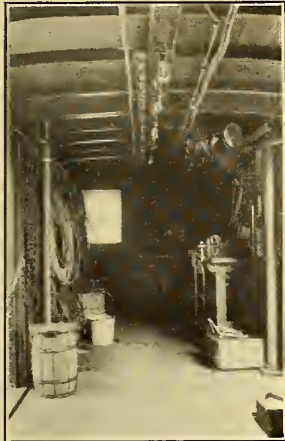
The interesting devices developed from the use of electric signal lamps have been the adapter block and the focusing device. By means of these the maximum efficiency of the low-voltage incandescent lamp is utilized and the focusing of lamps is placed on a basis which is so certain as to be almost mechanical. It is anticipated that the majority of initial installations in railroad work will be converted oil lanterns, but as these wear out and have to be replaced, it is assumed that the reflector type of lantern will be installed.

What is said to be the largest jet condenser yet built was recently completed by the Westinghouse Electric & Manufacturing Company, for the Alabama Power Company. It is capable of passing 13,000,000 lb. of water per hour.



# Keeping the Overhead System Fit

Systematic Inspection and Careful Analysis of Failures Tends to Reduce the Latter, Not Only by Eliminating a Defect Before It Proves Serious, But by the Use of More Suitable Equipment Where Failures Persist



ONE TYPE OF TOWER LINE CAR USED BY CONNECTICUT COMPANY

THE work of maintaining the trolley and low-voltage lines of an electric railway property, being not more radically unique than that of other departments, depends to a certain extent upon the inherent conditions of the particular locality and property. Routine maintenance practice, however, need not differ in any important respect on various properties where even approximately similar conditions exist. In this article the results of a study of overhead maintenance practice of the Connecticut Company is given to illustrate the ways in which progressive companies are endeavoring to keep their lines in good form. This company operates approximately 700 miles of track in Connecticut, serving most of the cities and towns, both large and small, in that state. The railway system includes eleven divisions, and each of the overhead division forces takes care of its own construction, inspection and maintenance under general supervision of P. W. Ripple, chief engineer of power and equipment, and H. M. Gould, who is supervisor of lines of the company.

The line work in each of the eleven divisions comes under the direct supervision of a line foreman, with the necessary force of linemen, ground men, etc., the number of men depending upon the size of the division. Table I shows the approximate mileage of each division, average number of men employed on the overhead work and the tower truck, car or wagon

equipment in operation. This table would be misleading without the added information that these men look after the high-tension system as well as the trolley and low-voltage lines. It is impossible, therefore, to make any clear division of duties, and assign a definite number of men to the low-voltage work. The Hartford, New Haven and Middletown divisions all include some miles of high-tension lines.

In further explanation of Table I it should be stated that the Hartford, Middletown and New Haven divisions, which, as already noted, include high-tension lines, each have one man patrol these lines one day a week. The tower trucks in use at New Haven, Water-

bury, Bridgeport and Hartford are Pierce-Arrow cars which are used mainly for emergency construction and maintenance. Ford runabouts are used by the signal maintainers.

Through the passage by the Public Utilities Commission of Connecticut of so-called Docket No. 1447 Order D, approving and establishing rules and specifications governing the construction and use of joint wood-pole lines, an inspection and report is made to the commission on Oct. 1 and April 1 each year. At these times complete inspections are made of the high-tension trolley and low-voltage system, and a detailed report of all defects found is made on the form shown in an accompanying illustration. The regular crew on each division makes the semi-



ONE TYPE OF TOWER LINE CAR USED BY CONNECTICUT COMPANY



TABLE I—MILEAGE, PERSONNEL AND EQUIPMENT OF OVERHEAD DIVISIONS

| Division        | Track Miles | Number of Men  | Equipment  | Division         | Track Miles | Number of Men   | Equipment  |
|-----------------|-------------|--|--|------------------|-------------|---|--|
| Stamford.....   | 23          | 1 Foreman<br>3 Men   | 1 tower wagon  | Waterbury.....   | 82          | 1 Gen. Foreman<br>3 Gang Foremen<br>2 Maintainers<br>13 Men | 1 tower truck<br>3 line cars<br>1 tower wagon<br>(seldom used) |
| *Hartford.....  | 183         | 1 Gen. Foreman<br>3 Gang Foremen<br>1 Sub-Foreman<br>1 Maintainer<br>15 Men  | 1 tower truck<br>2 line cars<br>1 tower wagon<br>(seldom used)                     | Derby.....       | 25          | 1 Foreman<br>4 Men  | 1 line car   |
| *New Haven..... | 151         | 1 Gen. Foreman<br>3 Gang Foremen<br>1 Emergency Foreman<br>5 Emergency Men<br>1 Signal Maintainer<br>21 Linemen, Groundmen,<br>and Teamsters | 1 tower truck<br>4 line cars<br>2 tower wagons                                     | Meriden.....     | 38          | 1 Foreman<br>5 Men  | 1 line car<br>1 tower wagon<br>(seldom used)                   |
| Bridgeport..... | 101         | 1 Gen. Foreman<br>3 Line Foremen<br>1 Maintainer<br>15 Men   | 1 tower truck<br>1 Ford runabout<br>2 line cars<br>2 tower wagons<br>(seldom used) | *Middletown..... | 35          | 1 Gen. Foreman<br>2 sub-foremen<br>5 Men                    | 1 line car<br>1 Ford runabout                                  |
|                 |             |  |  | New Britain..... | 41          | 1 Foreman<br>6 Men  | 1 line car<br>1 tower wagon<br>(seldom used)                   |
|                 |             |  |  | Torrington.....  | 13          | 1 Man   | 1 line car   |

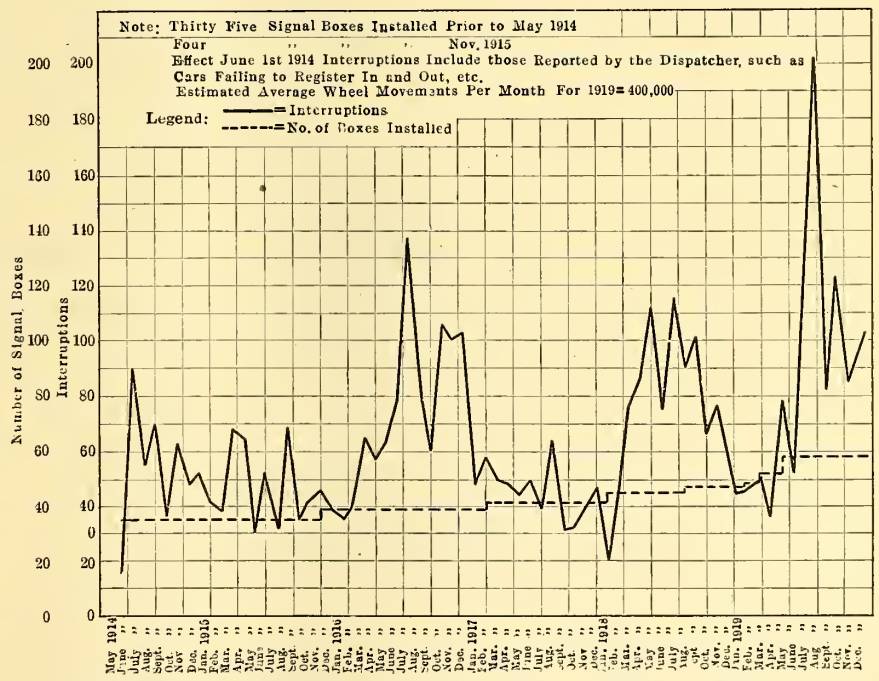
\*This division includes also high tension lines.

The report of the inspection, the form of which has been previously referred to, is made up in six copies. One of these is retained by the local foreman, one by the local manager and four are sent to the supervisor of lines. Two of these latter are sent to the Public Utilities Commission and two are kept in the office at New Haven. The copy of the report retained by the local foreman is used as a guide to assist him in planning his routine maintenance work. The holders of other copies of this report can check up at any time to ascertain whether the defects reported have been corrected. In the matter of routine maintenance, the crews recorded in Table I include in their regular work the duty of maintaining signals, telephones, electric track switches, etc. The New Haven division has, in addition to the regular repair and maintenance gangs, an emergency force consisting of a foreman and five men, three of whom are on duty at all times. They alone utilize the Pierce-Arrow tower truck. At Hartford, Waterbury and Bridgeport, one crew is detailed to handle construction, maintenance and emergency work on the city lines only. The four main divisions, namely, Hartford, New Haven, Bridgeport and Waterbury, each have a special signal maintainer who devotes his time to signals, electric track switches, lamp clusters, etc.

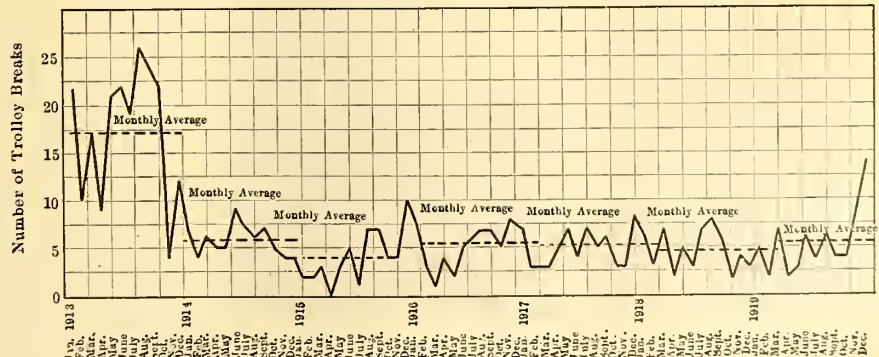
In addition to the semi-annual inspection each division is equipped with spare signal contactors and spare signal relays and is expected to replace three or four of each of these every month whether any defects are apparent or not. This method is believed greatly to reduce the number of emergency calls. At least once a month every signal box is inspected, the dust is blown out with a hand bellows, contacts are cleaned, etc. Thus, at least once every month a superficial inspection is made of all automatic signals, hand-thrown signals, electric track switches and telephones.

The type of monthly reports made on the inspections noted above is made

clear by accompanying illustrations. On the automatic signals the report includes defects and interruptions reported by the dispatcher as well as those detected on special calls and in routine inspection. Where it is reported that a wrong light is displayed by a car passing in or out of a signal block, this may be due to the overhead frog being out of line, but more often it is caused by the improper operation of the car through the switch, and upon inspection the signal is found "O.K."



CURVE SHOWING NUMBER OF AUTOMATIC SIGNAL INTERRUPTIONS ON THE WATERBURY DIVISION OF THE CONNECTICUT COMPANY



GRAPH SHOWING NUMBER OF TROLLEY BREAKS ON BRIDGEPORT DIVISION OF CONNECTICUT COMPANY



SIGNALS ON WATERBURY DIVISION AS ILLUSTRATED

| 1917 |      |      |      |      |     |      |      |      |       |      |      | 1918 |      |      |      |      |     |      |      |      |       |      |      | 1919 |      |      |      |      |     |      |      |      |       |      |      | Total |       |    |
|------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|------|------|------|-----|------|------|------|-------|------|------|-------|-------|----|
| Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. |       | Dec.  |    |
| 99   | 46   | 53   | 48   | 47   | 38  | 35   | 28   | 25   | 28    | 27   | 35   | 28   | 7    | 42   | 70   | 80   | 74  | 64   | 56   | 36   | 77    | 33   | 28   | 25   | 28   | 45   | 31   | 26   | 66  | 31   | 74   | 177  | 56    | 101  | 74   | 84    | 2,594 |    |
| ..   | ..   | 2    | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | ..    | 23 |
| ..   | ..   | 1    | 1    | ..   | 2   | ..   | 1    | ..   | ..    | ..   | 2    | ..   | ..   | ..   | 1    | 1    | 2   | 5    | ..   | ..   | 13    | ..   | 10   | 5    | 1    | 7    | ..   | 1    | 3   | ..   | ..   | 21   | 7     | 2    | 1    | ..    | 111   |    |
| ..   | ..   | ..   | ..   | 1    | ..  | ..   | ..   | ..   | ..    | ..   | 1    | ..   | ..   | ..   | 1    | 1    | 1   | 2    | ..   | ..   | ..    | 2    | 5    | 2    | 2    | ..   | 1    | 3    | ..  | ..   | 2    | 4    | 4     | 8    | 3    | 3     | 38    |    |
| ..   | ..   | ..   | ..   | ..   | 1   | ..   | ..   | ..   | ..    | ..   | 1    | ..   | ..   | ..   | ..   | ..   | 1   | 1    | 1    | 1    | 1     | 5    | 5    | 1    | 4    | ..   | 3    | 1    | ..  | ..   | 1    | 2    | 1     | 1    | 1    | ..    | 61    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | 1    | 1    | 1    | ..   | 1    | ..   | ..  | 1    | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 25    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | 1    | 1    | 1    | ..   | 1    | ..   | ..  | 1    | ..   | ..   | 1     | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 21    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | 1    | 1    | 2    | ..   | 3    | 5   | ..   | 3    | 5    | 7     | 2    | 6    | 4    | ..   | 1    | 1    | ..   | 4   | 1    | 2    | 6    | 6     | 4    | 4    | 5     | 72    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | 1    | 9    | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | 2     | 5    | 1    | 1    | ..   | ..   | 5    | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | 30    |       |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 18    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 1     |    |
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| ..   | ..   | ..   | ..   | ..   | ..  | 1    | ..   | 1    | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | 6    | ..   | ..   | ..    | 1    | ..   | 1    | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | 2    | 1     | 2     |    |
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| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 25    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | 1    | ..   | 2   | 3    | ..   | 4    | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | 5     | 43    |    |
| ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..   | ..   | ..   | ..   | ..   | ..  | ..   | ..   | ..   | ..    | ..   | ..   | ..    | 61    |    |
| 102  | 48   | 58   | 50   | 48   | 45  | 49   | 39   | 64   | 31    | 32   | 40   | 46   | 21   | 44   | 76   | 88   | 113 | 74   | 114  | 91   | 102   | 68   | 76   | 60   | 45   | 46   | 50   | 37   | 78  | 43   | 124  | 203  | 83    | 123  | 86   | 103   | 4,003 |    |
| 2.6  | 1.1  | 1.4  | 1.2  | 1.2  | 1.1 | 1.2  | 0.95 | 1.6  | 0.75  | 0.70 | 0.93 | 1.1  | 0.49 | 1    | 1.75 | 1.8  | 2.5 | 1.6  | 2.5  | 2    | 2.2   | 1.5  | 1.6  | 1.3  | 0.96 | 0.98 | 0.89 | 0.66 | 1.4 | 0.77 | 2.2  | 3.5  | 1.43  | 2.12 | 1.5  | 1.78  |       |    |

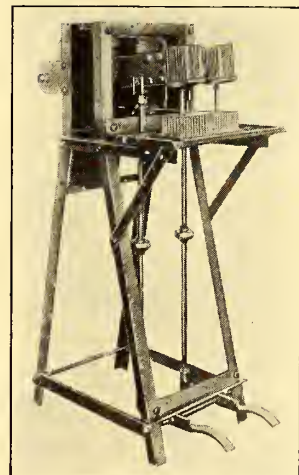
Among other things this graph illustrates that during the months of July and August, when the heaviest lightning disturbances occur, the number of signal interruptions reaches the maximum. This period during 1919 seems to have been particularly severe. This graph is of maximum value when considered in connection with the number of operations of the signals in a given period. The approximate number of wheel movements per month through all signals on the Waterbury division for the year 1919 was 400,000.

To supplement the graph a table is made up showing the causes of all interruptions. (See Table II.) It will be noted from Table II that more than 70 per cent of the interruptions were due to cars failing to clear the signals. This in many cases is due to improper operation of the signal contactor, to the trolley wheel leaving the wire at the frog or to some other cause which is not the fault of the signal. Another 10 per cent of the interruptions are due to lightning. At the peak recorded in the month of August, 1919, out of 203 interruptions, 177 were due to the first cause discussed above and only 3 per cent to lightning. Thus the graph alone would be misleading without an accompanying analysis. Normally, the peaks during July and August have been caused by lightning interruptions. Considering 40,000 wheel operations as the limit of possible failures, the number of interruptions in the worst month, namely, August, 1919, was 1/2 per cent, while in the best month of that year the number of interruptions was only 0.09 per cent.

Another graph of interest which has been made up by the Connecticut Company is that reproduced in an accompanying illustration showing the number of trolley wire breaks on the Bridgeport division since Jan. 1, 1913. This graph shows clearly that during the first ten months of 1913 the number of breaks was exceptionally high, and it was found that the largest percentage of these were due to breaks at the end of soldered sleeves. This type of sleeve was eliminated and the Cleveland splicer was substituted. A large number of the breaks which occurred during 1913 were also due to poor wire and "wild" trolley poles.

Electric Rivet Heaters Prove Efficient

A NEW electric rivet heater has been placed on the market by the General Electric Company, Schenectady, N. Y., which has proved both efficient and economical and gives promise of superseding the coke forge and the oil-burning furnace for rivet heating.



FRONT VIEW OF ELECTRIC RIVET HEATERS

The machine is shown in the accompanying illustration and at the first glance gives one the impression of a portrait camera ready for action. The rivets to be heated are placed between two electrodes and complete the circuit. These electrodes can be operated separately by the use of pedals, so that the man operating the machine can take out a heated rivet from one side, replace it with another to be heated and then shift to the other side for the next heated rivet. A switch on the back of the machine gives the variations of current needed in heating rivets of different sizes. The machine as constructed is capable of heating 800 rivets per hour, which is believed to be the maximum number an operator can handle.

Some of the advantages claimed for electric rivet heating are saving in time, reduction in danger of burning, and no smoke, ashes or gas to inconvenience the workers.

Richard Sachse, chief engineer Railroad Commission of the State of California, states that great interest has been manifested in England, France, Germany, Sweden and Japan in the report of inductive interference, which was reviewed in the issue of this paper for Feb. 28, page 455.

# Signaling the Approach of Cars for Connection

## A Description of Equipment as Developed to Signal Main-Line Cars When a Branch-Line Car Is Approaching to Make Connection

By HARRY RESTOFSKI

West Penn Railways, Connellsville, Pa.

THERE is a branch line a little over two miles in length on our line on which one car makes a round trip every half hour. This branch connects with the main line a short distance from a waiting room, as shown in an accompanying diagram. The branch line car is due at the waiting room on the hour and half hour, at which time main line cars pass others at the siding located at this point.

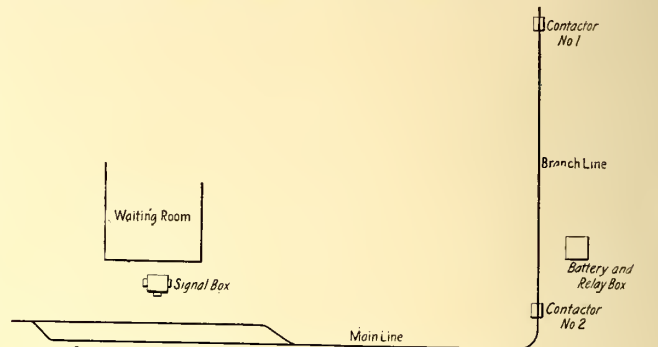
Prior to the installation of the signal described herewith, there was no way of knowing how late branch-line cars might be. For this reason it became the practice of crews not to delay main-line cars in order to wait for the branch-line cars to make the connection. At times the branch-line car would arrive immediately after the departure of the main-line cars, so that it would then be necessary for passengers to wait a half hour in order to make connection.

The equipment shown in a second illustration was installed to remedy this condition. Two directional contactors were attached to the trolley of the branch line. No. 1 contactor was located such a distance from the waiting room that the running time for the car from this point was two minutes. The other contactor was located at a point where the two lines join just below the waiting room. A battery box with relay equipment was located near contactor No. 2 and a signal box with red bull's-eye lenses was installed in front of the waiting room.

The equipment is automatic in its operation and the

latter is held in place against the action of the spring G. The signal light continues to burn until the car reaches contactor No. 2, when a circuit is established through the relay A and a portion of the dry batteries. Relay A then attracts the armature B which allows the spring G to open the alternating-current contact at E and so interrupt the flow of current to the signal line.

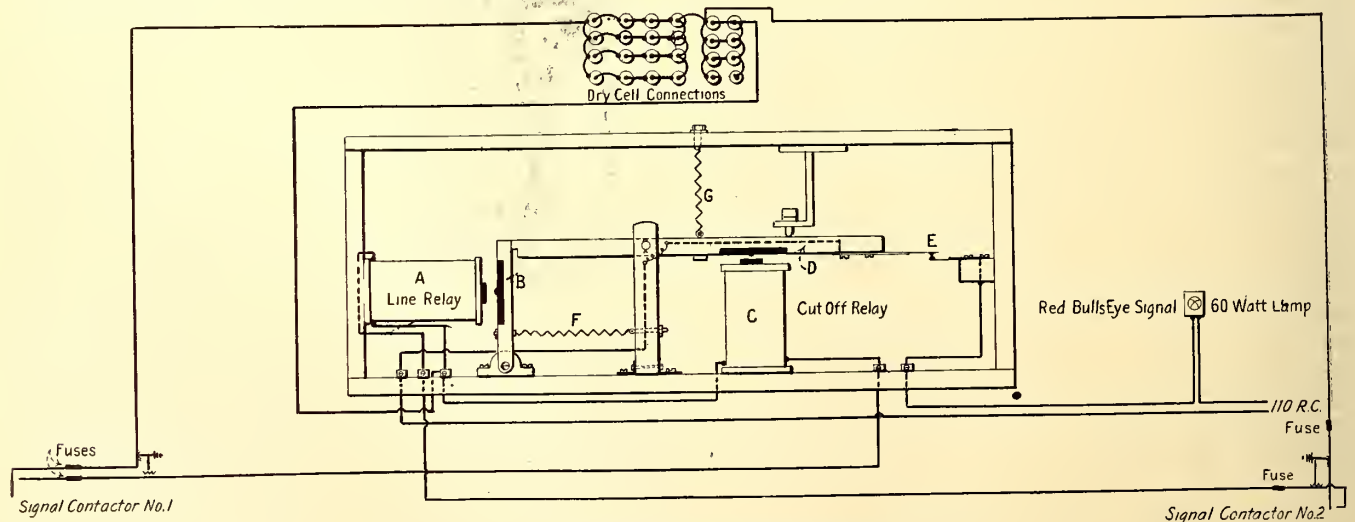
The signal thus shows red when the branch-line car is



LINE CONNECTION AND LOCATION OF SIGNAL APPARATUS.

within two minutes of the waiting room and if necessary main line cars are held that length of time.

The relays might have been operated from the trolley or with 110 volts alternating current, but it was decided to use dry cells as it was thought that less trouble would thus be experienced. Fewer cells are used in the circuit to No. 2 contactor than in the No. 1 contactor circuit because the former is closer to the relays and there is therefore less line loss. The battery as installed has a life of from six to eight months as current is used only at the instant that contact is made at one of the directional contactors. These contactors are a standard type built by the United States Signal Company. Fuses and grounded carbon blocks are used for



APPARATUS LOCATED IN BATTERY AND RELAY BOX.

sequence of operations is as follows: The trolley wheel of an approaching branch-line car operates contactor No. 1, which causes the momentary closing of a circuit from the battery through relay C. Armature D is thus operated causing contact to be made at E, and thus supplies 110 volts alternating current to the 60-watt signal lamp located in the signal box. As soon as the armature D operates, a spring F pulls the armature B to the right and under the offset end of D so that the

the protection of the contactor circuit. This equipment has now been in use for nearly two years and has proved entirely satisfactory.

A branch of the National Safety Council has been organized in Minneapolis with committees on finance, public safety, industrial safety, traffic, organization, schools and membership. It is planned to engage an expert safety engineer to take the lead in this work.

# A. I. E. E. Holds Traction Meeting

The Papers at the Pittsburgh Meeting of March 12 Covered Substation Problems and the St. Paul Locomotive—They Were Abstracted in Last Week's Issue—  
The Discussion Is Abstracted in This Issue

ONE OF the best attended meetings of the American Institute of Electrical Engineers which has been held outside of New York City took place in Pittsburgh on Friday, March 12. The entire day was devoted to discussion of railway apparatus and equipment, including descriptions of the two designs of locomotive for the latest Chicago, Milwaukee & St. Paul electrification. The papers for this meeting were abstracted in the March 13 issue of this paper.

The morning was devoted to an inspection of the Westinghouse Electric & Manufacturing Company's works at East Pittsburgh, during which the visitors had opportunity to see one of the new automatic switchboards which are being built for operation in one of the Cleveland Railway's substations. The most interesting event of the morning, however, was the inspection of one of the ten St. Paul locomotives which the Westinghouse company is furnishing. After an interesting motion-picture exhibit of railway electrification, the Westinghouse company entertained the group at luncheon in the Women's Cafeteria. The afternoon session was devoted to two papers on short circuit and rotary flashing protection, and to two papers on automatic railway substations. The evening session, held after an informal evening dinner, was devoted to the discussion of the two designs of the St. Paul locomotive. Over 300 were seated at the dinner and nearly 500 attended the meetings.

During the morning the board of directors held a meeting, at which, in addition to other matters considered, President Calvert Townley was authorized to appoint, after conference with W. S. Murray, a committee for the specific purpose of study and report on the super-power scheme for the Northeastern Atlantic Seaboard. It will be recalled that at a meeting of the Institute held in New York City on Feb. 20, a resolution was passed requesting the board to consider the advisability of appointing such a committee.

## PROTECTION AGAINST FLASHING ANALYZED

In the discussion of the papers on "Short-Circuit Protection for Direct-Current Substations" by J. J. Linebaugh and on "Flashing of 60-Cycle Synchronous Converters and Some Suggested Remedies" by M. W. Smith at the afternoon session, F. D. Newbury made the point that a modern high-speed breaker is a greater potential danger than an ordinary breaker. Unless it clears the circuit before flashing occurs, it may cause flashing by its opening. If the circuit is not opened at all, there is less danger from flashing than if it is opened just after flashing occurs. That is, if on account

of the high current there is sufficient gas generated to "short" the machine, then that "short" will continue even after the circuit is opened. Mr. Newbury also pointed out that the two papers do not agree as to the effectiveness of flash barriers as a protection against flashing. While perhaps the question is not finally answered now, it is hoped to find the answer of flash

protection without the use of barriers, which form obstructions around the commutator and brush-holders. The high reluctance of the commutating pole is an improvement which will assist materially in the solution of this problem.

C. H. Jones, electrical engineer Chicago, North Shore & Milwaukee Railroad, quoted some interesting experiences with reference to flashing in its substations. From its experience, the new commutating-pole converters are apparently much more liable to flash than the older converters. Whether this is a bad effect accompanying better design in other ways, as compared with the older types of converters, or whether there is some other reason was not

analyzed by Mr. Jones. He stated that he was merely presenting experience. New equipment has been installed with barriers and none of these rotaries have flashed. Sometimes the rotaries have been heard to "squeal" as though they were about to flash, but they have never done so. Two of the rotaries which had been installed without barriers flashed on occasion; since adding barriers there has been no record of a flash. The stresses imposed which have caused flashing, when flashing occurred, and "squealing," when flashing seemed imminent, have been as great as those involved in starting a four-car train in front of a substation, the train drawing 1,000 amp. per car at the start.

In closing the discussion on these papers the point was made that in order to prevent flashing by means of a high-speed breaker the circuit must be broken before one commutator bar can move from one brush to another, and this time element usually cannot exceed 0.008 sec. The General Electric Company experiments, in which a breaker was timed, included one test (which was verified by repetition) of breaking dead short circuit five times in seven seconds without any subsequent flashing. A high-speed breaker is particularly effective with a machine having high-reluctance commutating poles, and, if the development along this line is perfected, flash barriers may be done away with. A combination of a high-speed breaker, cutting in resistance, with a low-speed breaker which breaks the circuit completely somewhat later, has been used. However, the high-speed breaker upon operation, when it cuts in resistance, starts a cyclic variation on the alternating-

**WE** MUST LOOK at the subject of electrification broadly. Every heavy electrification so far installed has proved successful. No steam railroad operator who has an electrified section would consider reverting to steam. Electrical engineers must not becloud these facts in their discussion of types and details of locomotives. In the present instance, both locomotives will doubtless give satisfactory service on the St. Paul.

CALVERT TOWNLEY

President American Institute of Electrical Engineers

current side, and, if the low-speed breaker operates seven or eight cycles after this, the machine is still likely to flash due to the variations on the alternating-current side not having been damped. If, on the other hand, the low-speed breaker does not operate until seventeen or eighteen cycles, the operation is satisfactory.

#### AUTOMATIC SUBSTATIONS FAVORED

Much interest was evident in the discussion of "Automatic Railway Substations" by F. W. Peters, and "Automatic Substations for Heavy City Service" by R. J. Wensley. S. Q. Hayes related what seemed to him a coincidence, that only on the preceding day he had received information from Brown, Boveri & Company, that one automatic substation is now installed in Switzerland. This, however, is not automatic in the sense in which the term is used in this country, in that the station starts operation when the load approaches it, but rather that it starts and stops automatically by a clock arrangement, starting at a certain given time in the morning and stopping at a set time in the evening.

C. H. Jones stated that from the two and a half years' experience of his company the automatic substation is a success, at least in heavy interurban traction service, in fact, he feels that the automatic substation is more satisfactory than the manual. On this road there are five substations, three of 500-kw. capacity each, one of 300-kw., and one of 1,000-kw. All are 25-cycle, but one is being changed over to 60-cycle, and a new 60-cycle substation is on order. These five substations operate on an interurban system where 47-ton steel cars are used in from one to four-car trains. Mr. Jones emphasized, however, that an automatic substation cannot go forever without attention. It needs careful observation and maintenance, and he has found it necessary to make inspection once per day.

Mr. Jones made the additional point that he has found it desirable to know what the station has done between inspections. At the present time no recording instruments of any kind are furnished by the manufacturers to indicate what happens in the station between inspections. Manufacturers should provide some such equipment. In its absence he has installed Veeder counters on each piece of operating mechanism and, by checking up the number of times one piece operates against the number of times the others operate, some idea of the general action of the various pieces is obtained. But this is not sufficient.

Another speaker argued that the installation of automatic substations allows a road to carry over peaks with smaller installations on account of the inherent characteristic of intermittent operation. Continuous operation, even with low loads, keeps machine temperatures up, whereas intermittent operation, over the peak only, allows a greater peak load. Another feature is that the low trolley voltage, due to the inadequate system of distribution from manually operated stations, the number of which must be affected by the operator's wages, may be much improved by redistribution of substations on the automatic basis. As an inverse to the taking down of copper in Mr. Wensley's analysis, an automatic substation may prove its economy by savings realized by obviating the necessity for putting up copper. Many electric railways must also control auxiliary circuits, such as lighting, sometimes industrial power,

and sometimes pumping, and this may also be done from the automatic substation. Another economic feature with reference to shut-downs due to labor strikes is that in many cases where some labor can be obtained, the main power house can operate and automatic substations will keep the system going, thus making a saving in preventing the loss of revenue which would occur through non-operation of the road.

Another speaker said that little had been said about high-tension switching. On interurban roads which are competitors of steam roads, continuity of service is of extreme importance. Where the road depends upon a long-distance high-tension supply line a steam station is usually kept in "hot standby" and, if the long-distance line falls, the steam station cuts in. Such interurban roads using automatic substations must then have duplicate lines with additional relays to cause automatic transfer from a disabled line to another line, so arranged that, when the disabled line is restored the station automatically returns to it. Another feature in the case of a "disconnect" due to overload is that a manual station's operator usually is told to make three trials to close the circuit, spacing these trials about a minute apart, and, if trouble still exists, to report to someone higher up. In automatic substations there must be something to take the place of this, and a motor-operated switch has been used to close the circuit three or four times at satisfactory intervals. Then, if trouble still exists, the switch is locked up and the dispatcher is automatically signaled.

#### FUTURE POSSIBILITIES OF THE AUTOMATIC SUBSTATION

Donald Bowman, Commonwealth Edison Company, raised a question in regard to the future possibility of the application of automatic substations to extremely heavy low-tension direct-current service. His question related to a system where the whole distribution plant is underground and the element of continuity of service is at least equivalent in importance to operating cost. In many substation operations it is satisfactory if everything is done as per schedule, but if on a large system a generating unit or a substation unit burns out, either of which seriously impairs continuity of service, then there must be emergency switching, both high-tension and low-tension. And in part the switching done must be developed by the needs of the moment and can hardly be scheduled in advance. Similar conditions arise when a manhole "blows out" or when some other heavy accident happens in the underground distribution system.

In closing the discussion on these two papers Mr. Peters stated he was in thorough agreement with Mr. Wensley on the analysis of concentrated city service. To be sure, most of the present installations are interurbans and there is no doubt as to the return on the investment in those cases. On the other hand, in heavy city service the equipment is not so cheap and the attraction to automatic stations in big centers must be based on an analysis such as Mr. Wensley has given and on more effective operation in general. If all engineers took the interest in automatic substations which Mr. Jones does they would be much better off. He said also that there are several automatic substations operating in Australia and one is now being shipped to New Zealand.

Mr. Peters said also that the application of automatic substations to industry has been urged, as these are



excellent in large factories. For example, in the case of an industrial plant having a long low-voltage distribution, the fixed charges on the actual investment in copper plus the heating losses will more than take care of the installation of small automatic substation units in the industrial establishment. One large manufactory is now installing several of these to replace its heavy low-voltage distribution.

#### ABSOLUTE AUTOMATIC OPERATION IMPROBABLE

Mr. Wensley first answered Mr. Bowman's question as to intensified low-voltage systems and stated that this was a real problem, perhaps the biggest problem in the application of automatic substations. There have already been developed as part of the standard product selective power relays to clear out from the tie bus feeders which are giving trouble. Power can be fed in through several buses from different directions and automatically relays can pick a satisfactory live bus. Many other operations like this can be performed. But, in Chicago, where there is one of the largest networks in the country, it will probably be impossible to make the whole system automatic. The system operator, however, might be enabled by some method of selection, such as is used in the automatic telephone system, to control individual switches in a substation and thus take care directly of the emergency switching.

On the other hand, the automatic substation has some inherent characteristics in the case of serious shut-downs which can never be equalled by the present manual method of operation. Reference here is made to a condition in which there is a complete, or very large partial, shut-down of service and in which service must be restored. Under manual operation, if the whole or a large part of the system is down it is frequently necessary to send out men to cut off individual buildings and large feeder sections, so that the load may be taken on a little at a time. Under the automatic system the feature of load-limiting resistance helps the system to come back gradually and pick up the entire load without any such universal disconnection. Mr. Wensley was willing almost to guarantee that an automatic substation system could pick up a full load within three minutes after power was supplied again, as compared with an estimated three hours under manual operation.

Of course the principle of load limiting resistance is not limited in its application to automatic substations, but it might be installed as an auxiliary to manual operation. However, the additional automatic features of the automatic substation are well worth while, for they tend to make the operation most rapid, in fact, some series of operations are completed in the same time that the station operator would be deciding as to which switch to throw first.

Referring to the necessity for applying high-speed circuit breakers to automatic substations, Mr. Wensley said that by the automatic introduction of three steps of resistance in cutting down a short circuit before opening up, the necessity for a high-speed circuit breaker is eliminated.

#### A MUSICAL TREAT AT THE DINNER

After the informal dinner in the evening, short addresses were made by E. H. Sniffin, manager of the power department of the Westinghouse Electric & Manufacturing Company, by A. W. Thompson, president of the Philadelphia company, which owns and oper-

ates the local electric light and power company, gas company and railways and by Calvert Townley, president of the Institute.

During the dinner the guests were very pleasantly entertained by a musical treat by Phillips Thomas of the Westinghouse Company. Mr. Thomas produced his music electrically. By means of a convenient keyboard mechanism he connected various values of inductance and capacity in a resonating circuit whose source of energy was a mercury vapor lamp and to a piano accompaniment played a large number of popular and even classical airs. A loud speaking transmitter served to make the music audible to all in the large dining hall.

#### LOCOMOTIVE DISCUSSION LACKS EXCITEMENT

At the evening session the two papers by A. F. Batchelder and S. T. Dodd of the General Electric Company and N. W. Storer of the Westinghouse company were presented in discussion of the two designs of locomotive for the Chicago, Milwaukee & St. Paul Railroad. Judged from the tenor of previous Institute meetings on matters having to do specifically with methods of trunk line electrification, the discussion at this meeting was, as Mr. Storer expressed it, exceedingly tame. None of the lively discussions between representatives of the two schools of thought developed, as might have been anticipated from earlier traction meetings.

Mr. Storer, after reading his paper, made the additional remark that it would be difficult to imagine two results or two locomotives differing more than these do and yet made to fill the same specifications. On the other hand, this very difference shows the flexibility of the application of electricity, not only to traction, but to industry in general.

R. L. Wilson, recalling his practical experience in the beginning of heavy electric traction on steam roads, said that the early impression was that the electric locomotive was so complicated as to be not readily accepted by steam railroad operators. It still appears to some railroad men to be a complicated piece of machinery, but its reliability has been proved. There is quite a divergence mechanically between these two locomotives. The Westinghouse locomotive is the well-known Pacific type, but what led to the other type is not apparent. It seems that the General Electric Company expected its locomotive to react on the track and that certain devices have been introduced to overcome this tendency. One of these is the use of rollers under the cab. On the New York, New Haven & Hartford locomotives a roller is used under the cab, but, while similar to the one now adopted on the St. Paul locomotive, it differs in that all rollers continue to bear weight, whereas there is a possible objection in this one in that the roller on one side rolls up an incline and is active, but the roller on the other side may be left without weight on it and thus prove a weak point.

The slow speed motor on the General Electric locomotive would naturally call for high copper losses. The question was raised as to the reasonableness of the amount of heat which would be produced in the motors on the long grade which these locomotives must negotiate on the St. Paul. Another question related to the temperature rating, the paper having given 266 hp. as the rating of the motor at 120 deg. temperature rise, but having said nothing as to the maximum operating temperature expected. Considerable stress having been laid upon the efficiency of the gearless motor at high speed,

the question was raised as to what would be the average speed at which these locomotives would operate.

Mr. Storer was asked as to possible contemplated difficulties with the exciter, which is mounted like an ordinary interurban motor. The point was brought out that this means a reversal of the ordinary drive between gear and pinion in this type of mounting, in that the usual drive is a small pinion driving a large gear, whereas in this case the large gear drives the small pinion. Mr. Storer's reply was that the size of the axle-driven generator was so much over the amount of power it would be called upon to give that no trouble with this was anticipated.

A. M. Candy, in discussing the complexity of the modern locomotive, related his experience in connection with the Pennsylvania electrification. In this case a man was placed on each locomotive to help the engineer in case of trouble and these men vied with each other in finding quick answers to hypothetical troubles and stayed up late at night familiarizing themselves with all the various details of the locomotive, but in no case was there any opportunity to test their ability. The complexity is apparently over-emphasized. Another speaker called attention to the fact that in comparing the electric locomotive with the steam, if every little detail of the steam engine from the chemistry of its coal to the final mechanics of its valve motion were taken into consideration, it might be found as complex in its way as the electric locomotive is in its own.

#### SUCCESS OF ELECTRIFICATION EMPHASIZED

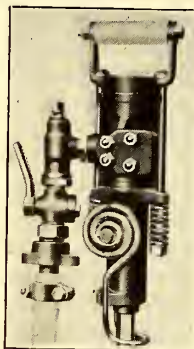
President Townley emphasized the fact that the electrification of the steam road must be looked at broadly; that so far every electrification of a steam road had been successful; that, to be sure, these electrifications had all been with different types of locomotives, varying in design and efficiency, but that electrical engineers must emphasize the uniform success of electrification. No steam railroad operating man who has an electrified section would discard it now and replace it with steam. When electrical men argue too much about the types and locomotives, steam railroad operators may grow skeptical. What will probably happen in the present instance is that both of these locomotives will perform to the entire satisfaction of the Chicago, Milwaukee & St. Paul Railroad, and while electrical engineers may learn something from the comparison of the two designs for a given specification, the argument about these two designs should not be emphasized in such a way as to throw any doubt upon the intrinsic value of either. Electrifications now planned and to be executed in the near future will call for so many locomotives that all the facilities of all the manufacturers will not be enough to satisfy the demand.

In closing the discussion Mr. Dodd said that he did not know the temperature at which the motors would operate, but that he knew the motors would perform service and called attention to the successful operation of similar motors on the New York Central. As to complexity, he stated that if it were desired he could show diagrams much more complex than those showed by Mr. Storer but emphasized again the point made by Mr. Townley that the first thing to look toward is service. With reference to the center of gravity, he stated he did not see that it made much difference where it is, so long as the weight is properly distributed to make a locomotive ride the track satisfactorily. In this connection he called

attention to a previous discussion of this point by Mr. A. F. Batchelder before the American Society of Mechanical Engineers at its annual meeting in December, 1916.

He brought up another point of Mr. Townley's that there is a big job ahead in electrification and it is splendid to have these two designs upon which to base further developments. At the present time there are about 350 heavy traction electric locomotives and about 63,000 steam locomotives, so that the work of electrification is just beginning and there is much to work out before electricity comes into its own.

Mr. Storer said he was sorry the meeting had been so tame. He said he tried to start a few things but could not get any reaction. He did emphasize that he was very glad that the two companies were both working on the same job, that both locomotives would probably perform good service for the railroad, and that, as a result of the divergent designs, the whole art would benefit from the results of the study of the service of the two locomotives.



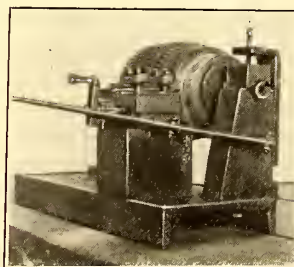
HAND HAMMER  
DRILL

#### Light, Hand-Hammer Drill

A SMALL, light, hand-hammer drill has been developed by the Ingersoll-Rand Company, New York, N. Y. This machine is known as the "Bar 33 Jackhammer." Its weight is 21½ lb. and it is recommended for drilling holes in concrete or other foundations, where a machine of extreme light weight is necessary. It is not recommended for drilling deep holes or for use in hard rock.

#### Commutator Slotter for Small Armatures

THE accompanying illustration shows a small, simple commutator slotting machine which was made up in the shops of the Georgia Railway & Power Company, Atlanta, Ga., to do the slotting work on the air compressor armatures. As there are only about two arma-



SMALL HAND-OPERATED  
COMMUTATOR SLOTTER  
FOR SMALL ARMATURES

tures to be repaired each week, it was not considered worth while to devise a power-driven machine using a revolving saw for cutting away the mica.

In this machine a sharpened piece of hack-saw blade is held in the tool post by two yokes fastened to the tool head by four bolts and nuts. The tool head is shifted toward and away from the commutator by means of a crank and a ⅜-in. screw. This tool post is also machined so that it may be moved laterally or axially by means of a lever having its fulcrum on the pedestal which supports the armature. This handle is attached to the tool head as seen, and a slot in the lever permits of oscillating the tool back and forth by means of the lever. The lever is 5 in. long from fulcrum to the point of tool head attachment and 12 in. long from this point to the end.



ELECTRICALLY-OPERATED TRAIN ON COAST DIVISION OF THE CHICAGO, MILWAUKEE & ST. PAUL RAILROAD ON THE SUMMIT OF THE CASCADE MOUNTAINS

# St. Paul Electric Service Out of Seattle Begins

**Notable Inauguration of Service on March 5 Attended by Representatives of Railroad, Power and Manufacturing Interests**

THE inauguration of electric passenger service on the Coast Division of the Chicago, Milwaukee & St. Paul Railroad occurred on March 5, 1920, when a train drawn by a General Electric locomotive made the run from Seattle to Cle Elum and return. On board was a party consisting of officials of the road, executive heads of the Puget Sound Traction, Light & Power Company and the Stone & Webster companies, representatives of electrical manufacturing companies, newspaper men from all over the Northwest, technical and trade journal correspondents, five motion-picture operators and a number of commercial photographers. In all 114 persons were on board the train as the guests of the Puget Sound Company which furnishes power for the operation of this section of the road. The trip occupied eleven hours, and the program worked out according to schedule. This locomotive is one of five which will furnish passenger service on the Coast Division, where the freight locomotives will be re-gearred G. E. locomotives transferred from the Rocky Mountain Division. The passenger service formerly given with the last-named will be given with the new Westinghouse locomotives described, together with the G. E. machines, in the issue of this paper for March 13. The accom-

panying photographs show the train and the party, and give an idea of the scenic beauties en route. Officials of the Chicago, Milwaukee & St. Paul on the "special electrical" train were: H. B. Earling, vice president; Macy Nicholson, general manager; J. L. Brown, assistant superintendent of transportation; J. R. Veitch, assistant traffic manager; R. Beeuwkees, chief electrical engineer; F. B. Walker, assistant electrical engineer; H. W. Williams; A. P. Chapman, Jr., assistant general passenger agent; W. L. Hubbard (all from Seattle); E. A. Lalk, Tacoma; W. P. Warner, Spokane; F. J. Allman, Tacoma; F. C. Dow, Tacoma, and J. F. Bahl, A. J. McCarthy and R. F. Randall, Seattle. Others in the party were: W. S. Elliott, general manager, O. W. R. & N., Spokane; W. H. Wingate, trainmaster, Milwaukee, Seattle; William Emerson, traveling engineer, Milwaukee, Seattle; Frank Rusch, superintendent motive power, Milwaukee, Seattle; R. J. Middleton, assistant chief engineer, Milwaukee, Seattle; R. H. Dean, electrification department, Milwaukee, Seattle. Representatives of steam railroads and electrical manufacturing companies were guests on the trip, as follows: I. B. Richards, general superintendent Northern Pacific, Tacoma; W. H. Olin, assistant gen-



TRAIN STARTING ON RETURN TRIP FROM CLE ELUM TO TACOMA TERMINUS



OFFICIALS OF THE MILWAUKEE AND PUGET SOUND TRACTION, LIGHT & POWER COMPANIES, NEWSPAPERMEN AND GUESTS OF THE COMPANIES ON THE INITIAL TRIP OVER THE MOUNTAINS. PICTURE TAKEN AT CLE ELUM, WASH.

ral freight and passenger agent, Oregon-Washington Railroad & Navigation Company, Seattle; H. F. Alexander, president, Pacific Steamship Company, Tacoma; A. M. Ingersoll, H. R. Williams, A. I. Bouffler, W. C. Dawson, C. D. Phillips, A. F. Marion, O. S. Bowen, A. R. Cook, Charles E. Peabody (all of Seattle and Tacoma); J. B. Cox, General Electric Company; H. E. Plank, General Electric Company, Seattle; W. D. McDonald, Westinghouse Electric & Manufacturing Company; Captain R. B. Childs, Inter-Mountain Power Company, Seattle; C. M. Riddell, mayor, Tacoma; J. W. McCune, chairman Tacoma Commercial Club; Rene Martin, London; A. B. Howe, Tacoma; E. E. Kimball, General Electric Company; Allen W. Eshelby, Westinghouse Company, Seattle; S. Kaneko and Mosuke Higuchi, representing the Osaki-Shosen Kaisha Steamship Company, Seattle and Tacoma,

and F. H. Shepard, director of heavy traction, Westinghouse Electric & Manufacturing Company.

The Puget Sound Traction, Light & Power Company was represented by A. W. Leonard, president; W. J. Grambs; D. C. Barnes; John Harisberger, superintendent of power; R. T. Sullivan, George Newell; H. B. Sewall; George Quinan, chief engineer; H. J. Gille, E. A. Batwell, E. H. Thomas, W. H. Somers, Judge C. W. Howard and Scott Z. Henderson.

As the details of this electrification have been given in several recent issues of this paper, they will not be repeated at this time.

A map of the newly electrified section of the road was printed on page 481 of the issue of the ELECTRIC RAILWAY JOURNAL for March 6, and a news account of the inauguration of electric service followed in the issue for March 13, page 533.



TRANSPORTATION OFFICIALS ON THE TRIP

Left to right: J. L. Brown, Assistant Superintendent, Milwaukee; Macy Nicholson, General Manager, Milwaukee; A. L. Bouffler, Seattle; F. M. Dudley, General Attorney, Milwaukee; R. F. Weeks, Division Freight & Passenger Agent, Milwaukee; H. W. Williams, Chief Draftsman, Milwaukee; H. B. Earling, Vice-Pres., Milwaukee; R. J. Middleton, Assistant Chief Engineer, Milwaukee; J. R. Veitch, Assistant Traffic Manager, Milwaukee; A. W. Leonard, President, Puget Sound Traction, Light & Power Company, Seattle; J. F. Bahl, Assistant Ticket Agent, Milwaukee; R. Beeuwkes, Chief Electrical Engineer, Milwaukee

# C. E. R. A. Discusses Energy Saving

Paper by Prof. D. D. Ewing and Formal Discussion by Four Energy-Saving Device Manufacturers Are Features of Second Session — Abstracts of Two Papers on Bonding, Presented March 10, Are Published

A BUSY second-day session of the annual meeting of the Central Electric Railway Association March 10 and 11 at Louisville, Ky., was given over very largely to the presentation of a paper by D. D. Ewing, professor of electric railway engineering, Purdue University, on the "Economical Use of Electricity for Car Purposes," and the formal discussions by L. E. Gould, L. M. Clark, C. H. Koehler and William Arthur which followed. Abstracts of this paper and the discussions which followed will be published in a later issue. The report of the March 10 session and abstracts of two of the papers were printed last week. Abstracts of the other two papers of March 10 appear below.

President John F. Collins presided at the second session Thursday morning and made the paper and the discussions mentioned above the first order of business. At the conclusion of the discussion of these papers, Charles L. Henry commented upon the splendid points which had been brought out for making further economies in operating costs and admonished the members to put them into use, saying that the suggestions were of no value unless they were put into practice. He complimented the association and the program committee for the manner in which it had always gone down into the meat of things and developed studies and data and information which were of the greatest value to the member companies.

H. A. Nicholl, Anderson, Ind., when called upon to discuss the energy saving schemes, said that his company had recently undertaken an energy-saving campaign through the use of watt-hour meters because it believed that this would result in making available better data on the cost of operation, and would bring about a better distribution of equipment since it would show what cars were the heavier energy users. This made it possible to use the cars consuming the least power on those lines where the least power was available. It was also thought that valuable data would result as to the energy consumed by empty and loaded cars and that required for pull-ins; and further that the inspection of equipment on a kilowatt-hour basis, a plan afforded by the watt-hour meter, would result in economies of very great value indeed. Mr. Nicholl said that he thought the matter of energy saving through the use of one of the several devices was a subject which should be carefully looked into by every company.

As members of the committee on a national safety code to work with similar committees from other electric railway associations, President Collins appointed James Harmon, safety manager Interstate Public Service Company, New Albany, Ind., chairman, and H. A. Nicholl, Anderson, Ind., and E. C. Hathaway, Railway Audit Inspection Company, as the other members.

H. A. Nicholl, chairman, W. H. Bloss and Allen Edwards were appointed a committee of three to consider the president's address.

W. G. Stuck, master mechanic Kentucky Traction & Terminal Company, Lexington, spoke briefly of the plan

of his company to equip all interurban cars with fare boxes on the rear platform and to make use of a combination pay-enter and pay-leave system of fare collections. Passengers boarding cars at the principal terminals will pass into the car without paying their fares but will receive a check on which appears the name of the town at which they boarded. These passengers will then pay as they leave the car, according to the distance traveled from the name which appears on the check. Passengers boarding the cars at rural points will pay as they board the car.

The election of officers was made an order of business at the Thursday session. Their names were chronicled in this paper, issue of March 13.

One of the pleasant features of the Louisville convention was that President Collins and a party of railway and supply men made the trip to and from Louisville in Mr. Collins' private car, the "Michigan." The round trip comprised over 1,200 miles. On the trip south, the car left Jackson, Mich., at 7 a.m., Monday, and arrived at Louisville at 8 p.m. Tuesday. The members of the party boarded the car principally at Fort Wayne and at Indianapolis on the trip south, and took leave of the car at these same points on the return trip. The route followed by the car was as follows: Jackson to Detroit via the Michigan Railway and Detroit United Railway lines; Detroit to Toledo, Ohio, via the Detroit, Monroe & Toledo Short Line Railway; Toledo to Lima, Ohio, and Fort Wayne, Ind., via Ohio Electric Railway; Fort Wayne to Bluffton, Ind., via Fort Wayne & Northern Indiana Traction Company; Bluffton to Muncie and Indianapolis via Union Traction Company of Indiana; and Indianapolis to Louisville, Ky., via Interstate Public Service Company. On the return trip the car proceeded from Indianapolis to Toledo by way of Dayton, Ohio, passing over the Terre Haute, Indianapolis & Eastern Railway, the Ohio Electric Railway, and the Western Ohio Railway.

The Interstate Public Service Company operated a special car from Indianapolis to Louisville and also a return car for the convenience of the delegates, a large party of whom availed themselves of this service.

## Distribution Problems of Interurban Railways\*

BY J. S. HAGAN

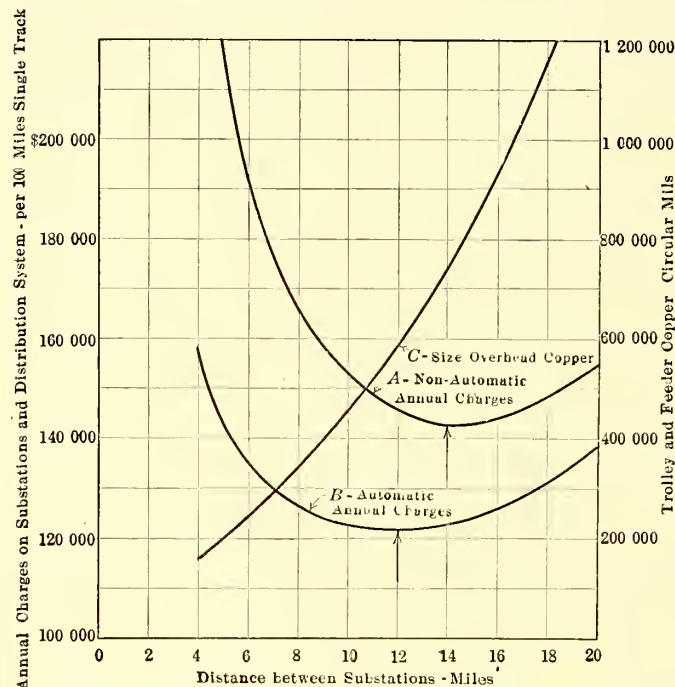
General Engineering Department Westinghouse Electric & Manufacturing Company

FROM an operating standpoint a high average voltage on an interurban line is very desirable. An article on "The Effect of Low Voltage on Railway Motors" by G. M. Woods in the ELECTRIC RAILWAY JOURNAL of Jan. 27, 1917, discusses the subject in detail, and points out the advantages of high voltage, and the disadvantages which result with low voltage. Because of the distances involved and the comparatively

\*Abstract of paper read at annual meeting of Central Electric Railway Association, Louisville, Ky., March 10, 1920.

light traffic on the average interurban road, the expense involved in supplying substation and feeder capacity to maintain a high average voltage is very great. It is the purpose of this paper to consider the factors which enter into choosing the location of substations and size of feeders and bonds on interurban roads.

In operation the ideal condition would be obtained if the power distribution were such that the voltage at the cars would at all times be that of the substation. The most economical distribution system is that in which the fixed charges on the investment are equal to the cost of the power lost in the distribution system. The minimum average voltage at which typical car equipments will maintain a desired schedule is fixed



CURVES SHOWING ECONOMICS OF SUBSTATION SPACING

within limits; and the voltage which will occur with recurring "bunching" of cars should not be below 350 volts as minimum on a 600-volt line.

With a given substation voltage and substation spacing, the choice of sizes of trolley line, feeders and bonds is dependent upon the profile of the road, size of the rail, number of tracks, weight of trains, headway and schedule speed of the equipments operating. Since the voltage at the train is determined by the sum of the voltage drops in the overhead copper and the return circuit through the rails, it is evident that, all other factors remaining equal, less feeder capacity would be required if there were two tracks than if there were one. Less feeder would be necessary with a single track of 90-lb. rails, than with one of 60-lb. rails.

#### WEIGHT OF TRAIN IS A BIG FACTOR IN FEEDER REQUIREMENTS

The current required to accelerate a two-car train is twice that required for a single car, and with a given substation spacing the increase in the amount of feeder to keep the voltage the same is much greater than in proportion to the currents. To illustrate the effect which the train weight has upon the feeder required, assume that a 600-volt single-track road with 70-lb. rails and No. 0000 bonds has substations spaced 10 miles apart. Take the weight of a single car with load as

60,000 lb. Assume that cars run on a 30-min. headway and, with an average of one stop in two miles, make a schedule speed of 30 m.p.h. With these conditions there is never more than one car moving in each direction between substations. Assuming that one car is running while the other is starting at a passing track midway between substations as the worst voltage condition, there would be required 456,600 circ.mil of overhead copper to keep a minimum of 350 volts on the trolley at the car.

If multiple-unit operation with 2-car trains were advisable the same traffic would be handled by running on a 60-min. headway. As before, assuming that two of these trains were passing midway between substations, 1,381,600 circ.mil of copper in the trolley and feeders would be required to maintain the same minimum voltage as with single car. In this instance a 100 per cent increase in train weight required a 203 per cent increase in feeder copper. Actually, with such a difference in train weights the investment involved in increasing the number of substations and slightly increasing the overhead copper would be less than increasing the feeder by the amount indicated and keeping the same number of substations.

The selection of the proper gear ratio for different classes of rolling-stock has a very important bearing upon feeder capacity. An equipment which is geared for a high speed takes a high current in starting, and a greater amount of feeder and substation capacity is required than would be necessary with equipment geared for lower speeds. Where competition or local conditions demand high-speed passenger service, there is no alternative but to install substation capacity and feeders to take care of that service. However, on many lines equipments are geared for a speed greater than the service demands and might readily be changed to a lower-speed gearing with the resultant advantages of higher voltage.

#### LOCOMOTIVES SHOULD BE GEARED FOR SLOW SPEED

The question of slow-speed equipments is especially important with regard to freight haulage. A freight car or locomotive equipment which is geared for a speed comparable to that of a passenger car will impose a power demand which is too great for the substation and feeder system of the average road. A large proportion of the time a freight train is on the road is consumed in terminal, switching and standstill time, and the actual running time is comparatively small. A slight reduction in running speed therefore has little effect on the service rendered shippers, but the use of low-speed equipments is very advantageous to railways in reducing the peak demand on substations. By using slow-speed motors with maximum reduction gearing on locomotive and freight-car equipments, relatively heavy trains may be hauled and the power requirements are so low that in many cases, with proper dispatching, no additional substations or feeders are required.

From the foregoing it is evident that the feeder requirements for interurban roads will vary between wide limits. One 600-volt interurban road 17½ miles in length, handling comparatively light traffic, has only one power house and substation located at the center of the line. With stub end feeding distance of 8¾ miles only the No. 0000 trolley is used. A double-track 600-volt road in one of the eastern states, 90 miles in length is operating multiple-unit trains on a 40-min. headway. The substations are spaced approximately 10

miles apart, and two No. 0000 trolleys and 1,000,000 circ.mil of feeder extend the length of the road with several miles of 1,500,000-circ.mil feeder. Instances may be cited of roads using amounts of feeder varying between these extremes. Most interurban roads have No. 000 or No. 0000 trolley and from 300,000 to 600,000 circ.mil of feeder. However, the number of railways which do not come within these limits is so great that the only conclusion which can be drawn is that the distribution layout of each road must be considered separately to meet the local requirements.

A number of interurban roads are using 1,200 to 1,500 volts on the trolley. The effect of increasing substation voltage is apparent. The same factors which enter in determining substation spacing and feeder capacity for low voltages apply to the higher voltages. Due to the decreased current in transmitting a given amount of power a smaller number of substations of increased capacity and less feeder may be used with high voltages.

#### GOOD BONDING IS A PRIME DISTRIBUTION NECESSITY

The size of rail for an interurban road is determined primarily by the weights and speeds of the cars. Ordinarily, in outlying districts where electrolysis is not a determining factor, the rail size which will be most economical from a maintenance standpoint has sufficient conductance to provide a return circuit without additional negative feeders. In recent years the importance of maintaining a return circuit of low resistance has been recognized.

On interurban roads it is seldom that traffic is so heavy that the size of rail bonds is determined by continuous current capacity. Ordinarily, rail bonds which are large enough to keep the track loss within limits have sufficient capacity to carry the current without overheating, provided the bonding is in good repair. For instance, a No. 0000 bond will carry a current of 450 amp. continuously without overheating, and for short periods will carry five times that current. These values are in excess of the demand imposed by average interurban road traffic. The current-carrying capacities of bonds, of course, vary directly in proportion to their sizes. The resistance of the return circuit is more dependent upon having all joints well bonded rather than upon the use of heavy bonds. The length of bond is short compared to the length of rail, and the total  $IR$  drop through the bonds is a small percentage of the total drop in the return circuit. In a track with 70-lb. rails and No. 0000 bonds 10 in. long, only 9.2 per cent of the total track drop is in the bonds if good contact is made with the rails. By the use of 500,000-circ.mil bonds the loss in bonds would be reduced to 4.6 per cent of the total track drop. Putting it in a different way, an increase in first cost of bonds of 137 per cent results in reducing the track drop by less than 5 per cent.

It is impracticable to use bonds which have a conductance equal to that of the rail. On this basis a 70-lb. rail would be bonded with 795,000-circ.mil copper, and a 90-lb. rail with 1,020,900-circ.mil copper. Since so little is gained by the use of large bonds, their higher first and maintenance costs are not justified. Mechanical considerations as well as current-carrying capacity fix the minimum size of bond for electric railway use at about No. 0. Practically the largest bond in use is 500,000 circ.mil. Most electric

railways use expanded-terminal or welded No. 0000 bonds, 10 in. to 12 in. in length.

Up to this point the effect of the various factors on the choice of feeders and bonds has been considered on the assumption that the locations of substations were fixed. While the location of manually-operated substations may be determined to some degree by the existing freight or passenger stations, where the agents may serve as substation operators, in general it is possible to choose locations which will permit approximately the most economical layout of substations. For a given investment a relatively large number of substations and little feeder, or few substations and larger feeders, may be installed with the same loss of power in trolley and track. However, the sum of fixed and operating charges, or total annual charges, will be very different with different substation spacings.

With the automatically operated substation the elimination of substation attendance, except for inspection, is an obvious advantage. In many localities substation heating is eliminated, and in some cases the reduction of no-load losses of the substation effects a considerable saving in power. Due to the reduction in annual charges per substation, automatic substations may be more closely spaced than manually-operated ones. For the conditions of traffic which obtain upon each road there is combination of substation spacing and feeder size for most economical operation. These spacings are different for the manually-operated and automatic substations.

The accompanying curves illustrate the variations of annual charges with both manually-operated and automatic substations with various spacings for a set of conditions assumed nearly typical for a high-speed interurban line. On a 600-volt road having 75-lb. rails and No. 0000 bonds, single cars weighing 60,000 lb. are operated on a one-hour headway. The cars are geared for a schedule speed of 30 m.p.h. with an average of one stop in 2 miles. With these conditions the cars are spaced 30 miles apart, and with normal operation there is never more than one car moving in each direction between substations. It is assumed that the minimum voltage permissible with one car starting and one car running midway between substations is 350 volts, and the feeder requirements for each substation spacing are based on these assumptions.

In the diagram the abscissæ represent miles spacing between substations. Curves *A* and *B* show the total annual fixed and operating charges on the complete distribution system, except track, for manually operated and automatic substations respectively. Curve *C* shows the amount of trolley and feeder in circular mils required for each substation spacing to keep the minimum of 350 volts on the trolley at the car.

The points at which curves *A* and *B* become horizontal show the substation spacings and feeder sizes which are most economical for manually-operated and automatic substations. For this assumed case the proper spacing for manually-operated substations is 14 miles and 750,000 circ.mil of overhead copper should be used. With automatic substations the spacing is decreased to 12 miles, with 590,000 circ.mil of overhead copper. It will be noted that the total annual charges are less with automatic than with manually-operated substations, and that the greatest saving is made by increasing the number of substations and decreasing the amount of feeder.

It should be borne in mind that the exact relation of the curves depends upon the nature and volume of traffic, and that these curves are applicable only to the particular case set forth. However, the general relation of substation spacing for manually-operated and automatic substations is that illustrated.

The advantages inherent in automatic substations have only recently been recognized by railway operating men, and it is to be expected that most future substation installations will be of the automatic type. The interurban electric railway of the future will have single-unit automatic substations closely spaced, and relatively small feeders.

### Some Bonding Results\*

BY R. J. CUSTER

Engineer Maintenance of Way Interstate Public Service Commission, Indianapolis, Ind.

**B**ETWEEN May 1 and Sept. 30, 1918, we installed 5,084 new No. 0000 bonds between the Indianapolis City Limits and Taylorsville with an electric arc bonding machine. This track is laid with 60-lb. A. S. C. E. rail and has been bonded with three or four different types of bonds including those with compressed, soldered and brazed terminals, the greater proportion of which had finally failed on account of broken strands or of having been knocked loose entirely.

Two men were used with the machine. At first they pushed it ahead on the rails from joint to joint. Later when the locations requiring rebonding became widely separated, the machine was placed on the line car and these places were bonded as the car passed over the road on its regular maintenance supervision.

The cost of installation of these 5,084 bonds was \$2,807.60 or 55 cents each, the material cost per bond being 40.2 cents, and the labor cost 14.8 cents.

By the end of September we found that our power consumption had been reduced 0.76 kw.-hr. per car mile which, at an average production cost of 2.2 cents at the d.c. feeder, shows a saving of 1.67 cents per car mile. As production conditions at the power house remained the same and the same class of equipment was operated all through the period of bonding, this saving is undoubtedly due to the improved conditions produced by the new bonds. An illustration will show what this saving means. In September our car miles operated were 97,700 which at the 1.67 cent reduction in cost per car mile shows a saving for that month alone of \$1,631.59. You can readily see that the entire cost of the installation of these bonds was very quickly returned.

Between Aug. 19 and Sept. 30, 1919, we installed 3,500 bonds on our track between Sellersburg and Jeffersonville. This track is laid with a 75-lb. A. S. C. E. rail and was originally bonded with two concealed bonds with compressed terminals. The condition of these bonds became so bad that a complete failure of our automatic signal system resulted.

The method of procedure on this job was as follows: The bonding machine was placed in an old city motor car, properly grounded and equipped with the necessary operating switches. All the supplies necessary were kept in this car. The bonding crew consisted of a motorman, a brakeman and the bonding operator. The brakeman kept the mould clamp loaded and adjusted ahead of the operator. The motorman followed the oper-

ator from joint to joint. During the last week's work on this job this crew worked at night and installed an average of 200 bonds in eight hours actual working time. The average number of bonds installed per day during the twenty-eight working days was 124.

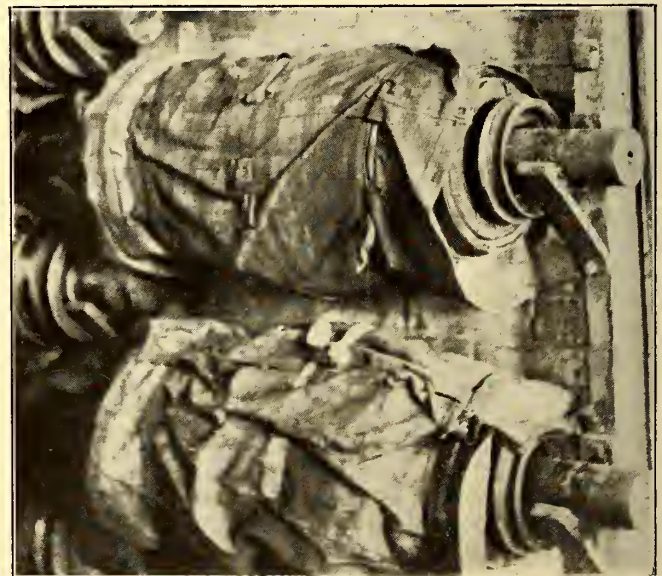
The cost of installation of these 3,500 bonds amounted to \$1,616.50 or 46.2 cents each, the material cost per bond being 35.1 cents and the labor cost 11.1 cents.

The average consumption per car mile for the three months following the completion of this job in comparison with that of the three months previous to the starting of the job showed a reduction in power consumed of 0.48 kw.-hr. per car mile. The power on this portion of our line is purchased at an average cost of 2 cents per kw.-hr. delivered to the d.c. feeder so that our saving is here shown to be 0.96 cent per car mile. As 51,192 car miles were operated during these latter three months, our saving will amount to \$491.44 or an average of \$163.81 per month. In this instance the cost of installation will pay for itself in power saved within ten months after the completion of the job.

After the installation of these bonds, in each case, it was noticed by the trainmen that it was easier for the trains to make their regular running time and this fact was often called to our attention by them.

### Keeping Dust Out of Armatures

**F**EW electric railways appear to realize the desirability of covering railway motor armatures after rewinding, to protect them from dust, but at the Salem (N. H.) shops of the Massachusetts Northeastern Street Railway all armatures stored on racks are covered with discarded car curtains as shown in the accompanying



ARMATURES COVERED WITH CURTAINS

photograph. The curtains are wrapped around the armatures and fastened in place with tape, and this simple expedient is undoubtedly a factor in reducing service troubles.

Richard Sachse, chief engineer Railroad Commission of the State of California, states that great interest has been manifested in England, France, Germany, Sweden and Japan in the report on inductive interference, which was reviewed in the issue of this paper for Feb. 28, page 455.

\*Abstract of paper presented before Central Electric Railway Association meeting at Louisville, Mar. 10.



## Oklahoma Utility Men Meet

Publicity, Mutual Insurance and Franchises Were Among the Subjects Discussed

THE Oklahoma Public Utilities Association, the membership of which is composed of officials of traction lines, electric light and power companies, gas companies, waterworks and other public service corporations, which met in an annual convention in Oklahoma City, March 9-11, adjourned with a banquet on the night of March 11. The convention elected officers as follows:

J. W. Shartel, vice-president of the Oklahoma City Railway Company, president; C. E. Devin, Apache, first vice-president; J. M. Gayle, Oklahoma City, second vice-president; William Mee, Oklahoma City, treasurer; H. A. Lane, Oklahoma City, manager. The new members of the Executive Committee are: E. W. Smith, Okmulgee; W. H. Crutcher, Oklahoma City; W. W. Lowe, Bartlesville; C. E. Devin, Apache; J. M. Gayle, Oklahoma City; F. B. Hathaway, Oklahoma City; J. G. Cronin, Oklahoma City.

R. C. King, an accountant of McAlester, was awarded a prize for the best explanation of the duty of a public service utility to the people.

A committee that has been working out a plan for compensation insurance for the utilities, reported that the details of the plan would be completed within a short time and submitted to the members of the association for their consideration.

The Legislative Committee reported that it had no special legislation to urge, but suggested that steps should be taken soon toward securing a revision of the system for taxing utilities, and also that provision should be made for indeterminate franchises for all public utilities. This is important, it was pointed out, when a utility faces the problem of securing money with which to make extensions and improvements to its service.

Bernard J. Mullaney, general manager Peoples' Gas, Light & Coal Company of Chicago, in an address declared that frankness on the part of public utilities in presenting to the public its claim for community support was important because the people should know the facts concerning the operation of a utility and should not merely be fed up on a lot of propaganda. Absolute frankness, he said, would go much farther in getting the desired results than any other course that might be pursued. Mr. Mullaney said that this idea had been carried out in Illinois in as practical a way as could be arranged up to the present time. The home paper, he told the convention, was the proper place for the manager of a utility to appeal to the people for community support, but he added that there were other ways in which this could be augmented.

A. Hardgrave, American Public Service Company, Dallas, Texas, said that the problem of operators having to appeal to the money markets in selling stock could be obviated somewhat by selling the securities locally to customers. He said this undoubtedly would improve the attitude of the public toward utilities.

H. S. Cooper, secretary Southwestern Gas & Electric Association, Dallas, Texas, discussed "current stealing," and told how effective work has been done in Texas, with the help of a State law, in discouraging this popular means of "beating" the electric light com-

panies. Mr. Cooper was requested to send to the secretary of the Oklahoma Association a copy of the Texas law which would be used as a model in framing a bill to be presented to the Oklahoma Legislature.

## Drilling Square Holes in Solid Material

A DEVICE for drilling a square hole in metal without previous preparation, which can be attached to a milling machine or drill press is being marketed by the Fairbanks Company of New York City. The trade name for the attachment is "Radebore Head."

The accompanying illustrations show how the holes are drilled. The attachment end of the drill is arranged for a swivel connection and has a positive drive from

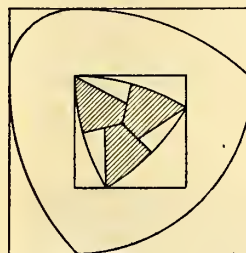


FIG. 1

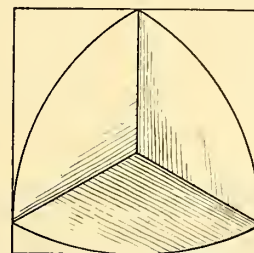
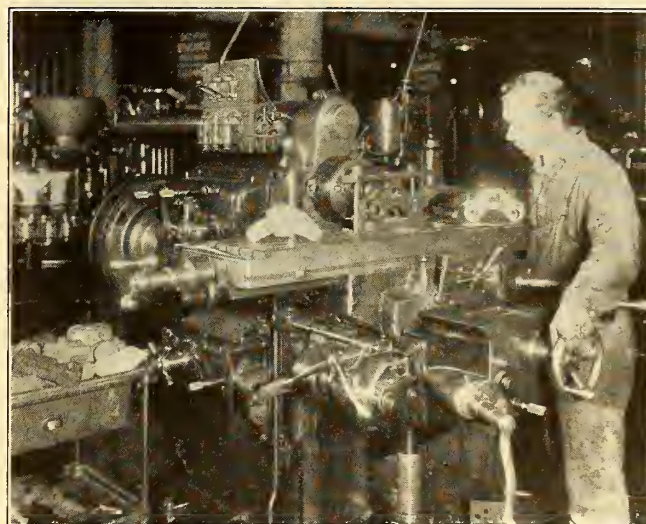


FIG. 2.



FIG. 3.

Drill, guide and cross-section of drill shank



DRILLING SQUARE HOLES IN ROCKER ARMS

the spindle of the machine. The shank of the drill follows around inside a square guide formed by the adjustable jaws of the head. Cutting edges are ground on the end of the drill. When the type of drill shown in Figs. 2 and 3 is used, square holes with "filleted" corners will be drilled. To make a hole with square corners a shank as indicated in Fig. 1 is used with one cutting edge longer than the other so that this will go into the corners to square them. The cutting lips follow a path determined by the adjustable jaws of the head so that no preliminary round hole is necessary.

Drills of two styles are manufactured, one producing a hole with rounded corners, and the other designed for die work and for squaring the ends of keyways, etc.

The heads or chucks are made in four sizes and two different styles. The range of drills is from  $\frac{1}{8}$  in. to 2 in. x  $\frac{1}{16}$  in. steps for the type of drill which produces round corners and from  $\frac{1}{8}$  in. to  $1\frac{1}{2}$  in. x  $\frac{1}{16}$  in. sizes for the type producing sharp corners.

## Compressor Overhauling Practice in Buffalo

A Definite General Overhauling Schedule for Car Equipment Assists in Keeping Parts in the Best Operating Condition

By J. W. HULME

Superintendent of Equipment International Railway, Buffalo, N. Y.

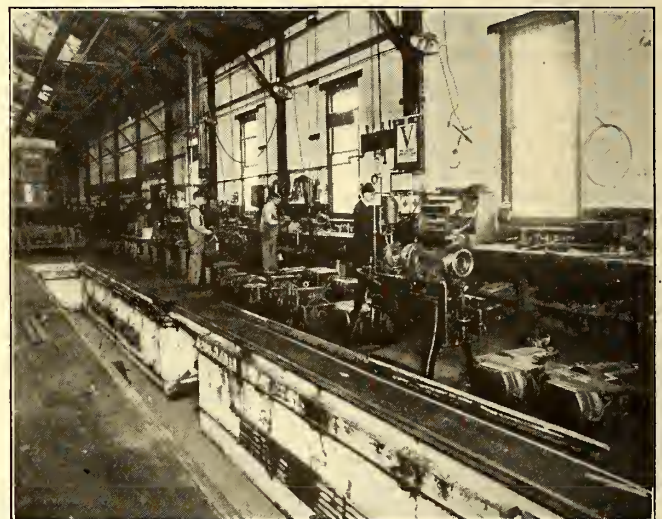
THE apparatus necessary for compressing, storing and regulating the pressure of air for electric cars is becoming more and more a vital consideration in the efficient operation of cars. When air compressors were first installed on electric cars, their sole purpose was to provide compressed air for use in the braking system in stopping the cars. From this beginning the use of air has extended to nearly all parts of the equipment, and when we look at the situation today we find compressed air used for operating the control equipment which starts and controls the car while it is running, for operating the braking system, for operating the

removal from the car, and the complete dismantling and cleaning of all parts, together with their renewal and reassembling with proper lubrication for the wearing parts. The compressor is removed from the car by means of a truck which has an adjustable height, as shown in an accompanying illustration. By the use of this truck one man can perform all the work necessary for removing the compressor and transporting it to the air room for thorough overhauling. In the air room, before any attempt is made to dismantle the parts, the compressor is thoroughly cleaned. For this purpose it is placed on a specially designed table 25 in. high x 36 in. wide and 96 in. long. This table is covered with No. 16 gage sheet iron. A solution of three parts of kerosene to one part gasoline is used to clean the outside casing of the compressor. After all dirt has been removed, the oil from the crank and gear case is drained out carefully and filtered for re-use as occasion demands.

After the compressor has been thoroughly cleaned on the outside, it is taken apart and the armatures, fields and brush-holders are sent to the electrical department



REMOVING A COMPRESSOR FROM THE CAR



AIR DEPARTMENT OF THE INTERNATIONAL RAILWAY

entrance and exit door mechanism, for applying sand to the rails, and in some cases for raising and lowering the trolley poles. This increased use of air has materially reduced the manual labor necessary in operating the car and at the same time has increased the schedule speed for the line, reduced the length of stop, and also decreased to a great extent the number of boarding and alighting accidents.

The possibility of run-ins due to air failure has increased with this added use of the air parts, so that those responsible for the maintenance of this equipment have been forcibly impressed with the vital importance of equipping all cars with the best air-brake equipment obtainable and then keeping it in first-class operating condition by periodical inspection and general overhauling. To meet these conditions the International Railway has given particular attention to this phase of its equipment, and as now arranged a regular weekly inspection is provided for, with a definite overhauling schedule in addition. This overhauling schedule provides for the cleaning of brake cylinders every year, and the general overhauling of all electrical and mechanical parts of compressors, motormen's operating valves, governors, door devices and sand valves every two years.

The overhauling of compressors requires their

for test and overhauling. The work in the electrical department comprises a thorough cleaning and any necessary tests to determine just what repairs are necessary. Of course, any grounds, short-circuits, or open circuited connections are repaired and then the fields and armatures are dipped in varnish and thoroughly baked.

On the overhauling bench in the air room, the mechanical parts of the compressor are thoroughly cleaned, the crank shafts and pistons are inspected and repaired, so that when they are again returned to service they will be in as good condition as when new. With all parts cleaned and repaired, the compressor is again assembled and tested. To provide for a careful running test, a testing rack has been fitted up to which the compressor is connected. During the test, careful attention is given to make certain that the operation of the compressor does not require more than the predetermined current. Also the air gage, which is connected to the storage tank into which air from the compressor is forced, is watched closely, and the hand of the gage must travel smoothly between the ranges of 80 lb. at which the governor cuts in to 100 lb. where the governor cuts out. After this test the pressure is reduced to 60 lb., and the time required to increase the pressure

from this amount to the cutting-out point which has been previously determined is measured. Ordinarily, the compressor is run for fifteen minutes continuously to insure that the electrical equipment is in first-class condition. In case the piston cylinders have been bored out, and bushings with new piston rings have been installed, the compressor is run for five hours with the bleed cock open so that the governor will cut in every ten seconds. This test is made so as properly to "work in" the various parts.

The governors, gages, motormen's valves, safety valves and door devices receive an equally rigid overhauling as do the compressors. All air pipes on the car are blown out to clear them of scale and are carefully tested for leaks.



POLE EXTENSION

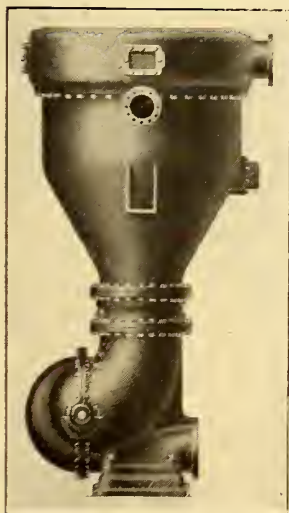
### Extension for Short Poles

THE advancing cost of labor and materials has led to the development of an extension for poles. This is being marketed by S. W. Hull & Company, Cleveland, Ohio. Two main compression members constructed of steel angles reinforced by steel bars comprise the frame, which may be fastened to the top of a pole by three through bolts. The construction permits of a large number of cross arms being installed; thus one can be bolted at every intersection of the lattice bars. The main compression members open and close to fit any size of wood pole top.

In addition to this extension being used where it is necessary to increase pole height, this has also proved advantageous where poles

have become butt-decayed. The old pole can be cut off at the ground and reset by the addition of a Hull extension frame, so as to give the original height.

### New Feature in Casing for Jet Condensers



VERTICALLY SPLIT CASING OF PUMP

A NEW feature in the vertically split casing of the tail-pump for vertical jet condensers, as manufactured by the Wheeler Condenser & Engineering Company, Carteret, N. J., has been brought out, and is illustrated herewith. This feature permits easy and quick removal of the pump rotor or other internal parts for inspection or repairs. The improvement is being added to two types of jet condensers manufactured by this company, the vertical jet condenser and the rectangular type counter-current condenser. Another feature

is the use of an expansion joint between the pump and the condenser body. This joint is designed to take care of changes in length due to temperature variation.

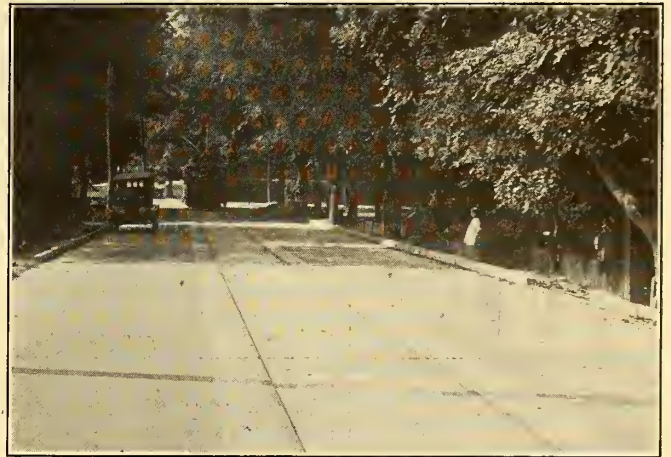
## Concrete Stringer Tieless Track Construction

Southern Public Utilities Company Has Standardized on Unique Construction, Believing It to Be the Most Satisfactory Type of Rigid Track

A RIGID type of track construction with the rails set in concrete and anchored by means of long hook bolts and without the use of any cross-ties, has been made standard construction by the Southern Public Utilities Company, which operates the street railway systems Charlotte and Winston-Salem, N. C., and Greenville and Anderson, S. C. This construction was originated by E. F. Taylor, formerly general manager of the company, and is unique in many respects.

The most conspicuous feature of the construction is the absence of ties. The rails are fastened by Carnegie clips directly to  $\frac{3}{8}$ -in. x 8-in. steel plates, and the bolt in every other clip extends down into a concrete beam and hooks around a  $\frac{1}{2}$ -in. corrugated iron bar which is laid continuous. The complete construction details are shown in the accompanying drawing.

The rail used is 70-lb. standard A.S.C.E. section, and the longitudinal plates on which the rail bears are



APPEARANCE OF THE SURFACE OF THE COMPLETED TRACK IN ANDERSON, S. C.

cut the same length as the rails and laid with the joints staggered so that they come at the center of the rail. The rail clips are spaced on 2-ft. centers except at the rail joints, where they are much closer together, as shown on the drawing. All clips at the joints are fastened with the long hooked bolts.

The rails are not welded at the joints, but A.S.C.E. angle bars are used. These are standard except for the holes and the notches for the clips. In addition to the  $\frac{3}{8}$ -in. x 8-in. steel bearing plates described above, a piece of 10-in. channel iron, 42 in. long is placed beneath each joint further to increase the bearing area. The only cross connections between the rails are the  $\frac{3}{8}$ -in. x  $1\frac{1}{2}$ -in. tie rods spaced 2 ft. either side of the rail joints and 9 ft. 8 in. apart for the remainder of the length of the 33-ft. rail.

The concrete foundation is of such cross-section as to give a longitudinal concrete beam or stringer under each rail. This stringer is 17 in. deep and 12 in. wide. Between the rails and between the tracks the thickness of the concrete decreases to 5 in. at the center. An expansion joint is provided every 33 ft. and no trouble has been experienced from cracking between expansion



ing a wearing quality in connection with railway work far superior to other types of pavement. When the concrete is properly installed there is no creeping of the rail, and practically no deflection is caused by the action of traffic over the rail because of the rigid contact throughout its length."

## Association News

### Delegates to Chamber of Commerce Meeting

THE American Electric Railway Association has appointed representatives to attend the annual meeting of the Chamber of Commerce of the United States to be held at Atlantic City, April 27-28-29. They consist of Lucius S. Storrs, who is a national counselor, and the following delegates: J. N. Shannahan, W. A. Draper, Britton I. Budd, P. J. Kealy, P. H. Gadsden and Charles L. Henry. If any officials of member companies of the association expect to attend this convention as delegates from their local chambers of commerce, they are urged to notify Secretary Burritt promptly of the fact.

A meeting of electric railway men in attendance at Atlantic City will be arranged to insure proper attention to any matters affecting the industry which may come up for consideration at the general meeting, and information as to representation of member companies, railway and manufacturer, who will be at Atlantic City, is necessary so that this meeting may be arranged for in advance.

### Questionnaire on Curved Head Rails

SECRETARY E. B. BURRITT, on behalf of the committees on way matters and equipment of the Engineering Association, has sent to member companies, which have used curved-head rails a questionnaire designed to bring out the facts regarding the use of these rails. The list includes twenty-four questions relating to rail and wheel contours and to the results which have been secured with curved head rails, and the committee hopes to secure operating data which will permit correct deductions to be made. Inclosed with the questionnaire form was a blueprint showing a curved-head design as applied to the association standard 7-in. grooved girder rail. The contour shown in the print is one that has been in satisfactory service on a number of properties. The committees hope that returns will be in their hands not later than April 15 and preferably by April 1.

### New T. & T. Committees

PRESIDENT W. H. COLLINS of the Transportation & Traffic Association has announced the membership of the committee on merchandising transportation. Some changes are also announced in the personnel of the committee on express and freight traffic facilities and costs as given in the issue of this paper for Jan. 31. The full personnel of these two committees is as follows:

Committee on Express and Freight Traffic Facilities and Costs: C. E. Thompson, Chicago, North Shore &

Milwaukee Railroad, Highwood, Ill., chairman; P. P. Crafts, Eastern Massachusetts Street Railway, Boston, Mass.; J. H. Crall, Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.; E. W. Fowler, Illinois Traction Company, Peoria, Ill.; R. B. Hull, Conestoga Traction Company, Lancaster, Pa.; F. D. Norviel, Union Traction Company of Indiana, Anderson.

Committee on Merchandising Transportation: W. J. Flickinger, Connecticut Company, New Haven, chairman; J. H. Alexander, Cleveland (Ohio) Railway; J. S. Bleeker, New Orleans Railway & Light Company; W. H. Boyce, Beaver Valley Traction Company, New Brighton, Pa.; F. G. Buffe, Kansas City (Mo.) Railways; F. R. Coates, Toledo (Ohio) Railway & Light Company; M. B. Lambert Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Richard Schaddelee, Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich.

### Coming American Committee Meetings

THE Convention Location Committee of the American Electric Railway Association is scheduled to hold a meeting at Atlantic City on March 24. The membership of the committee this year consists of Thomas W. Casey, National Pneumatic Company; H. Fort Flowers, Differential Car Company; John M. High, Pantasote Company; Martin Schreiber, Public Service Railway, and George Keegan, Interborough Rapid Transit Company.

The committee on national relations, of which Charles L. Henry is chairman, has scheduled a meeting in Washington for March 19.

F. R. Coates, chairman of the committee on company membership, has called a meeting of that committee in Toledo on March 30.

### Lawyer Addresses Public Service Section

AT ITS meeting held on March 10, the Public Service company section was addressed by Howard MacSherry, of the company's counsel, on the topic: "Questions of the Hour." The speaker took up a rather unusual line of thought for such meetings, but it proved to be one very instructive and stimulating to the audience. He gave a general picture of the economic situation in this country, which has come about on account of the world war, which, he said, had not settled any of the great world problems. These problems, in the speaker's opinion, could not be settled by mass movements, but must come about by the regeneration of the individual, using this term in its broad meaning.

The causes of unrest, said Mr. MacSherry, may be classified as follows: First, there are political causes, which ultimately come down to selfishness; then there are economic causes, and finally there is the manifest desire to make people better by passing laws. While the picture painted by Mr. MacSherry was a somewhat gloomy one, he did not consider it a legitimate cause for discouragement but urged his hearers to help improve the situation by diligence in their work and loyalty to their employers. He sensed a changing attitude on the part of the public toward corporations, and in particular to the Public Service Corporation, as people appreciate more and more that it is only through union and co-operation that great things can be done.

Following Mr. MacSherry, H. H. Norris, ELECTRIC RAILWAY JOURNAL, gave a brief account of a recent visit

to the Toledo section, where he found a fine spirit and evidences of close co-operation between the Toledo Railway & Light Company and the members of the section. For the membership committee, Mr. Shepard reported an increase of seventeen members during the past few months, with a determination to push toward the goal of 500. Chairman N. W. Bolen reminded the section of the slogan "A full house" and said that the next meeting would be "Past President's Night."

### Rhode Island Company Section Active

AT THE Jan. 8 meeting of the Rhode Island section, the speaker was Zenas W. Bliss, one of the receivers of the company, who gave a talk on "The Relations Between the Street Railway and the Public."

Mr. Bliss first reviewed his twenty years of service in various municipal offices and his connection with the public along financial lines, and said that he was somewhat inclined to think that electric railway transportation had not kept up quite with the times in all cases. He pointed out that business is absolutely dependent upon transportation in these days, whereas this was not true some time ago. Now if there is an interruption of transportation service vast numbers of people cannot get to work and great suffering is the result. There is a mutual responsibility between the corporations and the public, and there must be some way of properly adjusting their relationship by a properly organized government tribunal. There is a difference between government ownership and government control.

Mr. Bliss expressed the belief that it is possible to get the benefit of private enterprise with entire ownership by the state, which should lease the property to individuals. He concluded with these words: "While this problem in which we are so greatly interested is a very big problem, it is not the only one that we have. If other problems which are confronting us are not properly solved, our own problem will not matter much. The very foundation of our government is at stake. The solution of these problems is good citizenship, and without it none of them can be solved."

In addition to the address by Mr. Bliss, the company of 100 persons was entertained with music, dancing and refreshments.

At the meeting held on Feb. 12 the speaker was George H. Martin, Westinghouse Traction Brake Company, Boston, Mass., who spoke on "The Mechanical Equipment of the Safety Car." This talk was illustrated by means of lantern slides, showing the construction and operation of the many parts that go to make up the safety devices on the newest type of car. The membership on this occasion was entertained by a local impersonator. A nominating committee was appointed to report at the next meeting.

According to the *National Safety News* in 1910 there were 400,000 automobiles in the United States and out of every 100,000 population during that year, two and one-third persons were killed by automobiles. In 1917 there were 3,000,000 automobiles and nine and one-sixth persons out of every 100,000 population were killed by automobiles. During 1920 9,000,000 automobiles and trucks will be in use. The *News* asks: "How many thousand persons will be killed?" The answer, it says, "depends on you."

## Letter to the Editors

### European Relief Through Food Drafts

AMERICAN RELIEF WAREHOUSES

NEW YORK, March 1, 1920.

TO THE EDITORS:

I am sure that my fellow engineers will welcome an opportunity to assist in practical support of the relief measure for the civil population of the larger cities in Eastern and Central Europe. We have inaugurated a simple method by which it is possible:

1. For an individual in America to supply a relative or friend in Europe with a food package on payment in dollars at any one of several thousand banks in America.

2. For anyone desirous of helping to give to the unfortunate without naming a particular relative or friend.

This is made possible by a "Food Draft" which can be bought here, mailed abroad, and is good for the equivalent in food when presented at any one of our five central warehouses in Europe. Some four millions of our people are foreign born or have close foreign affiliations. A large proportion of these people are operatives in our mines and large technical industries.

This is not a "charity" in the ordinary sense of the term because we give much more than the same number of dollars could possibly buy in Europe if remitted in money at the present rate of exchange. Further, if the transaction is not completed in ninety days the purchaser of the draft is entitled to a refund, less a small charge for handling. Profits which may be derived from these operations will be credited to the European Children's Fund for child feeding in the country where the draft is presented.

HERBERT HOOVER.

[Electric railway companies with any considerable number of foreign-born employees might very well call the attention of these employees to the ease which this plan affords of supplying food to designated individuals abroad. The American Relief Administration carries stocks of staple foods in Hamburg, Warsaw, Vienna, Prague and Budapest. Out of necessity, deliveries can be made only at these warehouses but further shipment can be arranged locally by the recipient.—EDS.]

VIENNA, March 1, 1920.

TO THE EDITORS:

The American Relief Administration has established an American Relief Warehouse in Vienna, Austria. It is possible to buy at any bank in the United States American Relief Warehouse food drafts and send them to us in Vienna. On presentation of these food drafts at the warehouse in Vienna, we can draw American food. We are in great need of food in Austria. Individual food parcels sent from America usually do not reach us. Money does us no good when there is no food to buy.

Help us in our distress by sending an American Relief Warehouse food draft—quickly.

ILLUSTRIERTE MONATSFACH,  
ZEITSCHRIFT "DIE LOCOMOTIVE."

# News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

## Toledo Vote in June

### Protest Against Delay Until August— City May Issue General Credit Bonds

The action of Council at Toledo, Ohio, in extending until Aug. 10 the time at which a franchise settlement of the railway controversy at Toledo is to be submitted to the voters has brought forth a storm of protest from the members of the commission which drafted the cost-of-service measure.

Judge John M. Killits has also suggested that the date for the submission of the ordinance be made as soon as possible. He suggests that the company return the ordinance with objections in writing not later than April 3 and that Council and the franchise commission go over the measure in an attempt to harmonize all parts of it with company suggestions within three weeks after that date.

This would provide for an election in June rather than on Aug. 10, the date of the county and state primaries. Council may be asked to reconsider its resolution adopted last Monday night.

Henry L. Doherty has offered to pay the expenses of a special election rather than have the proposition go to a vote at the presidential primaries on April 27, before he would have time to make corrections in the proposed ordinance. Mayor Cornell Schreiber and Federal Judge Killits oppose this proposition.

In a letter to the Toledo Railways & Light Company, Federal Judge Killits submitted a copy of the ordinance prepared by the cost-of-service commission, which was appointed as an agency of the court to help solve the railway problem after the cars were brought back under the joint auspices of the City Council and the federal court.

The letter to the company follows:

By the consent of the city of Toledo I am submitting to you herewith copy of a service-at-cost street railway ordinance, the submission being under this condition: That you return the measure to me on or before April 3 with your comments thereon in writing, containing (a) a clear statement of the several objections of the company to the draft as now submitted, and (b) a draft of the several modifications the company deems necessary to meet its objections so stated above.

Upon the receipt of the draft ordinance with your comments upon it within the lines above stated, I will refer the matters to the commission with the request that it give your stated position careful consideration, with a reasonably limited opportunity for oral discussion, and will request the commission to submit again the draft ordinance to me with such modifications of the present form as it may then deem advisable within three weeks after the final reference. It is my intention then immediately to transmit the commission's conclusions to the Council, without any consideration thereof by myself.

You will kindly note that there is no obligation upon the company to consume all the time afforded it by this submission, and it will be very gratifying if the company is able to and will reduce the time of its consideration.

The commission appointed by Judge Killits to draft an ordinance providing for municipal ownership of the railway system has not held a meeting for several weeks. It has been waiting the decision of the Supreme Court on a test case involving the right of the city to issue bonds against the general credit of the city for the purpose of buying a street railway property.

The Ohio Supreme Court ruled on March 16 that the city of Toledo could issue bonds against the general credit of the municipality for the purchase of a public utility. This decision will allow the municipal ownership commission to proceed to draw up an ordinance providing for the purchase of the street railway property of the Toledo Railways & Light Company. The written opinion of the court will not be published for several days but Chief Justice Nichols gave out this statement:

Municipalities of the State are empowered by constitutional provisions to acquire any public utility, the product or service of which is to be supplied to the municipality or its inhabitants and they may issue bonds to raise money for such purpose, pledging the general credit of the municipality to their payment within the limits prescribed by the Legislature as to the amount of indebtedness for local purposes.

No legislative grant of power is essential. The issuance of such bonds may be limited or restricted by legislative act not as to purpose, but only as to amount of indebtedness the municipality may incur.

The city authorities will attempt to have both the cost-of-service and the municipal ownership ordinances ready to submit to the voters at one election. It is expected the date for election may be advanced to early in June.

## Improvement Plan Precipitates Fight

The Dallas (Tex.) Railway is hampered in its program of betterments and improvements in Dallas by controversies among patrons as to the most desirable routes for proposed extensions. The company had announced its building program for 1920, this had been approved by the City Commission and requisitions covering the improvements had been issued. One of the extensions covered an addition in Oak Lawn. Residents of that section have become involved in a controversy as to the most desirable routing of the extension. As a result the court has granted an injunction against the company restraining it from carrying out the proposed extension. The company will take no further action toward building that extension until the injunction is dissolved and the action against the company dismissed. The material for the extension has been assembled, as it was the first new line to be built under the 1920 program. This material will now be used in other parts of the city.

## Much Ado About Nothing

### Kentucky Interests So Conflicting Nothing Is Expected to Come of Utility Legislation

There are three bills before the Kentucky Legislature looking toward the regulation of the public utilities of the State. One of these bills provides for the creation of a Public Utilities Commission, but in its present amended form the measure would apply only to the gas companies. The second bill would put the gas companies under the State Railroad Commission. The third bill proposes home rule. It appears likely, however, that nothing further will be done toward regulating the utilities than to place the gas companies under the jurisdiction of the Railroad Commission.

### GOVERNOR PLEDGED TO ECONOMY

Governor Morrow was elected on a platform which promised that there would be no multiplication of state offices so that it is probable that the first bill mentioned above creating a new commission will not be passed. Moreover, if the proposed bill creating a public utilities commission is constitutional, then it would seem that the Railroad Commission might already be considered to have jurisdiction over the public utilities. There is the consideration also that such a bill, according to present statutes, would have to include jurisdiction over all municipally-owned utilities. This fact makes it highly improbable that the commission will be created, since none of the municipalities would tolerate the idea of having an outside body assume jurisdiction over local waterworks systems, for example.

### OPINION NOT UNANIMOUS

The bill giving jurisdiction over utilities to the Railroad Commission may not be passed because neither the utilities men nor the members of the Legislature are agreed on what is or is not wanted, other than that the general object of all of the proposed bills is to provide some means of controlling the gas companies.

There is also believed to be little likelihood of the third bill passing because the cities already have adequate jurisdiction over their utilities along lines and procedures specified by law. To open the control to a free hand on the part of the cities would, of course, meet with opposition.

As regards the proposed bill to create a public utilities commission, there is some doubt as to the constitutionality of such measure. The sentiment of home rule is also very strong.

## Railway Settlement on Business Basis

### Kansas City Chamber of Commerce Proposes Service-at-Cost, With Remission of Paving and Other Charges

The business men of Kansas City, Mo., have a program in mind for the improvement of electric railway transportation in that city. This program provides among many other things for service at cost, the entire remission of any charges against the Kansas City Railways for paving, street cleaning and snow removal and also contains financial details largely of local interest.

The plan for future action is based on the recommendations contained in a report by the executive committee of the committee of one hundred of the Chamber of Commerce. The full committee of one hundred met on March 5 and approved the report and the board of directors of the full Chamber then approved the recommendations. The recommendations are summarized as follows:

That the franchise be amended so the service-at-cost principle will be included and providing for a variable fare and a variable rate of return on capital invested.

That charges such as licenses, paving costs, snow removal, street cleaning and sprinkling, and lighting, be remitted, since these only increase the fare and have no place in the operation costs of a railway.

That the section of the franchise requiring certain prescribed investments in extensions each year be repealed, and that only such extensions be required as the board of control deems necessary and believes will be self-sustaining.

That Kansas City, Mo., and Kansas City, Kan., co-operate in working out uniform franchises for both cities.

That new capital, so far as is possible, be in the form of stock investments instead of bonds, since the present financial structure is top heavy in that the proportion of borrowed money to the stockholders equity is too high.

#### VARYING RATE OF RETURN

That the rate of return provide for a minimum of 6 per cent on stockholders' equity, the normal return being 7 per cent with variations up and down in 0.5 per cent steps, varying inversely with the fares—the higher the fare the lower the return on capital.

That the city directors publish monthly or quarterly financial and operating statements in simple form for the information of the public.

That the franchise valuation, plus the additions that have been made by the board of control, be made the basis of the valuation for the "service-at-cost" plan. (It is not recommended that a re-valuation be made at this time, because such action could only result in a greatly increased capital value.)

That the company provide means of receiving and acting promptly on complaints and suggestions from the public.

That larger and better trailers be used on the lines where physical conditions will permit their operation.

That service in the outlying districts be adjusted to the actual demand, by turning back cars at suitable points instead of running all cars to the end of the line.

That the board of control be charged with the duty of providing good service, making frequent checks on traffic to provide the proper number and distribution of cars.

That the headway and speed of cars be improved.

That trainmen be required to exercise courtesy and forbearance toward the public.

That upon the adoption of the "service-at-cost" plan, the initial fare be fixed at a figure sufficient to pay the cost of operation plus a just return on capital invested.

That the flat fare with the universal transfer, as distinguished from the zone system, be continued.

That the present good feeling between the company and employees be fostered and continued as far as possible.

That a further study of traffic conditions and possible remedies for congestion be made.

That looping in the downtown congested district be discontinued.

That the city provide more traffic policemen.

That the company undertake an educational campaign to induce patrons to provide tickets or exact fare when boarding cars in the congested district.

That the chairman of the board of directors of the company be a Kansas City man.

The committee of one hundred was appointed on July 17, 1919, at the request of the Real Estate Board. The purpose in appointing the committee was to have an analysis of the local railway situation made by business men to determine what the troubles were that made service poor, and to see what solution of the problem could be found. The committee met and organized on July 25.

During the following two weeks a number of meetings and hearings were held by this committee, and on Aug. 5, a preliminary report was made to the committee of one hundred, in which it was recommended that because of the great amount of work necessary, various sub-committees be appointed to study special phases of the problem. For each sub-committee it was recommended that a member of the executive committee be chairman.

On recommendation of the executive committee, these sub-committees were

appointed: Financial transactions, valuation, investigation in other cities, service and fares, economies and efficiency, franchise, labor, jitneys and other sources of traffic loss.

The work of these sub-committees in securing information and preparing reports, and the work of the executive committee in correlating and preparing the final report, were shown in the final report submitted to the committee at the meeting on March 5.

The final report is a 9-in. by 12-in. book of fifty printed pages. The first part of the report is given over to a summary of the findings and recommendations. Following these are the detailed data on which the final recommendations are based. The summary includes recommendations on valuation, financial transactions and financial condition, service and fares, franchise, jitneys and miscellaneous factors in railway operation.

The report and the investigations on which the committee's report is based comprise one of the most extensive pieces of work ever undertaken by the local Chamber of Commerce. The eight sub-committees and the executive committee worked for six months getting information. This was gathered not only in Kansas City, but from various other cities in the country. A sub-committee even made a trip to several of the large eastern cities, getting detailed data on their railway operation.

## Atlanta Men Strike

### Ignore Their Union and Tie Up City for Three Days—National Body Withdraws Support

The city and suburban traction lines at Atlanta, Ga., were paralyzed for almost three days during the week ended March 13 as the result of a strike of union carmen employed by the Georgia Railway & Power Company. The men left their posts shortly before 5 a.m. on March 10, and remained off duty until 5 p.m. on March 12. The decision to return to work was reached at a meeting on the morning of March 12, following a refusal of the national headquarters of the union to recognize the strike and an order stating that the men should return to work at once.

On Tuesday afternoon a board of arbitration, including Luther Z. Rosser for the company and Madison Bell for the men, with Judge John D. Humphries, acting as umpire, granted the men an increase of 15 per cent over the old scale of wages. The prevailing scale was 36, 38 and 40 cents an hour, and the increase raised this scale to 42, 44 and 46 cents an hour. This was not satisfactory to the men, and in spite of their previous agreement to abide by the decision of the board, they took a strike vote and left their posts. The vote was taken at a mass meeting called on Tuesday night which lasted until morning. The vote stood 499 to 149 in favor of the strike.

During the three days of the strike no cars operated. No disorder developed. The company had taken a stand

which indicated that it would not give up this time to the demands of the men. Public opinion was decidedly in favor of the company. At first it appeared that the men were equally determined not to return to work until they were granted an increase in pay considerably greater than that awarded by the board of arbitration. Doubtless they would have remained out for an indefinite period but for the fact that the national headquarters of the union refused recognition of the strike on the grounds that the union permits the settlement of such disputes by a board of arbitration. Furthermore, the men realized that public opinion was against them.

In a large paid advertisement in Atlanta newspapers the Chamber of Commerce demanded that the men return to work. The chamber declared that the men had violated their solemn word in leaving their posts. The Rotary Club of Marietta, Ga., served by the interurban system, called upon the company to leave its cars in the car-house until it was able to operate on an open-shop basis. All this had its effect upon the men and doubtless resulted in the early settlement of the strike.

It had been stated at hearings of the arbitration board that if increased salaries were granted this would necessarily mean an increase in fares, as the company is already operating at a loss. Whether the increase granted by



the board, while it is only 15 per cent, will result in another raise in fares is still undetermined.

During the progress of the strike, retail business in the downtown district was seriously interfered with, and while means were found to bring employees to work and get them home, there was no satisfactory transportation for customers and downtown stores suffered as a result. The Atlanta Auto-

mobile Association had called upon auto owners to help out, but even so, thousands of people were compelled to walk. Railroads serving suburban towns that are also served by the electric traction lines of the Georgia Railway & Power Company put on more trains and this helped out to some extent.

It was late Saturday before the full schedules were in operation on all of Atlanta's city and suburban lines.

## Railway Makes Counter Franchise Bid

### Detroit Line Unalterably Opposed to Plan for Opposition System Built by City

A statement signed by President Frank W. Brooks of the Detroit (Mich.) United Railways brands Mayor Couzens' proposed piecemeal plan as "not only unfair but dishonest." The company signifies its intention to fight the Mayor's plan, and to endeavor by all legitimate means to prevent his policy from being imposed upon the company. It has also made a counter franchise proposal.

#### SETTLEMENT ORDINANCE OFFERED

The company's position was outlined and a plan of settlement proposed, based on the adoption of a working agreement between the company and the city. An ordinance outlining its plan has been prepared by the company, which will be immediately submitted for the consideration of the taxpayers and electors of the city of Detroit.

In his letter to the electors, Mr. Brooks states that no one appreciates more fully than the company's officials that the service they have been able to give is inadequate; that no one is as vitally interested in changing this situation and providing adequate service as they are, that the city authorities are responsible for the discomforts car riders are suffering and the inadequate service with which they are provided.

In justifying the statement that the company has availed itself of every resource at its command to improve conditions, it is pointed out that within the past ten years—and since most of the important franchises are claimed to have expired—the company has expended in betterments and extensions of tracks, equipment and facilities, upward of \$13,000,000 in reliance upon the belief that in any final settlement of the railway situation, the company would be treated fairly, and its stockholders reasonably protected if the city should conclude to engage in municipal ownership and operation.

#### COMPANY WILLING TO SELL

To this end it is contended the company, in recognition of an alleged desire on the part of the taxpayers and electors of the city to engage in municipal ownership, co-operated with city representatives to enable them to do this by offering to sell to the city the entire railway system at its fair value, and on two occasions entered into formal agreement to that end.

Reviewing the details of the plan which the company assisted in giving the electors an opportunity to ratify, President Brooks stated that in the first instance it was agreed that the fair value of what was needed by the city should be fixed by three of the Wayne County Circuit Judges, and in the second instance a fixed price was agreed upon at least \$10,000,000 below the investment of the company. Mr. Brooks adds:

These plans having failed, Mayor Couzens now undertakes to force upon the people the so-called "piece-meal" plan of acquiring a railway system, and proposes to create a second railway to engage in competition with this company. To accomplish this, the Mayor proposes to dismember and cripple our system and by coercion compel us to sell important parts of our system at less than the conceded value. For instance, he proclaims publicly that the cost of construction of our Woodward Avenue and Fort Street tracks is about \$70,000 per mile (it is actually \$100,000 per mile) and that he will force us to sell at \$40,000 per mile.

Twenty million dollars is the estimate the company puts on the cost of needed extensions, cars and equipment, and this amount can only be secured by a reasonable grant of authority to operate the system under fair conditions.

#### CONDITIONS OF COUNTER PROPOSAL

The company filed with the Corporation Counsel a counter proposal to the Mayor's plan. This is in the form of an ordinance and provision is being made to permit the submission of the ordinance to the voters as soon as the City Council will authorize an election. This ordinance cannot go before the people at the election on April 5 as there is not sufficient time to fulfill the provisions of the city charter, and unless a special election is called, it cannot be voted on before the November election.

In the ordinance the company proposes to surrender all existing franchises and private right-of-way held by the company. Control of service will be vested in the City Council, giving the city the right to regulate the operation of the system with respect to maintenance of its tracks, frequency of service and routing, and operation of interurban cars within the city limits.

The ordinance obligates the company to begin immediately on the construction of 200 miles of extensions to the present line and to complete these extensions at the rate of 50 miles per year for four years.

Provision is also made for adding 350 new cars, comprising 200 new double-truck motor cars and 150 trailers within the first year, with 100 new motor cars and 100 new trailers to be added during each of the following three years. All obsolete cars are to be replaced with modern types.

A straight 5-cent fare with universal transfers is specified, to apply on all lines within the city, including lines now outside the single-fare zone, and is to be extended to include territory annexed to the city in the future.

The ordinance provides for the purchase or lease of the Detroit United Railway city system by the city of Detroit at any time during the life of the thirty-year agreement at a price to be fixed by the board of arbitration, the agreement to be terminated by the exercise of the city's option to purchase or by the failure of the company to carry out the program of extension.

Under the ordinance, the price for which the city shall purchase the lines or lease them at a rental of 6 per cent of the valuation, is to be decided upon by the appraisal of the board of arbitrators, this appraisal to be made immediately after the passage of the ordinance, and from year to year as long as the 6 per cent return is made.

Provision is made for the use of the Ford gas car or any other system of equipment adaptable to Detroit's needs, which can be operated more economically and efficiently than the present power system. Tracks and cars will be provided for a subway or elevated rapid-transit system when such system shall be built by the city.

A detailed description of the proposed extensions which the company shall be required to build under its terms, provided the ordinance is ratified, is attached to the ordinance.

The Detroit United Railway proposes to form a new company to take over the entire business of the city lines in order to differentiate between city and interurban accounts, the books of this proposed new company to be opened for inspection and examination at all times by city officials.

### Promoters of Subways Must Explain

The street railway committee of the Council of Cleveland, Ohio, has decided to give the Cleveland, Akron & Canton Terminal Railway until April 10 to agree with the Law Director on certain changes to be made in its franchise. This company has been authorized to build a subway under East Fifty-fifth Street for the transfer of freight cars from the southern part of the city to the lake front. Law Director Fitzgerald desires so to change the franchise as to compel the company to build at a depth that will not interfere with the proposed municipal subway. The Hopkins interests were allowed one week to appear before the committee and show cause as to why their subway franchise should not be repealed.

## City to Buy Buses

New York to Start with an Initial  
Outlay of \$1,140,000  
—Expects a Profit

The Board of Estimate of the city of New York has unanimously committed the city to an experimental municipal bus system. Strange as it may seem, the city voted an appropriation for buses on the same day that the receivers of the surface lines in Manhattan and Brooklyn withdrew their appeal for an increase in fare. In some quarters it is believed that buses will supplant all suspended trolley routes.

### COMMISSIONER WHALEN IN CHARGE

The Department of Plant and Structures has been supervising the operation of privately owned buses over 5 routes in Manhattan since last September, in Brooklyn 7 routes since October, 1919, and in Staten Island 5 routes since Jan. 19, 1920. Through the efforts of Commissioner Whalen, of Plant and Structures, the Finance and Budget Committee of the Board of Estimate, recommended that his plan for the purchase of 200 buses be approved. On March 12, 1920, the Board of Estimate unanimously voted to issue \$1,140,000 in tax notes to cover the cost of these buses. Commissioner Grover A. Whalen, who is the general manager of the municipal bus lines was directed to prepare contracts and specifications for competitive bidding for the buses, and to submit these forms together with a full description of the type, style and size of vehicles to the board as quickly as possible.

The routes on which the buses are to be operated has not yet been definitely settled, but Mayor Hylan has directed that some of the buses be sent to Staten Island for use along the routes on which the Staten Island Midland Railway suspended service last January. The motion of President La Guardia of the Board of Aldermen, however, for the city to take over the present bus route between St. George Ferry and the Army Base hospital at Fox Hills was adopted, thus overruling the contention of President Van Name of the Borough of Richmond at a recent hearing that the privilege was held by a private party who should be allowed to retain it. The route in question is approximately 3 miles long and the fare charged is 15 cents each way.

### THE COMING REVOLUTION

In commenting on the action of the Board of Estimate Commissioner Whalen said:

Their action was a great step along the line of progress. When the buses are placed in operation and the street cars and tracks eliminated from the roadways, it will completely revolutionize the city's traffic problems and will be a solution of the many difficulties occasioned by the present method of surface car transportation, which has been most aggravating to the people.

The policy of the city in connection with the operation of the bus system will be one of courtesy and efficient service. It will also afford to the city an additional source of revenue which is very much needed.

When the municipal bus operation becomes city wide it will relieve, in a measure, the great burden of taxation. It will also help largely to build up the sparsely occupied territory in the city.

It is estimated that the buses will cost \$5,500 each, and that the operation of the 200 buses will net the city an annual profit of \$275,064. Buses will seat twenty-seven passengers and operate on a 5-cent fare.

It is expected to have the buses in operation not later than May 15.

## Rhode Island Legislation Probably Lost

An agreement with respect to the affairs of the Rhode Island Company, Providence, R. I., upon which legislative action can be taken at the present session seems remote. March 30 is the last day for the introduction of new business except by unanimous consent, and some of the Assembly leaders say there is no chance at this late day to take up such a big problem as is involved in connection with the affairs of the Rhode Island Company.

It will be recalled that on Feb. 24 the receivers of the Rhode Island Company presented to the Legislature a plan for state ownership and control with private operation for all lines of the company. The results which it was hoped to achieve under this plan were summarized in the *ELECTRIC RAILWAY JOURNAL* for Feb. 28, page 445.

Meanwhile bondholders of the United Traction & Electric Company and the Rhode Island Suburban Railway have agreed upon a plan of re-organization of the properties. The conditions of this reorganization were made public during the week ended March 13. Receivers of the Rhode Island Company have also been working on a reorganization plan. They made the details of their plan public early in the week ended March 20. Of course these respective plans are only tentative, but the terms of the plans are so different that the parties at interest would appear to be farther apart with respect to a settlement than before the plans were made public. Both plans provide for the reduction of the securities outstanding.

## Contract Awarded for Power Improvements

The board of directors of the Monongahela Valley Traction Company, Fairmont, W. Va., has confirmed the action of the officials in signing a contract with the Fred T. Ley Company, contractors, for the installation of a 20,000 kw. turbine in the Rivesville power plant of the company. This addition, costing about \$700,000, will make the local plant one of the largest in the South.

The turbine is now being assembled by the General Electric Company. It will be shipped to Fairmont in June. The necessary condenser equipment has been purchased from the Alberger Condenser Company. It is expected to have the new unit ready for operation by Oct. 1.

## Trainmen Force Action

Binghamton Men Strike When Council  
Again Puts Off Granting Relief  
to Railway

Patience has ceased to be a virtue at Binghamton, N. Y. It took the trainmen in the employ of the Binghamton Railway some time to find this out, but when they did the men took things into their own hands and went out on strike. They didn't strike against the company. They struck against the Council, the members of which they helped to put into office. Binghamton walked while the Council talked. It walked for several days.

### ROAD IN RECEIVER'S HANDS

The Binghamton Railway has had more than its share of trouble. It has been denied a square deal and is in hands of a receiver. On a 5-cent fare the company could not increase the pay of its men. It said so frankly. The men accepted the statement. The Council, however, paid no attention to the plea of the company. It persisted in watchful waiting. This policy of procrastination the men have brought to an end.

At the meeting of the Council on March 8 two ordinances were introduced, both of which aim to grant the company permission to petition the Public Service Commission to establish a 6-cent fare. Introducing a measure and passing it are two different things. The men had learned this by experience. They acted while the Council deliberated. The next morning all Binghamton walked. The men believe in a policy of live and let live. They announced they would take their chances with the company, but that they were through taking chances with the Council. They did, however, arrange to run cars at rush hours so that the working public might not be seriously inconvenienced.

At first some members of the Council were inclined to become belligerent. They threatened to withhold approval of the fare measure until the conductors and motormen returned to work. The Council soon found that in this game the trainmen held all the trumps. Only when the railway men were assured that the ordinance would be passed did they announce the cars would again be run. The present wage scale is 34 to 38 cents an hour. The new rate will probably be 41 cents to 45 cents an hour, although the men have made no fixed demands. This matter remains to be adjusted.

### COMPANY PAYING THE LIMIT

There is a wage agreement in Binghamton. The company is now paying in excess of the rates prescribed, but it has gone the limit on the present fare. The men understood and appreciated this, but the Council did not. It was necessary to bring the facts home to them forcibly. The trainmen succeeded by direct action, where indirect appeal failed.

## News Notes

**City Petitioned to Take Over Railway.**—M. J. Morley is conducting a campaign to induce the Mayor and Commissioners of Phoenix, Ariz., to take over the Phoenix Railway. More than 2,000 names already have been signed to the petitions now being circulated among residents and property owners.

**May Retry Mr. Dempsey.**—John J. Dempsey, former director, vice-president and transportation head of the New York Consolidated Railroad, Brooklyn, (N. Y.) Rapid Transit System, will probably be retried on a charge of second degree manslaughter in connection with the Malbone Street wreck. The jury in the first trial of Mr. Dempsey was unable to reach an agreement.

**\$1,376,341 Is Chicago's Share.**—The share of the city of Chicago in the profits of the Chicago Surface Lines for the fiscal year ended Jan. 31, 1920, will be \$1,376,341, according to estimates made on March 14 in the City Comptroller's office on the basis of the traction companies' monthly statements for the year. With this addition the traction fund in the possession of the city will be \$27,431,841.

**Union Wants Agreement Modified.**—The members of the local division of the Amalgamated Association at Providence, R. I., have voted to notify the Rhode Island Company that they intend to reopen, for possible revision, the present working agreement with the railway. This agreement expires on May 31. The contract as it now stands requires ninety days' notice of a desire for its modification.

**Co-operative Plan for Louisville.**—Six representatives of the employees of the Louisville (Ky.) Railway and six officials of the company met recently to perfect a Co-operative Welfare Association seeking betterment of mutual interests and improvement of car service. Details of the Stotesbury-Mitten plan in operation in Philadelphia were studied and its principles adopted as the basis for the working plan of the organization.

**Objection to One-Man Cars Withdrawn.**—End of the opposition to the railway system in Muscatine, Ia., has come with the abrogation by the City Council of an ordinance demanding two-man car operation. The Clinton, Davenport & Muscatine Railway, operating the city lines, installed one-man cars some time ago. The city fought the one-man car bitterly at first, but has now repealed the ordinance and withdrawn its action from the State Supreme Court.

**Carhouse Held Up.**—More than \$1,000 was taken from the Starr Avenue carhouse of the Toledo Railways & Light Company, Toledo, Ohio, when two armed bandits held up the dispatcher and receiver late Friday, March 12. The robbers came about an hour before the night run conductors turn in their funds. They unceremoniously kicked in the door and directed their guns at the men on hand, grabbed the money and whisked away in an automobile. The police have found no clues in connection with the hold-up.

**Strike on Williamsville Line.**—Electric railway service between Buffalo city line and Williamsville was suspended on March 3 when motormen and conductors employed by the Buffalo & Williamsville Electric Railway struck for higher wages. The men at present receive 35 cents an hour, it is said, and are seeking an increase to 50 cents. The strike does not involve more than a dozen men, but the walkout will greatly inconvenience commuters. Two cars are operated on the line during the day, and two or three more during the rush hours.

**Seattle Elects New Mayor.**—Hugh M. Caldwell, formerly Corporation Counsel of Seattle, Wash., has been elected Mayor of the city over James Duncan, the labor candidate, by a margin of 17,098 votes, the largest majority ever given a mayoralty candidate in the history of Seattle. Mr. Caldwell polled 50,875 votes while Mr. Duncan received only 33,777. Only 88 per cent of the city's registered strength participated in the election. Mr. Caldwell made the conduct of the Seattle Municipal Railway one of the points in his attack upon the existing city government.

**Scranton Demands Refused.**—The Scranton (Pa.) Railway, through Jilson J. Coleman, general manager of the company, has rejected the demands of its employees for an increase in wages of 20 cents an hour. Mr. Coleman, in refusing the increase, stated that the additional pay and the reduction in hours asked by the men would cost the company \$450,000 annually. He pointed out that the company's net earnings for the year ended Dec. 31, 1919 amounted to \$118,431. Wages were increased on Jan. 1, 1920, the present scale for trainmen being from 46 to 50 cents an hour.

**Wage Advance in Reading.**—The Reading Transit & Light Company, Reading, Pa., on March 5 announced an increase of 4 cents an hour in the wages of the 600 motormen and conductors employed over the entire system, comprising Reading, Lebanon, Norristown and Roxborough. This advance, which is the seventh to be made by the company in less than three years, increases the maximum wages of motormen and conductors from 46 to 50 cents an hour. The new scale will go into effect on March 16. Since fares were first advanced in January, 1918, the wages of the men have advanced a total of 22 cents an hour—from 28 cents to the present rate of 50 cents.

**Court of Industrial Relations Suggested.**—Senator White of Atlantic County has introduced a bill in the New Jersey Legislature to set up a Court of Industrial Relations to take the place of the Board of Public Utility Commissioners. The new body would be fashioned along the line of the recently created Kansas court and would handle utility and all transportation and industrial matters. The new organization is to be composed of three judges to be appointed by the Governor with the advice and consent of the Senate. The members of the court would hold office for three years. The salary would be \$5,000 a year. Upon the court would be conferred the same powers that are now vested in the Public Utility Commission.

**Newspaper Man Gives Live Facts.**—Jonathan C. Dill has an interesting story "Are Trolley Cars Extinct?" in the *Utica Saturday Globe* for Feb. 28. It describes in a chatty way some of the things which the electric railways are "up against". One of these is not the automobile, according to an interview which Mr. Dill had with a local railway manager. In spite of the increase in the number of automobiles during the past eight years, the railway is carrying a constantly larger number of passengers. This proves that the electric railway is not obsolete or being seriously affected by automobile competition. It is only faced with the situation which every individual has had to meet, namely, increased expense. This is a serious matter when income does not go up in like ratio.

## Program of Meeting

### American Railroad Association

The American Railroad Association and the Railway Supply Manufacturers' Association have announced plans for the annual convention to be held in Atlantic City, June 9 to 16, inclusive. The reports of committees of Section III—Mechanical—investigating locomotive matters will be received and discussed on Wednesday, Thursday and Friday, June 9, 10 and 11, and reports of committees on car matters will be taken up on Monday, Tuesday and Wednesday of the next week. The sessions of the Mechanical Section will be held in the morning to give time for viewing the exhibits. The Purchases and Stores Section of the American Railroad Association will hold its annual meeting on June 14, 15 and 16, in the Hippodrome.

The Railway Supply Manufacturers' Association has arranged to have exhibits in the balcony over the main building on Young's pier, which will make the total exhibit space approximately 100,000 sq.ft., an increase of 6,500 sq. ft. over 1919. Applications have already been made for practically all the available booths and a large number of new companies will be represented. All entertainment features will be held on the pier, as was done in 1919.

# Financial and Corporate

## Net Income Increases

Dallas Interurban Company's Figures Show Prosperous Year—Some Divisions Operated at a Loss

The gross earnings of the Texas Electric Railway during 1919 amounted to \$2,951,511, representing an increase of 23.9 per cent over 1918. Operating expenses and taxes increased \$302,019.96, or 21 per cent over 1918.

The net income of the company after interest charges for 1919 was \$735,454.68, or an amount available for dividends on preferred stock at the rate of 2.8 times the annual dividends on all preferred stock. The balance available for common stock was \$476,454.68, virtually all of which has been used for increased working capital, made necessary by the higher prices of materials and for betterments and improvements of the property.

### DIVIDENDS PAID

Regular dividends at the rate of 7 per cent were paid on the first and second preferred stock and an initial dividend at the rate of 0.5 per cent on the common stock for the quarter ending Dec. 31, 1919, has been declared payable March 1, 1920.

Of the six street railway systems operated by the Texas Electric Railway, Denison reported the only gain in income after depreciation values had been deducted. At that place the gross revenue was \$34,647 for the year. Operating expenses and taxes were \$22,286, and depreciation was assessed at \$6,783, or an income after depreciation of \$5,578. The gross revenue from the Waco street railway system was \$341,518 for the year, with operating expenses and taxes placed at \$287,404. Depreciation was given at \$75,780, or a deficit in income of \$21,666. The deficits at Waxahachie, Corsicana, McKinney and Sherman were given as \$7,767, \$6,820, \$6,107 and \$720, respectively.

## Hudson Valley Operating at Deficit

Additional detailed evidence covering the operation of the Hudson Valley Railway, Glens Falls, N. Y., was presented to Public Service Commissioner Frank Irvine on March 12 on the company's petition for permission to charge a 7-cent fare in its different operating zones. The evidence was by D. C. Waters, auditor for the company. If no further hearing is desired the case will be closed for decision.

About fifteen statements were introduced by Mr. Waters. They covered the operation for 1914, 1918 and 1919 of the Troy-Waterford zone and the Glens Falls-Fort Edward zone, the latter divided between urban and inter-

urban operation, and between Ballston Junction and Saratoga Springs, tolls paid over the Lansinburg-Waterford bridge, rate 2½ cents a car; rates for electric current furnished by the Mechanicville power plant and details of operation of the latter. There was an income account of the company's freight department for 1918 and 1919, and four months in 1917, the net income in 1919 being \$17,565 and in 1918, \$28,550.

An income statement for the last six months in 1919 showed: total revenue, transportation, \$504,509; revenue from other railway operations, \$33,596; total railway operating revenues, \$538,105; total operating expenses, \$440,931; net operating revenue, \$97,173; taxes, \$24,530; operating income, \$72,643; non-operating income, \$2,719; gross income, \$75,362; deductions from gross income, \$180,050. The deficit in net income available for dividends was \$116,085.

Mr. Waters said operations for the first two months in 1920 showed a continuing deficit, the net deficit for January being \$22,606 and for February, \$31,407. There was charged for taxes in January \$4,500, or one-twelfth of about \$54,000.

## If Providence Will Let Him

With the injunction to run the road for four months longer—"if Providence will let him"—Harrison B. Freeman, receiver for the Hartford & Springfield Street Railway, Warehouse Point, Conn., received some encouragement by Judge Lucien F. Burpee of the Superior Court of Hartford County on March 12 when the court granted the receiver permission to borrow \$10,000 to meet extraordinary expenses that are being incurred by the road, the major part of the necessary money being accounted for in cost of coal and for removal of snow.

Francis R. Cooley, chairman of the bondholders' committee, supported the stand of Mr. Freeman, telling the court that the bondholders believed that the road could weather the financial storms if it got past the present trying weather.

The road has bills outstanding for the present winter of \$8,023, one half of this sum being represented in coal, and it has no money to meet these obligations. The January receipts fell below expenditures by \$3,671, and cost of snow removal in February pushed the operating deficit for that month to \$6,840.

The railroad runs on both sides of the Connecticut, between the two cities whose names it bears and connects thirteen towns, many of which would be almost cut off from each other and the rest of the world if the trolley failed to run.

## Receiver Discouraged

Forced to Suspend Operation Representative of Court Decides to Apply for Order of Sale

George Spalding, receiver of the Blue Hill Street Railway, has announced that the road will be sold for junk. The road was placed in operation on Nov. 3, 1899. It is the only route to Great Blue Hill from Mattapan Square, Boston. The road runs through Canton to Stoughton. It also connects with Sharon.

The road has never paid a dividend, but up to 1918 it was able to earn operating expenses. There are twenty-one cars, 12½ miles of track, a carhouse at Canton and a power house in the same place. The last car started over the road was reported recently to be half buried in the snow at Ponkapoag. It had been sent out on its regular run on Feb. 5.

The company shut down because of its inability to secure delivery of coal from the New York, New Haven & Hartford Railroad. The entire force of trainmen has been discharged.

Mr. Spalding was appointed receiver of the road in April, 1919. The company then had a deficit of \$101,000. Despite the efforts of the receiver, he has been unable to reduce this. In fact the deficit at the present time is \$110,000. The deficit in January was \$7,000. There have been six zones with a 5-cent fare in each zone.

On account of its dependence on the Blue Hill Street Railway for power, the Norwood, Canton & Sharon Railway has also been obliged to close down. This little road was abandoned some time ago, but the tracks and wires were bought from a junk dealer by citizens who put the property in repair and obtained cars and power from the Blue Hill Street Railway.

Mr. Spalding says that he will apply for permission to foreclose the mortgage, but as the sale will have to be advertised four weeks before there is a decree, it will probably be some time in April before the road is finally put up at auction. If there are no bidders for the road Mr. Spalding will sell the property for junk.

F. A. Prince, a resident who helped in the purchase of the Norwood, Canton & Sharon Railway, is reported to have stated that steps will be taken to resume service on the Norwood, Canton & Sharon Railway and that the Blue Hill Railway will probably be rescued.

## Cost of Cambridge Subway Declared

The cost of the Cambridge Subway has been declared by the Massachusetts Department of Public Utilities to be \$7,868,000. Under the provisions of the Act of Legislature whereby the State is to buy the Cambridge Subway, \$8,000,000 was set aside for purchase. Thirty days after the price certification of the subway by the State Department of Public Utilities, the tube is to become the property of the State.

### Municipal Earnings Drop

San Francisco City-Owned Lines Face Difficulties Similar to Those Confronting Private Companies

The annual report of the Municipal Railway, San Francisco, Cal., for the fiscal year ended June 30, 1919, shows a gain in operating revenue over the previous year of only 1.07 per cent. But due to a 13.85 per cent increase in

off in traffic and the speed of cars increased 2.66 per cent to fill the gap caused by pulling off cars.

The several comparison charges included cover services rendered by various city departments, insurance on cars, and city, state and federal taxes. The "true" net income, therefore, is greater than the comparison net income shown, by the amount of the comparison or so-called charter charges. In 1918 these

platform labor charges have increased 12.5 per cent since April 16, 1919, due to an advance of 6.25 cents per hour in wages. For the year 1919, platform expense totaled \$847,567, an increase of 17.18 per cent over the previous year. In reality for every revenue car-hour operated, platform service cost \$1.09. The hourly wage paid is now 56.25 cents and eight hours constitutes a day's work.

Passenger revenue for 1919 increased but 1.17 per cent over 1918 due to the fact that the number of revenue passengers increased but 1.3 per cent. The average fare per revenue passenger also slightly increased because the loss in revenue from tickets used by the government and from the sale of school tickets was offset by a 14.18 per cent increase in the number of 2-cent transfer passengers and a 1.4 per cent increase in five cent cash passengers. The average fare of passengers lost was 3.3 cents as against 4.58 cents from those gained.

#### SOME OPERATING PERCENTAGES

A further analysis of operating expenses indicates that maintenance and depreciation took 22.7 per cent of the operating revenue in 1919 as against 20.02 per cent in 1918. About 25 per cent of the operating expenses go toward maintenance and depreciation. The amount set aside for depreciation represents 14 per cent of the passenger revenue, and is equivalent to more than 5 per cent of the road and equipment account.

Power cost takes 13.6 per cent of the operating revenue, while conducting transportation takes 43.5 per cent. In other words, the cost of operating the cars takes practically one-half of the total amount spent. General and miscellaneous expenses, when considering all comparison charges, consumed 7.38 per cent of the total operating revenue which is equivalent to practically 8.5 per cent of the total operating expenses.

The general balance sheet shows the plant and property to be worth \$6,903,758, an increase of \$404,278 over the previous year. This is because of three track extensions covering 6.06 miles of single track that were made in the early part of the year 1919.

### Public Service Makes Common Payment

Quarterly dividends of 1 per cent on the common and 2 per cent on the preferred stock have been declared by the Public Service Corporation of New Jersey. According to President McCarter the electric company and the gas company now are functioning properly and making satisfactory earnings, while the railway has been allowed a rate sufficient to enable it to pay its operating expenses and fixed charges without yielding any substantial return upon the investment.

The company did not declare any dividend on the common stock for the quarter ended Dec. 31.

#### INCOME STATEMENT OF SAN FRANCISCO MUNICIPAL RAILWAY (Includes all charges as required by charter)

| Year Ended June 30                                      | 1919               | 1918               | Per Cent Change, + Inc., - Dec. |
|---|--------------------|--------------------|---------------------------------|
| Revenue from transportation.....                        | \$2,391,176        | \$2,363,366        | + 1.176                         |
| Revenue from other railway operation.....               | 10,222             | 12,563             | - 18.65                         |
| <b>Total railway operating revenue.....</b>             | <b>\$2,401,398</b> | <b>\$3,375,929</b> | <b>+ 1.072</b>                  |
| Way and structures.....                                 | \$63,331           | \$49,337           | + 28.4                          |
| Equipment.....  | 147,446            | 95,460             | + 54.50                         |
| Power.....  | 327,687            | 284,433            | + 15.10                         |
| Conducting transportation.....                          | 1,045,704          | 899,764            | + 16.28                         |
| Traffic.....  | 264                | 339                | - 21.851                        |
| General and miscellaneous.....                          | 70,612             | 68,305             | + 3.37                          |
| General and miscellaneous (comparison charges).....     | 10,904             | 9,644              | + 13.08                         |
| Depreciation (14 per cent of passenger revenue).....    | 334,867            | 330,736            | + 0.95                          |
| Accident reserve (4 per cent passenger revenue).....    | 95,676             | 94,535             | + 1.21                          |
| <b>Total operating expenses.....</b>                    | <b>\$2,096,491</b> | <b>\$1,832,553</b> | <b>+ 13.85</b>                  |
| <b>Net operating revenue.....</b>                       | <b>\$304,907</b>   | <b>\$543,376</b>   | <b>- 44.10</b>                  |
| Taxes—(comparison charges required by charter)—         |                    |                    |                                 |
| State franchise (5.25 per cent operating revenue).....  | \$126,155          | \$124,602          | + 1.248                         |
| Municipal franchise (3 per cent passenger revenue)..... | 71,757             | 70,878             | + 1.242                         |
| Municipal car license (\$15 per car).....               | 2,955              | 2,955              | .....                           |
| Federal taxes (1 per cent net income).....              | .....              | 10,640             | - 100.00                        |
| <b>Total taxes.....</b>                                 | <b>\$200,867</b>   | <b>\$209,075</b>   | <b>- 3.92</b>                   |
| Operating income.....                                   | 104,040            | 334,301            | - 68.80                         |
| Non-operating income.....                               | 22,248             | 21,500             | + 3.48                          |
| Gross income.....                                       | \$126,288          | \$355,801          | - 64.50                         |
| Bond interest.....                                      | 243,093            | 248,214            | - 1.66                          |
| Net income transferred to profit and loss.....          | * \$116,805        | \$107,587          | - 208.80                        |
| Surplus at beginning of year.....                       | 216,916            | 109,329            | + 98.20                         |
| Surplus at close of year.....                           | \$f00,111          | \$216,916          | - 53.80                         |

\*Deficit.

operating expenses, the net income for the year after deducting comparison charges required by its charter, showed a theoretical deficit of \$116,000. Actually the balance was \$88,965 as compared with \$326,306 for the previous

charges amounted to \$218,719 while in 1919 they had decreased 3.17 per cent to \$211,771 due, to the fact that the net income of the company was a deficit and therefore no federal income taxes were payable.

#### STATISTICAL INFORMATION OF SAN FRANCISCO MUNICIPAL RAILWAY

| Year Ended June 30  | 1919              | 1918              | Per Cent Change, + Inc., - Dec. |
|---|-------------------|-------------------|---------------------------------|
| Track owned and operated (miles).....                                 | 58.23             | 56.28             | + 3.46                          |
| Track owned and operated co-jointly with United railroad (miles)..... | 5.15              | 1.04              | .....                           |
| Car house tracks and sidings and unused spurs (miles).....            | 3.95              | 3.95              | .....                           |
| <b>Total (miles).....</b>   | <b>67.33</b>      | <b>61.27</b>      | <b>+ 9.90</b>                   |
| Average total miles of single track operated at end of year.....      | 63.38             | 57.32             | + 10.60                         |
| Revenue car miles*.....   | 7,212,763         | 6,935,090         | + 5.45                          |
| Revenue car hours*.....   | 779,746           | 766,997           | + 1.66                          |
| Revenue passengers—   |                   |                   |                                 |
| Five-cent cash.....   | 47,524,125        | 46,874,775        | + 1.408                         |
| Five-cent Government ticket.....                                      | 69,262            | 110,303           | - 37.32                         |
| Two and one-half cent school ticket.....                              | 597,483           | 683,192           | - 12.53                         |
| Two-cent revenue transfers.....                                       | 856,166           | 750,026           | + 14.18                         |
| <b>Total revenue passengers.....</b>                                  | <b>49,047,036</b> | <b>48,418,296</b> | <b>+ 1.298</b>                  |
| Free transfer passengers.....   | 9,836,127         | 13,589,247        | - 27.50                         |
| free passengers, employees, police, firemen, etc.....                 | 458,090           | 388,493           | + 17.9                          |
| <b>Total passengers.....</b>  | <b>59,341,253</b> | <b>62,396,036</b> | <b>- 4.89</b>                   |

\*Includes bus mileage and hours.

year. Which is equivalent to a decrease of \$237,341 or 72.5 per cent in net income.

Passenger traffic as a whole fell off 4.89 per cent due to the fact that the number of free transfers collected decreased 27.50 per cent and revenue passenger traffic increased only 1.298 per cent. Schedules were also cut to some extent with this falling

The chief reason for the decrease in net operating revenue, as shown in the accompanying table, for the year 1919 is the increase in the cost of operation which is 13.85 per cent greater than in the previous year. This is attributed to the greater cost of labor and material and is especially reflected in the maintenance charges for equipment, which increased 54.5 per cent. Hourly

### London Traffic Increasing Cost of Operation of English Lines, However, Offsets Any Gain from Increased Traffic

A study of the operations for the year 1919 of the five companies, parties to the agreement under the so-called London Electric Railway Companies Facilities Act of 1915, discloses that although the traffic receipts increased £2,156,078 or 31.0 per cent the

The full effect of the increases in wages since the termination of the World War, and the extra cost of materials, fuel and other supplies was not felt in 1919. The working costs in 1920 will, therefore, be considerably higher and already the companies have appealed to Parliament for the right to increase their fares. Mention of this was made in the issue of ELECTRIC RAILWAY JOURNAL for Feb. 7, page 301. The accompanying tables give an out-

The case was previously decided by the Circuit Court in favor of the city. Appeal to the Supreme Court of the State was made by the company. The Supreme Court found an error in the judgment of the Circuit Court, but it proved one that could be corrected. The modification provides that the city's percentage of the earnings should date from Sept. 31, 1913, instead of Aug. 6, 1913, \$262.78 being adjusted the city for this period.

INCOME STATEMENT OF ROADS IN LONDON FOR YEAR 1919

|   | Metropolitan District Railway | London Electric Railway | City and South London Railway | Central London Railway | London General Omnibus Company | Total      |
|---|-------------------------------|-------------------------|-------------------------------|------------------------|--------------------------------|------------|
| Traffic receipts  | (a) £2,131,938                | £1,538,707              | £314,402                      | £449,493               | £5,242,299                     | £9,676,839 |
| Operating expenses  | 1,128,958                     | 1,012,397               | 238,714                       | 318,945                | 5,480,584                      | 8,179,598  |
| Net receipts  | £1,002,980                    | £526,310                | £75,688                       | £130,548               | * £238,285                     | £1,497,2   |
| Miscellaneous receipts (net)                              | 160,020                       | 109,887                 | 26,673                        | 59,356                 | 207,694                        | 563,630    |
| Gross income  | £1,163,000                    | £636,197                | £102,361                      | £189,904               | * £30,591                      | £2,060,871 |
| Interest, rentals and other fixed charged                 | 336,115                       | 290,738                 | 47,203                        | 46,039                 | 108,412                        | 828,507    |
| Net income  | £826,885                      | £345,459                | £55,158                       | £143,865               | * £139,003                     | £1,232,364 |
| Reserve for contingencies and renewals                    | 45,000                        | 45,000                  | 25,000                        | 20,000                 | 285,000                        | 420,000    |
| Dividends on guaranteed and preference stocks             | (b) £124,930                  | 126,947                 | 42,500                        | 21,600                 | .....                          | 315,977    |
| Total deductions  | £169,930                      | £171,947                | £67,500                       | £41,600                | £285,000                       | £735,977   |
| Surplus paid into or drawn from common fund               | £656,955                      | £173,512                | (c) £12,342                   | £102,265               | (c) £425,003                   | £496,387   |
| Amount received from common fund                          | £59,566                       | £148,916                | £29,783                       | £99,278                | £158,844                       | £496,387   |
| Per cent of total   | 12                            | 30                      | 6                             | 20                     | 32                             | 100        |
| Add balance from last year's accounts                     | 21,332                        | 23,605                  | 24,567                        | 17,484                 | 60,930                         | 147,918    |
| Total amount available for dividends and further reserves | £80,898                       | £172,521                | £54,350                       | £116,762               | £219,774                       | £644,305   |

(a) Including \$566,370 from government compensation after providing for adjustments.  
(b) Exclusive of dividend on second preference stock.  
(c) Deficit drawn or met out of common fund.

operating expenses in the same period jumped 47.8 per cent, with the result that the net income applicable for reserves, contingencies and dividends was 10.32 per cent or £115,303 less than at the close of the preceeding year. The fact that the London General Omnibus Company failed to earn its operating expenses is largely responsible for this

line of the financial operations and of the traffic of the roads in the city of London for the year 1919.

### City Wins Tax Fight

The city of Parkersburg, W. Va., has been awarded a verdict in its suit against the Kanawha Traction & Elec-

The years 1914, 1915, 1916 were used in the case and the city will collect approximately \$1,000 for the period. In addition to the amount for these years a settlement will be made for the years 1917, 1918, 1919. It is expected that this settlement will net the city several thousand dollars additional.

STATISTICAL INFORMATION OF ROADS IN LONDON FOR YEAR 1919

|                                    | Metropolitan District Railway | London Electric Railway | City and South London Railway | Central London Railway | London General Omnibus Company | Total          |
|------------------------------------|-------------------------------|-------------------------|-------------------------------|------------------------|--------------------------------|----------------|
| Mileage—first track                | 27 825                        | 41.03                   | 7.325                         | 6.825                  | .....                          | .....          |
| second track                       | 26.975                        | .....                   | 7.325                         | 6.764                  | .....                          | .....          |
| Total—all tracks                   | 70.80                         | .....                   | 15.680                        | 21.375                 | .....                          | .....          |
| Average total miles operated       | 70.80                         | .....                   | 15.680                        | 21.375                 | 400                            | .....          |
| Train miles—active                 | 4,700,398                     | .....                   | 1,345,305                     | 1,523,237              | .....                          | .....          |
| idle                               | 139,623                       | .....                   | 22,642                        | 13,917                 | .....                          | .....          |
| Total train miles operated         | 4,840,021                     | .....                   | 1,367,947                     | 1,537,154              | .....                          | .....          |
| Total car miles operated           | 16,868,610                    | 25,225,196              | 6,726,508                     | 6,725,389              | 75,431,534                     | 130,977,237    |
| Revenue passengers carried:        |                               |                         |                               |                        |                                |                |
| Ordinary (cash)                    | (b) 94,946,736                | 120,848,798             | 28,240,792                    | 39,500,855             | 673,159,709                    | 956,696,890    |
| Workmen                            | (b) 22,095,147                | 31,130,608              | 11,380,985                    | 3,896,548              | .....                          | 68,503,288     |
| Season                             | (b) 25,401,190                | 15,604,260              | 2,282,436                     | 4,904,484              | .....                          | 48,192,370     |
| Total passengers                   | (b) 142,443,073               | 167,583,666             | 41,904,213                    | 48,301,887             | 673,159,709                    | 1,073,392,548  |
| Gross passenger revenue            | £1,360,000                    | £1,538,707              | £314,402                      | £449,493               | £5,242,299                     | (b) £8,900,000 |
| Average fare per passenger (pence) | 2.29                          | 2.19                    | 1.8                           | 2.2                    | 1.87                           | 1.99           |
| Car-mile statistics:               | s d                           | s d                     | s d                           | s d                    | s d                            | s d            |
| Traffic receipts                   | 2 6.12                        | 1 1.47                  | 0 11.24                       | 1 16.03                | 1 4.68                         | 1 5.76         |
| Operating expenses                 | 1 16.03                       | 0 9.65                  | 0 8.52                        | 0 11.4                 | 1 5.71                         | 1 3.12         |
| Net income                         | 0 11.78                       | 0 3.28                  | 0 1.97                        | 0 5.09                 | 0 *4.43                        | 0 2.26         |
| Passenger traffic                  | 8.48                          | 6.6                     | 6.23                          | 6.25                   | 8.92                           | 8.22           |

(a) Operated by Electric Locomotive.  
(b) Estimated.  
\* Deficit.

loss in net income for the other four companies, namely the Metropolitan District Railway, the London Electric Railway, the City & South London Railway, and the Central London Railway, all earned a profit for dividend distribution.

tric Company arising out of the provision that the city shall receive a certain per cent of the earnings of the company. The company held that the city was not entitled to participate in any returns from lines running into the suburbs.

### Carhouse and Cars Burned

Loss estimated at between \$50,000 and \$60,000 was caused by the burning of the carhouse of the Danbury & Bethel Street Railway in Danbury, Conn., on March 16. Nineteen cars were destroyed.

## Financial News Notes

**Would Sell Part of Road.**—Receiver Robert W. Perkins has applied to the Superior Court at New London, Conn., for permission to sell so-called dead-weight sections of the Shore Line Electric Railway.

**Mr. McRoberts a Monongahela Director.**—Samuel McRoberts, prominent New York banker, has been elected to the board of directors of the Monongahela Valley Traction Company, Fairmont, W. Va., to succeed the late Jere H. Wheelwright, who died in France last January.

**To Extend Sales to Public.**—Stone & Webster, Boston, Mass., have begun in some localities the offering of new issues of securities to the public served by the utility in question. It is planned to extend the scope of this work in the future as new capital requirements arise or other occasion warrants.

**Notes to Cover Paving Cost.**—Declaring that it is unable to pay \$25,204.63 in cash for its share of the paving on Juniper Street in Atlanta, Ga., the Georgia Railway & Power Company has petitioned the Railroad Commission for approval of the execution and issuance of three promissory notes of approximately \$6,301.16 each, dated on or about March 13, 1920, and payable to the city of Atlanta one, two and three years after date, with interest at 7 per cent.

**Charter Amended.**—An Amendment has been filed to the charter of the Louisville (Ky.) Railway. It provides that the affairs of the company shall in the future be managed by a board of directors of not less than five nor more than fifteen members. One member shall be the president and all members must be stockholders, under the amendments. This is in accordance with plans for charges in the personnel of the company referred to recently in the *ELECTRIC RAILWAY JOURNAL*.

**Inventory Filed in Fare Case.**—The Omaha & Council Bluffs Street Railway, Omaha, Neb., has filed with the State Railway Commission an inventory in compliance with the order of the commission. This inventory does not carry any valuations. The company is, however, working on a valuation which will be filed with the commission when completed. The inventory and the valuation are in connection with the 7-cent fare which was allowed the company last summer. The increase in fare went into effect about Aug. 10 of last year. It is still in force.

**State Valuation Commission Suggested.**—Senator Collins B. Allen, of Salem, N. J., has introduced a bill in the New Jersey Legislature for the establishment of a commission composed of the

Governor, Treasurer and Comptroller for the purpose of making an independent valuation of electric railway property. The measure carries with it an appropriation of \$100,000 and permits the Commission to employ electrical and mechanical engineering firms to perform the work. It also empowers the commission to examine the books of the companies as a basis for rate making.

**Ordered to Resume Service.**—The Board of Public Utility Commissioners of New Jersey has issued an order directing the Public Service Railway, Newark, N. J., to improve the condition of the tracks and roadbed on Main Street, Moorestown, N. J. by June 30. The company is also directed to resume the same service it operated previous to discontinuing operation some time ago, owing to the condition of the tracks the railway last November discontinued operation and failed to provide for transportation of patrons upon cars of the Burlington County Transit Company.

**San Francisco Reorganization Approved.**—Announcement has been made that the California Railroad Commission has approved plan of reorganization for the United Railroads of San Francisco, submitted by the committee of holders of first mortgage four's, 1927. Under the plan of reorganization the new company will be called the Market Street Railway and the 4 per cent certificate holders will receive 15 per cent of par value in first mortgage bonds of reorganized company; 50 per cent in 6 per cent prior preference cumulative stock; 5 per cent in first preferred 6 per cent stock; 10 per cent second preferred stock; 20 per cent common.

**New Trustee at Dallas.**—The Dallas (Tex.) Railway announces that the Equitable Trust Company, New York, has been appointed trustee to fill the vacancy caused by the resignation of the Scandinavian Trust Company, appointed trustee under a mortgage and deed of trust given by the railway on June 15, 1918, securing an issue of notes issued by it and designated as its secured gold notes. These notes were issued in the refinancing of the company in connection with the carrying out of its program of improvements and betterments pledged under its service-at-cost franchise granted by the city of Dallas.

**Dallas Doing Better.**—The Dallas (Tex.) Railway shows a net return of 5½ per cent on invested capital of \$8,771,905, according to figures for February given out by Richard Meriwether, vice-president and general manager. Cars of the company in Dallas carried more than 4,500,000 people, of whom 639,362 or 13.4 per cent, were transfer passengers. Cars traveled a total of 575,530 car-miles, and trainmen worked a total of 62,872 car-hours. The average number of passengers carried per mile was 8.2, and the average miles traveled by each car was 9.1. Gross earnings for

the month amounted to \$218,725. The operating expenses were \$180,628.

**Abandonment Petition Allowed.**—The Public Service Commission for the Second District of New York has granted the petition of the Chautauqua Traction Company approving a declaration of abandonment of its line from Westfield to Barcelona, about 1 mile long. The commission's order follows an investigation by Chairman Charles B. Hill, who in a memorandum, shows that the line has always run at a heavy loss in operation, the loss reaching several thousands of dollars each year. The objection was raised that because of certain provisions in consents by local authorities the company has no legal right to abandon under section 184 Railroad Law, and that the section, so far as it assumes to extend that power to the company, is unconstitutional. This is not sustained by the commission.

**Seek to Have Service Restored.**—At a hearing on March 15 before Deputy Public Service Commissioner Morgan T. Donnelly an attorney for the receiver of the New York Railways stated that the service had been discontinued on the Eighth and Fourteenth Street lines by direction of Federal Judge Mayer, but that the receiver would be willing to consider any reasonable suggestion which could be made for the operation of service, provided the service could be rendered at less than ruinous loss. The hearing was adjourned to March 22. In the meantime the commission will engage in negotiations to determine if it is not possible to work out a plan for resumption of service. The lines cut off on March 6 were the Eighth Street, Fourteenth Street, Fourteenth Street-Tenth Avenue and the Fourth and Madison Avenue Lines. Substitute service on two of the lines—the Eighth and Fourteenth Street routes—was furnished by motorbuses which are being supplied and operated by the city.

**Rainier Line Rejects City's Appraisal.**—Figures on which it is proposed to base negotiations for the purchase by the city of the Seattle & Rainier Valley Railway have been submitted to the utilities committee by Councilman W. H. Moore of the Council of Seattle, Wash. Mr. Moore's report, places a value of \$765,760 on the property. This does not include a sum the company spent in raising the tracks and filling the right-of-way to the present grade. Councilman Moore said he considered it a legitimate item of the valuation and the report was accepted with the understanding the sum would be added as soon as it could be estimated. Councilman Moore was authorized by the Council to make an appraisal of the line after residents of Rainier Valley had filed a petition asking the city to purchase the property. The figures were telegraphed to E. W. Sampson, president of the company, at Chicago and a reply stated emphatically they would not be considered.

# Traffic and Transportation

## Fare Petitions Withdrawn

Three New York Companies Give Up Hope of Aid from Board of Estimate—Inquiry to Continue

Despairing of obtaining financial relief at the hands of the municipal authorities, three of New York City's traction lines on March 12 withdrew their petitions to the Board of Estimate and Apportionment for an increase in fare. The companies thereby ceased to be voluntary participants in the boards inquiring into the city's transit system. Nevertheless, Corporation Counsel Burr announced on March 13 that the board would continue its investigation.

The notices of withdrawal of the applications were signed by Henry L. Stimson, counsel for Job E. Hedges, receiver of the New York Railways; James R. Sheffield, trustee of the Interborough Consolidated Corporation, the holding concern of the Interborough Rapid Transit Company and the New York Railways, and Lindley M. Garrison, receiver of the surface, elevated and subway lines of the Brooklyn Rapid Transit Company. No notice was served by the Interborough Company, because the inquiry into its affairs by the board is ended, and because it is not bankrupt. It was stated that if the board reopened its inquiry into this company that it also would notify the board that it was not seeking any financial help from the board.

### JUDGE MAYER TAKES ACTION

In withdrawing the petitions for relief, the receivers acted upon instructions from Federal Judge Mayer, who has charge of the companies' affairs. Colonel Stimson sent the following letter to Mayor Hylan:

MAYOR JOHN F. HYLAN,

Chairman of the Board of Estimate:

Sir: By direction of Judge Mayer of the United States District Court, I beg to inform you that I shall not participate in any further hearings before your board upon the subject of the affairs of the New York Railways. By the same direction the petition filed with you on Jan. 7, 1920, by Mr. Hedges, as receiver of the company, is hereby withdrawn. Such further investigation into the affairs of that company as your board may desire to make will not be attended by counsel for the receiver.

HENRY L. STIMSON.

Two-and-one-half months have passed since Judge Mayer directed the receivers to apply to the board for a temporary fare increase. As yet the board has given no indication of an intention to aid the companies. Although numerous hearings have been held there has been little progress in the direction of fixing a valuation of the lines.

Representatives of the companies, in testifying at the traction inquiry, have frequently been taunted with unfairness and otherwise heckled by city officials, including the Mayor. It is believed that

this badgering had much to do with Judge Mayer's decision.

The board at its session on March 19 decided definitely to continue the inquiry. Mr. Burr declared that he thought the city would have no trouble in proceeding with the investigation since, under a resolution of the board, he was empowered to issue subpoenas, if necessary. The Public Committee on Transportation presented a request that the board designate a committee to con-

fer with representatives of the security holders with a view to arriving at a solution of the traction problem.

Corporation Counsel Burr on March 17 asked the Public Service Commission to notify the Interborough Rapid Transit Company that, unless it takes immediate steps to improve its service, the city will take steps to seize and operate the company's subway lines at the end of ninety days. The terms of the subway contract give the city the right "to enter upon and as agent of the lessee, to operate the railroad and equipment \* \* \* at the rate of fare and in the manner provided in the lease for the remainder of the term." Mr. Burr charged that the quality of the service justified the city in carrying out this provision.

## \$6,000,000 Houston Value

### Special Master Holds Texas Property Is Denied Fair Return Under Five-Cent Rate

The Houston (Tex.) Electric Company can not earn a fair return on its property valuation with the present fares at 5 cents for adults and 2½ cents for children. This is the finding of Otis K. Hamblin, special master, appointed by Federal Judge J. C. Hutcheson to hold hearings and fix the valuation of the company's property and report on the adequacy of the return earned by the company.

Judge Hamblin in his report submitted to Judge Hutcheson places the valuation of the company's property at \$6,000,000. He further reports that the company is now earning only 1½ per cent on its property valuation over a depreciation of 4½ per cent, and concludes that this rate of return is inadequate and is in effect confiscatory. Judge Hamblin says the company should be allowed a return of 8 per cent on its valuation of \$6,000,000.

### MAYOR FAVORS 6-CENT FARE

Mayor A. E. Amerman said he believed that a 6-cent fare would provide a fair return, and that the fare litigation would probably be ended. The Mayor doubts, however, if the 6-cent fare will prove adequate if the city demands improvements in service and facilities.

Judge Hutcheson will review the findings of the master in chancery at an early date. It is expected he will approve the report. If he does this city authorities and officials of the company will confer and if possible reach agreement on improved service and facilities and also on a higher fare than 5 cents.

Luke C. Bradley, district manager for the Stone & Webster Company, which operates the property, said the people of Houston were not getting the service the city deserved because the 5-cent fare was inadequate and the company was being starved to death. The authorized earning of 8 per cent, as proposed in the report of Judge Hamblin, and future fares to be

charged by the company depend much on the co-operation of the people of Houston and the company, he said.

### CASE LONG IN COURTS

The litigation between the city and the company has been before both the State and Federal courts. The company in its original petition to the City Council to increase fares represented that fares then authorized were inadequate and would not afford a fair return to the company. After extended hearings, the City Council passed an ordinance authorizing fares of 6 cents for adults and 3 cents for children.

This ordinance was attacked by the organized labor interests of the city, and under the initiative and referendum provisions of the city charter, a petition to refer the ordinance to the people for ratification was circulated and the required number of signers secured. At the referendum election the ordinance was rejected. Thereupon the company appealed to the State courts, alleging that the repeal of the ordinance was accomplished through illegal means. The company lost this fight.

### APPEALS TO FEDERAL COURT

The company next brought suit in the Federal District court, representing that its property was being confiscated by the low fares authorized by the city, and asking that the court fix valuation of its holdings to be used as a basis for fixing fares. Judge Hutcheson then appointed Judge Hamblin to hold hearings and fix a just valuation and a fair return.

Judge Hamblin explained that the valuation of \$6,000,000 had been arrived at after exhaustive investigation in which representatives of the city, of the company, disinterested engineers and valuation experts had been heard.

In the hearings Lamar Lyndon, valuation expert, set the value of the company's properties at \$5,300,000. The special master increased this figure by \$700,000.



# Parking Dead Line in Los Angeles

## Ordinance Effective on April 10 Will Relieve Congestion in Business District—Three Zones Established

A "no-parking" ordinance will go into effect in the business district of Los Angeles, Cal., on April 10. Under it the parking of automobiles and other vehicles will be prohibited within certain areas, and within others will be restricted to a definite period of the day. The elimination of parking within the congested area will leave the streets clear for the operation of electric cars.

Adoption of some form of restriction on the operation of vehicular traffic is generally conceded to be the only hope of relieving the transportation system in Los Angeles. Portions of the Los Angeles business district are considered

are exempted from the parking ban. Outside of this "congested" area, but still within the business district proper, is a section in which the automobilist may park his car for a period of two hours without interference from the police. This section is bounded on the north by Sunset Boulevard, on the east by San Pedro Street and Central Avenue, on the south by Pico Street and on the west by Georgia, Bixel and Buylston Streets.

Beyond these limits unrestricted parking will be permitted. The new ordinance also prohibits the use of the "left-hand turn" during the no-parking

In any case great numbers of these autoists will use the trolleys.

The company will thus be confronted with a daily increase in the number of riders of approximately 80,000. To meet the new conditions the railway plans to provide additional equipment. It will also be in better shape to carry the additional burden since it will be able to operate its cars on a faster schedule. In this connection it plans to reroute its cars and to make other operating changes proposed by the commission. These latter measures will become effective on May 1. It is estimated that when the new system is in full swing the company can operate its equipment with one-half the present headway.

### REFERENDUM PROPOSED

The carrying out of the no-parking plan will in all probability alter the course of the city's development. It may lead to the growth of new shopping and theater districts to cater to automobilists. The plan has encountered considerable opposition at the hands of motorists. More than 15,000 persons have signed petitions for a referendum on the question of retaining the parking regulations.

Several large garages are being erected within the no-parking area. One of these has already been completed. Another is to be put up immediately at a cost of \$650,000 and, when finished, will provide parking space for 1,032 vehicles.

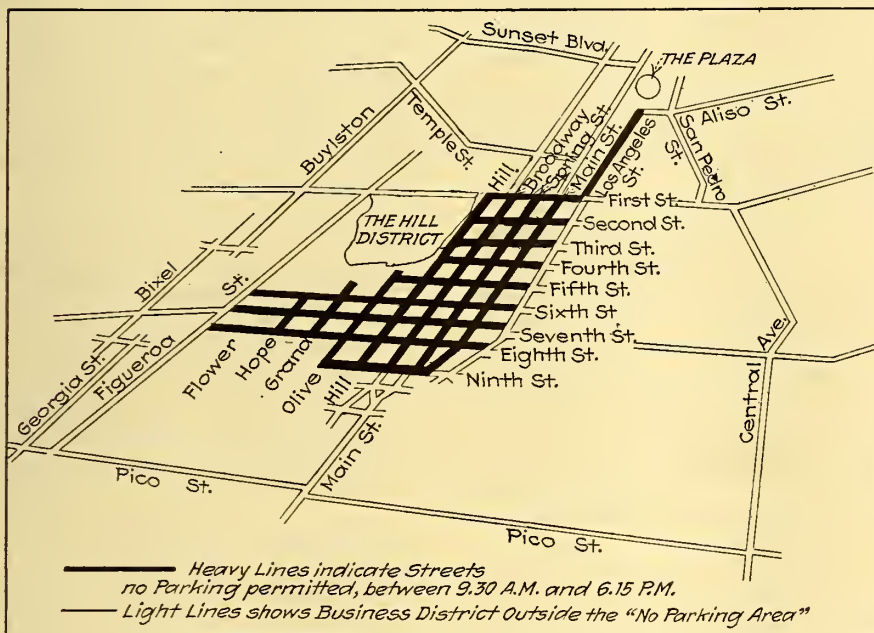


DIAGRAM OF LOS ANGELES PARKING PLAN

the most congested areas of the sort in the entire country. The Los Angeles Railway and the Pacific Electric Railway are physically unable, because of vehicular congestion, to operate their cars on schedule.

### COMMISSION'S RECOMMENDATIONS

The State Railroad Commission, after an exhaustive study of traffic conditions in the city, recommended enactment of drastic anti-parking legislation and a general rerouting of cars. Acting on the commission's recommendations the City Council recently passed an ordinance, effective on April 10, under which the operation of vehicles within the business section will be controlled. The ordinance divides the business district into three zones, a "congested" or closed district, a semi-restricted section, and an unrestricted area.

Within the first of these the parking of automobiles is prohibited between the hours of 11 a.m. and 6.15 p.m. This district is bounded as indicated in the accompanying illustration. Certain street-sections in the hill region

hours. Commercial deliveries are to be made from alleys whenever conditions permit.

The enforcement of these rules is expected to react on the electric railways in two ways. First, it will speed up operating schedules. At present 30,000 automobiles park in the congested district each day. Their elimination will remove the greatest obstruction to the fast operation of cars.

### MORE RAILWAY RIDERS

Second, the prohibition of parking in the heart of the city will turn a considerable volume of traffic now taken care of in other ways to the Los Angeles Railway. The number of persons daily entering the congested district in automobiles is estimated at 82,000. Since these riders may not leave their machines in this district while they are attending to their business or pleasure, the vast majority of them will either seek other parking accommodations, such as garages, park their cars at the beginning of the closed section and walk in, or leave them at home.

### Safety Bonus Plan Working Well

Results of the first month's trial of the safety bonus plan, recently adopted by the Dallas (Tex.) Railway as a means of encouraging efficiency and carefulness on the part of its employees, have proved most satisfactory. Richard Meriwether, vice-president and general manager of the company, reports that all but forty-two out of the total of 553 trainmen in the company's employ eligible to participate in the system, came through the month with perfect service records, and that 508 received the additional 2 cents an hour as bonus for perfect records.

Data on the bonus plan, as submitted by Charles Swenson, superintendent of transportation, to Mr. Meriwether, indicated that almost one-half of the trainmen who failed to receive the bonus, lost this extra pay through reporting late for duty. One motorman lost the bonus because he operated his car faster than the schedule called for. Seven trainmen were not awarded the bonus because of collisions, and one motorman lost the bonus because he turned back without orders and talked to a woman while on duty.

The safety bonus plan was announced by the company to take effect on Jan. 1. It will be continued for three months as a test. At the end of that time the company will probably announce the general results.

## Seven Cents in Auburn

This Rate Will Prevail for Three Years  
—Commissioner Declares Six-Cent  
Fare Inadequate

The Public Service Commission for the Second District of New York on March 9 directed that for a period of three years, unless changed by order of the commission, a 7-cent fare shall be the maximum fare which may be charged by the Auburn & Syracuse Electric Railroad on cars within its Auburn, N. Y., zone, including all lines within the city and between Auburn and Owasco Lake and between Auburn and Soule Cemetery. The new fare becomes effective on three days' notice.

The company has been operating under a 6-cent fare since Dec. 31, 1918, and on Jan. 13 the city waived fare restriction in certain franchises so as to permit further investigation and a fare not to exceed 7 cents.

Commissioner Frank Irvine, in a memorandum accompanying the order, reviews the evidence on the hearing. He says:

This shows a deficit from railroad operation under the 6-cent fare of \$1,929, a deficit after paying taxes of \$11,593 and of income applicable to capital investment of \$6,932. Interest on bonds is not deducted. On the face of this showing no inquiry into value of the property is necessary. The city system is of very considerable extent and the equipment seems adequate and in good condition. It is certainly entitled to earn some return and more than can be hoped under present conditions even from the proposed increase in fare.

The city's waiver provides that the city within three years may make application for a reduction in the rate. Commissioner Irvine in conclusion says:

It may not be amiss to repeat an admonition given already to some other companies under similar conditions; that is, that as there seems now to be no prospect of early return to conditions formerly considered normal in finance and prices, the best efforts of the company should be given to devising means of reducing expenses without impairment of service. Not that the commission deems the present expenses excessive as compared with other systems operating under present methods; they are not so; but because it is felt that some improvements in the methods themselves are imperatively necessary.

## Important Freight Interchange

The Northwestern Elevated Railroad, Chicago, has purchased two new 50-ton electric locomotives which will be equipped with Westinghouse 567 motors. These are the same type motors which were specified for part of the last all-steel cars bought by the Elevated Lines.

The two locomotives will be used in connection with the interchange of freight between the Chicago, North Shore & Milwaukee Railroad and the Chicago, Milwaukee & St. Paul Railroad. North-bound freight received from the steam road at the interchange yard which lies between Irving Park Boulevard and Wilson Avenue will be hauled over the elevated structure from this point to Evanston and sent north over the North Shore Line.

Three steam locomotives are now kept busy in hauling this freight over the elevated structure paralleling the Northwestern "L" to the present interchange point in Evanston. The Ele-

vated company will take over the handling of this interchange freight between Wilson Avenue and Evanston on Oct. 1.

## Many Routing Changes Suggested

The executive committee of the Louisville (Ky.) Railway is being flooded with petitions of merchants for changes in present routings, and also of residents of certain sections of the city. Merchants are anxious to reroute some of the East and West lines and one or two North and South lines around a downtown loop. It is held that this would eliminate many transfers and give better service. However, a similar plan of a few years ago did not prove satisfactory, and the new plan would call for building some three or four blocks of additional line in the business district, as well as connections in other sections of the city. F. A. Sager, who has been employed by the railway to aid it in solving various problems, has taken all of these suggestions under advisement. The company is not likely, however, to go to the expense of building additional trackage which would probably further slow up traffic.

## New York Transfer Charge Upheld

The attempt of the City of New York to restore free transfers on the lines of the New York Railways by abolishing the 2-cent charge allowed by Public Service Commissioner Lewis Nixon, was defeated on March 16, when Justice Greenbaum of the Supreme Court granted the motion of Terence Farley, counsel to the commission, to quash the writ of certiorari obtained by Corporation Counsel Burr.

The action of the court was an answer to statements made by Mayor Hylan, Mr. Burr and other representatives of the city government that Mr. Nixon exceeded his authority in permitting the transfer charge, and that it was in effect an increase of fare which the Court of Appeals had decided could not be allowed by the commission without the consent of the Board of Estimate.

Justice Greenbaum explained at length the rights retained and granted by the city under the franchises of the company, and in reference to the order of the commission said:

It is plain from the reading of the order that in permitting a 2-cent charge for transfers no rights of the city are affected thereby.

The opinion refers to various valuations of the railway to show the need the company had of an increased income, and referred to the fact that the city had conceded the right of the commission to grant the company the privilege of charging for transfers at fourteen out of the ninety-nine points where a charge was allowed.

The privilege of the company to charge for transfers at ninety-nine of the 113 transfer points is to run only for one year, when the commission will decide whether to extend the time or restore the free transfers.

# Transportation News Notes

**Would Abolish Freight Service.**—The West Virginia Traction & Electric Company, Wheeling, W. Va., has applied to the State Public Service Commission for permission to discontinue freight service on its line between Wheeling and West Alexander. The company asserts that to continue such service it would require additional equipment.

**Must Segregate Negroes.**—The South Carolina Railroad Commission has ordered the Augusta-Aiken Railway & Electric Corporation of South Carolina, Augusta, Ga., to install separate compartments in its cars for the accommodation of negroes. The commission directs the company not to operate its cars in South Carolina without segregating the races.

**Seven Cents in New Castle.**—The Pennsylvania Public Service Commission has authorized the Pennsylvania-Ohio Electric Company, Youngstown, Ohio, formerly the Mahoning & Shenango Railway & Light Company, to charge 7-cent cash fares on its New Castle (Pa.) city lines. The company is ordered to sell six tickets for 40 cents and twenty school tickets for \$1. Under the order the new rates became effective on March 14.

**Increase on Fall River Line.**—The Massachusetts Department of Public Utilities has authorized the Union Street Railway, New Bedford, to increase the fare between New Bedford and Fall River from 20 cents to 25 cents. The company, which operates over the tracks of the Eastern Massachusetts Street Railway in Fall River, had temporarily discontinued service within the limits of the latter city because of the demand of the Eastern Massachusetts Street Railway management that it charge 10-cent fares in Fall River.

**Six-Cent Fare Stands.**—The Memphis (Tenn.) Street Railway has reached an agreement with the City of Memphis whereby it will continue to charge a 6-cent fare for three months from April 1. If at the end of that time the company is still in need of additional revenue the fare will automatically advance to 7 cents. The State Railroad & Public Utilities Commission, which has had the company's application for a rate increase under consideration, has approved the agreement.

**Rerouting in Pittsburgh.**—In an effort to improve spacing between cars using Forbes Street, the Pittsburgh (Pa.) Railways has announced new routing for several of its lines. In a statement explaining the changes, the company declares that since the num-

ber of riders has been increased the matter of spacing is much more important now than it has been in the past. This is the most important route change made by the Pittsburgh Railways in many years. It is expected to go a long way toward helping to solve Pittsburgh's trolley transportation problem.

**Interurban Increase Protested.**—Mayors Morris of New Albany, and Myers, of Jeffersonville, have filed protests with the Interstate Commerce Commission against an increase of cash fares from 7 cents to 10 cents between Louisville and New Albany over the line of the Louisville & Northern Railway & Lighting Company. The company has arranged to sell ticket books at the rate of 7 cents a fare, with cash fares 10 cents. The increase becomes effective on April 3, unless the schedule filed is suspended within thirty days by the Interstate Commerce Commission.

**Surplus Accident Fund Divided.**—An average of about \$50 a man for those who were in the company's service all of 1919 was paid recently by the San Diego (Cal.) Electric Railway when the surplus in the accident fund for 1919 was distributed. There was \$10,369 in the fund after all claims for injury or damage to property had been paid. This was distributed to the men pro rata, based upon the number of hours worked. The policy of distributing this fund each year was adopted by the company several years ago to make the men careful to avoid accidents. It has accomplished this result, according to the officials. Most of the accidents that did occur were caused by automobiles, it was stated.

**Demand for Service Improvements.**—A demand that the Public Utilities Commission of Illinois take immediate action to improve service on the Chicago Surface Lines was made in a public statement issued by Attorney General Brundage on March 10. The State officials urged the extensions of "turn-back" service on some of the lines which now use loops in the congested district; the installation of trailers to add to seating capacity, and the use of all available cars in the rush and non-rush hours. The commission replied with a statement to the effect that all these suggestions had already been presented to that body and were being considered.

**Changes in Albany Southern Tariff.**—The Albany Southern Railroad, Hudson, N. Y., under changes in its tariff, filed with the Public Service Commission for the Second District, proposes as effective on April 5 these changes: Local one-way fares increased from 8 to 11 cents from Prospect Heights to East Greenbush; reduced from 33 cents to 30 cents from Schodack Center to North Chatham; increased from 36 cents to 39 cents from Merchants to Albany. Rules relating to commutation tickets will provide that in case the sale price of a ticket is lawfully changed before expiration, the ticket will not be honored for transportation

but the unused portion will be re-deemed.

**Municipal Operation for Staten Island.**—Grover A. Whalen, Commissioner of Plant & Structures of New York City, has announced that the city authorities will take over and operate the lines of the Staten Island Midland Railway, Richmond Borough. The company suspended operation last January following the refusal of the Board of Estimate to grant it an increase in fare. Commissioner Whalen stated on March 13 that, acting under instructions from Mayor Hylan, he had practically completed arrangements for the purchase of twenty cars from the Emergency Fleet Corporation for use on the Midland Company's tracks, the latter company having transferred its own rolling stock to the lines of the Richmond Light & Power Company. The Richmond County Grand Jury is at present investigating the situation.

**More Safety Cars for Terre Haute.**—The Terre Haute Traction & Light Company, Terre Haute, Ind., has placed an order for ten additional safety cars for use in Terre Haute. This brings the total number of safety cars purchased by the company up to sixty-six and will provide for 100 per cent safety-car operation, including rush-hour service. All sixty-six cars are of identical design and equipment, this fact being of great importance from the viewpoint of low maintenance costs because of the complete standardization. The purchase of the last ten cars was financed in Terre Haute. Three local bankers were induced to purchase the cars, the company obligating itself with five-year 6½ per cent equipment notes. The bankers will pay for the cars when delivered and will give the company a bill-of-sale for them when it has met its obligations. The attitude of the public and the newspapers on the one-man cars in Terre Haute was the subject of an article in the *ELECTRIC RAILWAY JOURNAL* for March 6, page 495.

**Favor Higher Tube Fare.**—Resolutions favoring an increased fare on the lines of the Hudson & Manhattan Railroad, New York, N. Y., have been adopted by the directors of the Chamber of Commerce of Jersey City, N. J. The company, which operates the tubes under the Hudson River, has notified the Interstate Commerce Commission of its intention to raise fares to 8 cents on April 4. The 8-cent fare is expected to yield additional revenue to the amount of \$1,000,000 per year. On the basis of the 1919 figures, which showed a deficit of \$1,301,753 in the net available income to meet interest on bonds, the company still would not be meeting this item in full. Oren Root, president of the company, recently announced that although the gross revenue of the road had increased 64.82 per cent in the years from 1915 to 1919, the cost of maintenance and operation had risen in the same period 155.20 per cent. The cost of operation per car-mile increased from 18.21 cents in 1914 to 37 cents in 1919.

## New Publications

### McGraw Electric Railway List

For February, 1920, 284 pages, published by the McGraw-Hill Company, Inc., New York.

The issue for February of this well-known semi-annual list has just been published. As usual, it contains the names of all operating electric railway companies and municipal lines in the United States and its insular possessions, also in Canada, Mexico and the West Indies. A list of officers and a brief enumeration of the equipment are included. In this edition, which has been completely revised, are represented approximately: 1,450 changes in personnel, 650 changes in power plant and substation equipment, 500 changes in mileage and rolling stock, 500 additional miscellaneous changes, 44 receiverships, 15 re-organizations and other valuable statistics on the industry.

### Commercial Research: An Outline of Working Principles

By C. S. Duncan, Ph.D. The MacMillan Company, New York, N. Y., 385 pages. Price \$2.25.

It is sometimes easier to accomplish progress by warning people of impending danger of falling behind in the race than by appealing constructively to man's better nature. As Mr. Steinmetz prophetically said during the progress of the war: "Whichever side emerges victorious, all nations must of necessity adopt better standards of business and scientific organization as a matter of self-preservation."

As Mr. Duncan says, trade persists through multifarious social and political changes. The new age, like the old, will be built on a foundation of commerce. What this commerce is to be, what rules of the game are to be adopted, what organization for trade will result, what prevailing spirit will animate it, are points of vital interest.

"Commercial Research" contains a discussion of scientific principles for the solving of commercial problems, and is a guide to their application. In everyday, untechnical language there are stated the devices by means of which the manager may most quickly and accurately visualize his problems; the need for research; character of commercial research; sources of business facts; methods of collecting them; their nature, analysis, presentation, interpretation, and organization for research.

All this material is intended for education and especially for the self-education of those already in the midst of the game. There is to be found here a discussion of principles and not of historical development. The book is written for the business man; for his use and not for his entertainment.

## Personal Mention

### J. C. Nelson in Command

Made Head of Empire State Railroad,  
Succeeding the Late H. S. Holden  
—L. L. Odell Promoted

J. C. Nelson, vice-president and general manager of the Empire State Railroad, Syracuse, N. Y., was elected president of the company at the meeting of the board of directors on March 9. Mr. Nelson succeeds the late H. S. Holden. At the same time L. L. Odell was elected assistant general manager. Mr. Odell will continue in his capacity as treasurer.

Mr. Nelson has been in charge of the company's affairs since the death of Mr. Holden in November, 1918. Since



J. C. NELSON

that time the office of president has been vacant. The Empire State Railroad, which took over part of the system of the Empire United Railways, sold under foreclosure, operates 80 miles of track in the central part of New York State, including an inter-urban line connecting Syracuse and Oswego and the city lines in Oswego and Auburn.

Mr. Nelson was graduated from the University of Alabama with the degree of civil engineer, later taking a special engineering course at Cornell University. In the year 1902 he became connected with the engineering firm of Ford, Bacon & Davis, New York, with which he was associated for a number of years. He was at first employed in the construction department in connection with the development of the firm's properties in the South, and was later transferred to the New York office, where he was engaged on construction and valuation work. He also made several investigations of public utility operation.

He was appointed general manager of the Gary & Interurban Railroad, Gary, Ind., in 1916. From Gary he

was transferred, in the following year, to Syracuse, as general manager of the Empire United Railways. When this company was reorganized in October, 1917, Mr. Nelson became vice-president and general manager of the Empire State Railroad, its successor. In March of last year he was elected vice-president and general manager of the Ithaca (N. Y.) Traction Company, continuing his connection with the Syracuse company.

### Municipal Railway Head Quits After Election

Thomas F. Murphine, director of public utilities of Seattle, Wash., and superintendent of the Seattle Municipal Street Railway, resigned on March 16. R. M. O'Brien, assistant superintendent, has been placed in charge of the public utilities department, while D. W. Henderson, superintendent of transportation, has been given temporary direction of the municipal railway.

Mr. Murphine became the active head of Seattle's extended municipal railway system, with its trackage of more than 225 miles, in April, 1919, when the city completed the purchase of the railway lines of the Puget Sound Traction, Light & Power Company. He was formerly superintendent of the 18-mile municipal railway line which the city had installed. He was graduated from the University of Washington in 1898 with the degree of A.B., and from the School of Law of the same institution in 1907. He was a member of the 1913 and 1915 sessions of the State Legislature, where he was a leader of the Progressive and municipal ownership forces. In 1918 he was appointed superintendent of public utilities by Ole Hanson, then Mayor of Seattle, during whose administration the transfer of the railway to the city was arranged.

David W. Henderson, who has been placed in charge of the municipal lines, has been superintendent of transportation since April, 1919. Until that time he was head of the transportation department of the Puget Sound Traction, Light & Power Company. He had been connected with the latter company for seventeen years.

The recent municipal elections resulted in the choice of Hugh M. Caldwell as Mayor of Seattle. During the campaign Mr. Caldwell condemned the public utilities department and municipal railway. He was elected by an overwhelming majority. The new executive is reported to be preparing to separate the municipal railway from the public utilities department and to place the former in charge of a superintendent of transportation.

### R. I. Todd Honored

Chosen President of Central Electric  
Railway Association—His Career  
as Railway Operator

Robert I. Todd, president and general manager of the Indianapolis (Ind.) Street Railway and the Terre Haute, Indianapolis & Eastern Traction Company, was chosen president of the Central Electric Railway Association at the annual meeting of that body at Louisville, Ky., on March 10 and 11. Mr. Todd's election was noted in the *ELECTRIC RAILWAY JOURNAL* for March 13. Mr. Todd has been associated with the work of the Central Association for many years and has already served as first vice-president, but could not be induced to accept the presidency until this year. He has now taken the office reluctantly, but has pledged himself sincerely to do his utmost in promoting the interest of the member companies.

Mr. Todd was born on Nov. 29, 1869, at Lakewood, N. J. He received the



R. I. TODD

degree of electrical engineer from Johns Hopkins University in 1893. His connection with the railway field began while he was still a student at the university, his summers being spent in the employ of the traction company at Raleigh, N. C., one of the earliest electric lines in the country. Subsequently he became connected with the Washington, Eckington & Soldiers' Home Railway, Washington, D. C., which was later consolidated into the City & Suburban Railway, and still later into the Washington Railway & Electric Company, serving as superintendent and electrical engineer.

He left this position in 1899 to become connected with the Compressed Air Company as chief engineer, this company having undertaken the development of compressed air motors for the Metropolitan Street Railway, New York City. Later he became more directly connected with the latter road, doing engineering work for Mr. Starrett, who was then chief engineer of this company. In 1900 he went to Pittsburgh as mechanical engineer in charge of shops and power houses

of the Pittsburgh Consolidated Street Railway, now included in the system of the Pittsburgh Railways.

In the latter part of 1901 Mr. Todd was chosen vice-president and general manager of the Cincinnati Traction Company, leaving this position early in 1903 to assume general supervision of the engineering work of the electric railway properties of the United Gas & Improvement Company, Philadelphia, Pa. In the following year he was appointed general manager of the Rhode Island Company, Providence, R. I., serving in this capacity until 1906, when he went to Indianapolis to become vice-president and general manager of the Indianapolis Traction & Terminal Company and the Terre Haute, Indianapolis & Eastern Traction Company.

Upon the death of Hugh J. McGowan in 1911, Mr. Todd was elected president of these two companies, the former now being known as the Indianapolis Street Railway. Mr. Todd served a term as president of the American Electric Railway Transportation & Traffic Association in 1912. He is now the fourth vice-president of the parent Association. He is a member of the American Society of Mechanical Engineers and an associate member of the American Institute of Electrical Engineers.

George J. Smith, who resigned on Feb. 1 as superintendent of equipment of the Kansas City (Mo.) Railways, was recently tendered a dinner by officials of the company at the Hotel Muehlebach, Kansas City. On this occasion Mr. Smith's former associates presented him with a gold watch and chain. Arrangements have been made whereby Mr. Smith, who is now engaged in the automobile business in Kansas City, will act for the company in an advisory capacity.

E. T. Goslin, electrical engineer to the Glasgow Corporation Tramways Department, Glasgow, Scotland, has been appointed general manager of the Clyde Valley Electrical Power Company, to succeed Archibald Page, who has been appointed a technical member of the Commission under the Ministry of Transport for the control of the electrical supply of the kingdom. Mr. Goslin began his career in London with Messrs. Crompton & Company, Ltd., the well known electrical engineers. Thence he went to the Hove Electric Lighting Company, after which he was in the service of the County of London Electric Lighting Company. Mr. Goslin entered the Glasgow Corporation Tramways Department twenty years ago, and during eighteen of these he has been the chief electrical engineer. He is a member of the American Institute of Electrical Engineers. During the war he was lent to the Coal Controller, and was afterwards appointed to the Ministry of National Service as Deputy Director of Labour. Mr. Goslin held the rank of Major in the City of Glasgow Royal Engineers.

## L. J. Drake, President

Head of Galena Company at Thirty-Nine  
—An Authority on Oil and  
Lubrication

Lauren J. Drake, who has just been elected president of the Galena Signal Oil Company, as mentioned in the last issue of this paper, comes from a family which has been prominent in the oil business, his father, for whom he is named, having been president of the Standard Oil Company of Indiana at the time of his death.

The present Lauren J. Drake is a young man to head such a large organization as the Galena Company, being only thirty-nine on his last birthday. That he should have been selected speaks volumes for the executive ability which he has displayed and the work accomplished during his fifteen years' connection with the company.

His record can be briefly summarized. Born in Keokuk, Iowa, on Aug. 27, 1880, he attended the public schools in Omaha and Chicago, and



L. J. DRAKE

was graduated from the Shattuck Military School in 1899. After six years' service with several important oil companies, where he acquired a general and broad knowledge of the oil business, he joined the Galena Company in 1905 as representative in the Middle West. His election as vice-president and director, with headquarters in New York, occurred in 1916, and as president of the company on Feb. 24 of this year. Mr. Drake is also president of the branches of the Galena Company in France, England and Brazil. The outstanding characteristics which have led to his business success are his resourcefulness, untiring energy and personality.

Mr. Drake is a member of the Railroad Club and Whitehall Club of New York City, the North Hempstead Country Club of Long Island, the Franklin Club of Franklin, Pa., and the Wandango Country Club of Reno, Pa.

H. D. Anderson of Philadelphia, Pa., has been appointed secretary and treasurer of the Wilmington & Philadelphia Traction Company, Wilming-

ton, Del. Mr. Anderson succeeds Charles N. Ryan, resigned.

Charles M. Kemp has been appointed general freight and passenger agent of the Fort Wayne & Northwestern Railway, Kendallville, Ind. Mr. Kemp was formerly station agent at Kendallville.

G. B. Cade, secretary and treasurer of the Atlantic Coast Electric Railway, Asbury Park, N. J., has been appointed assistant to S. F. Hazelrigg, president of the company. Mr. Cade has been connected with the road for more than twenty years.

## Obituary

### J. R. Harrigan Dead

J. R. Harrigan, vice-president and general manager of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., died on March 16 at his home in Kansas City after an illness of ten days. Mr. Harrigan, who took an active interest in the life of Kansas City, was also president of the Kansas City Interurban Freight Terminal Company.

Mr. Harrigan entered street railway work in 1886 following his graduation from the high school at Eau Claire, Wis. For two years he served as manager of the Eau Claire Street Railroad, operating a horse-car line. He then went into other business, but returned to Eau Claire in 1897 to assist in the electrification of the street railroad property and to act for four years as general manager of the new line, the Chippewa Valley Electric Railway. In 1901 he was appointed general superintendent of the Dayton, Springfield & Urbana Railway, Springfield, Ohio. In the following year he became general manager of the Columbus, Buckeye Lake & Newark Traction Company and the Columbus, Newark & Zanesville Railway, in which capacity he continued until the purchase of the roads by the so-called Widener-Elkins syndicate several years later, when he resigned.

In 1906 Mr. Harrigan assumed the management of the Canton-Akron Railroad, of which he was in charge until its absorption by the Northern Ohio Traction & Light Company, when he went to Buffalo, N. Y., as assistant general manager of the Buffalo & Lake Erie Traction Company. In 1908 he was appointed general manager of the Columbus, Delaware & Marion Railway, Columbus, Ohio. He resigned this position in 1910 to become vice-president and general manager of the Des Moines (Iowa) City Railway. In July, 1912, he resigned to assume the duties of general manager of the Kansas City, Clay County & St. Joseph Railway. He became vice-president of the company five years later, continuing to serve as general manager.

# Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,  
SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

## Wood-Pole Market Improving

**White Cedar Poles Advance 10 Per Cent  
—Increase in Chestnut Pole  
Prices Expected**

Wood-pole sales are improving. Business is encouraging and as soon as the railroads recover from the effects of the storm conditions over the country, deliveries will be much better than for some months past.

Although cutting operations have been difficult during the present season, the work is pretty well along, and were it possible to get transportation at the present time, the distributing yards of the different pole companies would be full to overflowing. As it is the poles have been cut and are on the ground waiting to be shipped. Car shortage is the greatest menace, although in some instances pole interests have built their own flat cars for moving poles to the main line of the railroads. Some stocks already have been received, and a large amount of poles are now loaded or en route.

Prices on red cedar poles have not advanced since the first of the year, when a general increase was made averaging from 10 to 15 per cent. White cedar, however, has advanced 10 per cent during the past week. There is a large demand in the East and South for both Northern and Western red cedar and also for Northern white cedar. In the West the greatest demand is for Western red cedar, which is cut in the off season and is in reality a local product obtainable on short notice at almost any time of the year.

Chestnut poles have not advanced since last year, but an increase is now looked for and may be announced at any time. Some of the best grades grown in parts of Virginia and Pennsylvania have been destroyed by blight although there is a considerable supply south of these districts which will be available.

## Grounding Device Sales Picking Up

Sales of grounding devices for a year past have been rather spotty among various manufacturers. Where labor conditions have permitted operators to work their plants at full capacity an increase in business has been shown for the year. Where labor conditions hindered production, inquiries received by the manufacturers indicate that the business of the year just closing would otherwise have been above that of the year previous. Ability to furnish the grounds has been a

big factor in the sale, in addition to more settled conditions and more liberal buying in this country and, particularly, the demand that has been growing abroad.

Current sales show an increase. Since the time to manufacture these devices is small, shipments can be made

promptly, or up to three weeks. In some cases, however, labor conditions are drawing out this time considerably.

Railways now coming into the market can get deliveries in ample time to do their spring work and at prices that are in all probability much better than those which will obtain at a later period.

## Heavy Sales Recorded for Track Maintenance and Reconstruction

**Girder and T-Rail, Special Work, Track Accessories, Steel Ties and  
Other Substitutes for Wooden Ties Have Prosperous  
First Quarter**

Sales of rail, ties and other materials for track maintenance and reconstruction work for the past three months have been better than for any corresponding period during the past three years. As the representative of a large special-work manufacturer expressed it, the volume of business has shown a considerable improvement over pre-war sales. Sales of one of the largest manufacturers of special track work for the month of February in one central district were larger than sales for the whole year of 1919. In the New England district, railways bought heavily of all kinds of track equipment and supplies. Much high T-rail was contracted for although the volume of orders for girder rail was considerably greater.

### BUYING IS GENERAL

Standard sections are requiring much mill space and manufacturers agree that the buying on the part of the railways has been very satisfactory. It is known, however, that the railways are in need of large quantities of track supplies and are confident that an enormous volume of business will be placed during the year although it is believed that the buying during the second quarter will not be as large in volume or as well distributed as during the first quarter.

No further increases in rail prices are announced with the exception of a slight advance in prices on complicated layouts of special work.

Mills are in shape to accept further orders on both standard and on special sections although deliveries are subject to certain conditions. Double track crossings and similar pieces can be obtained in four to five weeks. For standard sections, conditions depend largely on the quantity ordered and arrangements necessary at the mill to commence the rolling. Orders are pooled with the result that a number

of railway companies have their requirements for new rails supplied from a single rolling.

Track spikes, bolts and nuts, splice bars and miscellaneous equipment have been very active for the past two months. Owing to heavy purchasing by the steam road, deliveries have lengthened considerably, sixty to ninety days now being quoted.

Demands for steel ties and other substitutes for wooden ties have been particularly active, in fact, it is believed that the principal factor now is to obtain raw material enough to cope with the steady demand for this class of goods.

## Insurance for Employees

Commencing March 1, an insurance policy for the sum of \$500 will be given without cost to every employee of the Westinghouse Electric & Manufacturing Company who has been in the service of the company for a period of six months or more. In addition, the employees, after April 1, may increase the value of their policies to amounts varying from \$1,000 to \$2,000, depending upon their length of service and continuity of savings. All employees who have been in the company's service for six months or longer and who deposit a sum each pay day in the employees' savings fund equal to 2 per cent or more of their earnings will not only receive 4½ per cent interest compounded semi-annually on such deposits but in addition will automatically have their insurance increased to amounts up to \$2,000, depending on the length of time they have been with the company.

After an employee has maintained the required deposits for a period of five years he may discontinue or withdraw his deposits from the savings fund without in any way affecting the value of his insurance policy.

## Lightning Arrester Deliveries Good

Heavy Demands for Oxide Film Type and Increased Production Enable Manufacturer To Decrease Price

Manufacturers are better able to deliver lightning arresters than almost any other kind of equipment. Although sales have been fairly heavy, greatly increased production has enabled manufacturers to get some stock ahead. This, however, it is expected, will be swallowed up by the first rush of orders. As the heavy buying of the year takes place during the spring months, production of arresters is being pushed to the limit in an attempt to keep ahead of orders placed.

Distribution lightning arresters, both of the compression-chamber, multi-gap type and of the aluminum-cell type for 2,300-volt service, are in fair demand. Ample stocks of each kind are held ready for shipment. In the larger sizes of compression-chamber, multi-gap arresters, deliveries are four, eight and ten weeks respectively on voltages of 5,000, 7,500 and 15,000. Arresters of special design require four to six weeks additional.

In the high-voltage transmission field, deliveries on both aluminum-cell and oxide-film arresters range from two to eight weeks, depending upon size and type.

Direct-current, aluminum-cell arresters, such as are mounted on electric cars, can be delivered in quantity from stock on certain sizes, while for the remainder, two to three weeks is required. Magnetic blowout arresters for cars can be delivered in fairly large quantities from stock. The maximum delivery, however, being four weeks.

Prices have not changed since last fall with the exception of a small increase on compression-type arresters. The oxide-film arresters, however, have been decreased in price, on an average 5 per cent. According to the manufacturer, the decrease was made because of greater production and increased sales.

## Nineteen Cars Destroyed by Fire

Nineteen cars were consumed in a fire that destroyed one of the buildings of the Danbury & Bethel Street Railway, Danbury, Conn., on March 16, causing a loss estimated at between \$50,000 and \$60,000.

The fire destroyed all but one of the company's summer cars. Orders will be placed immediately for new rolling stock.

The fire department succeeded in saving the other buildings of the railway and thus prevented the complete crippling of the road by the destruction of its entire rolling stock. The closed cars in use at present were in one of the neighboring buildings and escaped damage.

The eleven single-truck open cars destroyed were purchased many years ago, but were still in excellent condi-

tion. Their loss will be felt severely, especially if difficulty is experienced in procuring new rolling stock before warm weather arrives.

## Transformer Prices Advanced 10 Per Cent

One of the largest manufacturers has advanced prices on all transformers approximately 10 per cent, on account of increased costs of raw material. Deliveries for distribution type range from delivery out of stock up to four weeks. High-tension transformer deliveries are quoted from ten to twenty weeks, depending on size. Two of the largest manufacturing companies report a good supply of standard stock sizes coming through the factories which will be available for delivery as soon as rail shipments improve.

Factory conditions are good as far as labor is concerned but delays in getting raw material has held up important work.

## General Electric Leases War Plant

Announcement has just been made that the General Electric Company has leased, with option to purchase, the forty-acre war plant of the Remington Arms Company at Bridgeport, Conn. This transaction provides the company with 1,500,000 square feet of floor space, available almost immediately, for the production of light rather than heavy apparatus. The plant consists of thirteen identical unit buildings easily accessible and conveniently interconnected. According to the present condition of business, the company could utilize this space for virtually any kind of apparatus, the need for space is so great. It is expected that between four and five thousand employees will be required to man the plant.

## Pole-Line Material Prices Materially Higher

An increasing demand is felt for pole-line material with the approach of the spring construction season. Generally speaking, stocks are in fair shape—much better, in fact, than stocks on other electrical materials.

Prices have advanced on almost all line material except wire. White cedar poles are up 10 per cent, cross-arms 8 per cent, insulators 10 per cent, hardware 10 per cent, and locust pins 25 per cent.

Cross-arms appear to be short east of the Rockies. It is reported that the Pacific Coast yards are piled high with cross-arms, but owing to a local shortage of rolling stock it takes from three to six weeks to make a shipment.

## St. Louis Car Sells Direct

Effective March 20, the St. Louis Car Company will sell safety cars direct to the railways. Edwin B. Meissner,

vice-president who is authority for this statement says that the company has now established its own safety car sales organization and that its engineers and entire sales force will be at the disposal of railway executives to assist in solving traffic problems.

Necessary changes in shop facilities have been made and arrangements completed at the St. Louis works for a greatly increased production of standard safety cars. At the present time, the schedule calls for a production of five standard safety cars per working day, but the company is prepared to increase its output if the occasion demands. Previous to this time, safety cars manufactured by the company have been sold entirely through agents.

## Rolling Stock

Boston (Mass.) Elevated Railway is in the market for seventy-five center-entrance motor cars in addition to the 100 cars recently purchased.

Lake Shore Electric Company, Sandusky, Ohio, has purchased sixteen safety cars for use on the Sandusky city lines, from the National Safety Car & Equipment Company.

New Orleans Railway & Light Company, New Orleans, La., has placed an order for forty safety cars with the National Safety Car & Equipment Company.

Interstate Public Service Company, Indianapolis, Ind., is reported to be in the market for two combination dining and parlor cars for use in connection with its limited trains running between Indianapolis and Louisville.

Terre Haute Traction & Light Company, Terre Haute, Ind., placed an order on March 4 with the American Car Company, St. Louis, Mo., for ten additional safety cars. This will bring the total number of safety cars purchased by the Terre Haute company up to sixty-six, all of which are of absolutely identical design and construction.

United Railways & Electric Company, Baltimore, Md., noted in the Feb. 21 issue of the ELECTRIC RAILWAY JOURNAL as placing an order with the J. G. Brill Company for thirty-three safety cars and for 100 center-entrance trailers, has specified the following details for this equipment.

|                            |                           |
|----------------------------|---------------------------|
| Number .....               | 33                        |
| Date of order .....        | Feb. 13, 1920             |
| Date of delivery .....     | April 15, 1920            |
| Type .....                 | Safety                    |
| Seating capacity .....     | 32                        |
| Weight, total .....        | Approx., 16,000 lb.       |
| Length over all .....      | 28 ft. 0 1/2 in.          |
| Truck wheelbase .....      | 8 ft. 0 in.               |
| Width over all .....       | 7 ft. 10 1/2 in.          |
| Rail to trolley base ..... | 10 ft. 8 in.              |
| Body .....                 | All steel                 |
| Interior trim .....        | Cherry                    |
| Roof .....                 | Arch                      |
| Air brakes .....           | Safety Car Devices Co.    |
| Armature bearings .....    | Sleeve                    |
| Car signal system .....    | Faraday                   |
| Car trimmings .....        | Bronze                    |
| Control .....              | West & G. E.              |
| Fixtures .....             | Curtain Supply & National |
|                            | Lock Washer               |
| Curtain material .....     | Pantasote                 |
| Designation signs .....    | Hunter signs              |
| Door mechanism .....       | National Pneumatic        |
| Fare boxes .....           | Johnson DM-2              |
| Wheelguards .....          | HB                        |
| Gears and pinions .....    | Standard                  |

|                     |                          |
|---------------------|--------------------------|
| Hand brakes         | Ackley Adjustable        |
| Heaters             | Consolidated             |
| Headlights          | Dayton No. 1583 A        |
| Lightning arresters | G. E. M. aluminum cell   |
| Motors              | West. 508 and G. E. 264  |
|                     | inside hung              |
| Varnish or enamel   | Enamel                   |
| Registers           | International Single Ry. |
| Sanders             | Ohio Brass               |
| Sash fixtures       | Brill                    |
| Seats               | Brill                    |
| Seating material    | Slat cherry seats        |
| Slack adjuster      | Gould                    |
| Springs             | Brill                    |
| Step treads         | Universal                |
| Trolley catchers    | Q. P.                    |
| Trolley base        | U. S. No. 6              |
| Trolley wheels      | Kalamazoo Stock          |
|                     | 5-in. wheel              |
| Trucks              | Brill                    |
| Ventilators         | Brill                    |
| Wheels              | 26-in. Rolled Steel      |

Specifications for the trailers are given below:

|                          |                                    |
|--------------------------|------------------------------------|
| Number                   | 100                                |
| Date of order            | Feb. 13, 1920                      |
| Date of delivery         | Sept. 1, 1920                      |
| Type                     | Double end centre entrance trailer |
| Seating capacity         | 62                                 |
| Weight, total            | 25,000 lb.                         |
| Bolster centers, length  | 24 ft. 0 in.                       |
| Length over all          | 48 ft. 2½ in.                      |
| Truck wheelbase          | 5 ft. 0 in.                        |
| Width over all           | 8 ft. 4½ in.                       |
| Height                   | 10 ft. 11¼ in.                     |
| Interior trim            | Cherry                             |
| Roof                     | Monitor                            |
| Air brakes               | Westinghouse trailer               |
| Bumpers                  | Angle iron with Anti climbers      |
| Car signal system        | Faraday                            |
| Car trimmings            | Bronze                             |
| Center and side bearings | Brill                              |
| Couplers                 | Ohio Brass Tomlinson No. 8         |
| Curtain fixtures         | Curtain Supply No. 88              |
| Curtain material         | Pantasote                          |
| Designation signs        | Hunter                             |
| Door mechanism           | Manual pneumatic                   |
|                          | National Pneumatic                 |

|                          |                           |
|--------------------------|---------------------------|
| Fare boxes               | Johnson DM-2              |
| Hand brakes              | Ackley Adjustable         |
| Heater equipment         | Consolidated              |
| Paint, varnish or enamel | R. F. Johnson Co.         |
| Registers                | International Single R-7  |
| Sash fixtures            | Brill                     |
| Seats                    | Brill                     |
| Seating material         | Cherry Slab               |
| Slack adjuster           | Gould                     |
| Springs                  | Brill                     |
| Step treads              | Universal                 |
| Trucks                   | Archbar                   |
| Ventilators              | Brill Ventilator openings |
| Wheels                   | 26-in. Rolled Steel       |

**Trade Notes**

The Johnson Fare Box Company, Chicago, has received an order from the United Railway & Electric Company, Baltimore, Md., for 133 registering fare boxes, and from the Memphis Street Railway for 100 additional boxes.

Wagner Electric Manufacturing Company, St. Louis, Mo., has removed its Buffalo office to 16 Carlton street. Alfred W. Baldwin, who has been connected with the company for a number of years, is in charge as branch manager.

Wheeler Condenser & Engineering Company, Carteret, N. J., has recently designed a vertically split casing of the tail pump for vertical jet and rectangular type counter-current condensers. The feature permits quick removal or inspection of the pump rotor or other internal part.

George Cutter Company, South Bend, Ind., announces the acquisition by the Westinghouse Electric & Manufacturing Company of a financial interest in that company. The management and the commercial policies will remain unchanged, but advantage will be taken of the Westinghouse engineering and other facilities to expand the Cutter Company's activities and

develop its lines to enable it to more effectively serve its customers and the industry. The Westinghouse Company will operate as sole distributors for the Cutter Company's products.

Ohio Brass Company, Mansfield, Ohio, has accepted the resignation of A. L. Wilkinson as vice president of the company. Mr. Wilkinson came with the company in 1894 and during the twenty-five years since that date served as salesman, general sales manager, secretary and vice president, having been elected to the latter office in February, 1919. The resignation was accepted by the directors only after Mr. Wilkinson had urged them to release him. For some time he has felt the need of a complete rest for the benefit of his health and he desired freedom from all responsibility.

**Franchises**

Los Angeles (Cal.) Railway: The Los Angeles has received a franchise from the Los Angeles City Council for extension of a line from Pico Street to Tenth Street.

Los Angeles (Cal.) Railway.—The City Council of Los Angeles has passed a franchise ordinance authorizing the Los Angeles Railway to install an electric line in Broadway between Tenth and Pico Streets, Los Angeles.

Santa Fe, N. Mex.—L. Britt, representing eastern capitalists, has applied to the Santa Fe City Council for a franchise to lay car tracks and build a power-plant in the city. If the franchise is issued work will be begun within the next few months.

**Power Houses, Shops and Buildings**

Pennsylvania - Ohio Electric Company, Youngstown, Ohio.—The Pennsylvania-Ohio Electric Company, formerly the Mahoning & Shenango Railway & Light Company, will shortly begin the construction of a new power plant in which the initial installation will include two 30,000-kw. turbo-generator units. This plant will probably be laid out for an ultimate capacity of 100,000 kw., which it is estimated will be needed to care for the company's business within ten years.

**Track and Roadway**

Boston (Mass.) Elevated Railway.—The Boston Elevated Railway will equip its Washington Street tunnel line with a system of three-position colored light signals and automatic stops. Altogether, 1.14 miles of double track, comprising thirty-three blocks, will be equipped. The system will be run by operating current, with the exception of the automatic stops, which will be of the pneumatic type.

Portland Railway, Light & Power Company, Portland, Ore.—The Oregon

Public Service Commission has refused the application of the city of Portland for the extension of a line of the Portland Railway, Light & Power Company from the city of St. Johns to the St. Johns terminal. The city's application was based upon an agreement with the company made in October, 1919.

Dallas (Tex.) Railway.—The Dallas Railway has been ordered by the Dallas City Commission to rebuild its tracks on South Lamar Street from Wood to Alexander Street.

Texas Electric Railway, Dallas, Tex.—This company has opened a passenger and freight station at McKinney, Tex.

Seattle (Wash.) Municipal Street Railway.—Mayor Fitzgerald of Seattle has refused to approve an ordinance authorizing an extension of the Ravenna Street line of the Seattle Municipal Street Railway, because the terms of the ordinance do not conform to the provisions of the bond ordinance appropriating funds for the extension.

Pacific Electric Railway, Los Angeles, Cal.—This company will lay new tracks on East Colorado Street, Pasadena. Work will begin on April 1.

Public Service Railway, Newark, N. J.—The State Board of Public Utility Commissioners has directed the Public Service Railway to improve the condition of the tracks and roadway in Main Street, Moorestown, and to resume service of a safe, adequate and proper nature by June 30.

**New Advertising Literature**

Sangamo Electric Company, Springfield, Ill.: Bulletin 45. Description of the various types of ampere-hour meters made by this company.

Electric Service Supplies Company, Philadelphia, Pa. A pamphlet on genuine Shelby seamless cold-drawn steel trolley poles.

Link-Belt Company, Chicago, Ill. A pamphlet on the Pratt ballast cleaner which screens all dirt out of stone ballast between tracks, giving effective drainage that reduces rotting of ties.

Templeton, Kenly & Company, Ltd., Chicago, Ill. Bulletin 9020, "Track Maintenance. A Problem and Its Solution" presenting recommendations for railway maintenance with demonstrated economies. Details of construction of No. 101 simplex track jacks with considerable data also are given.

General Electric Company, Schenectady, N. Y. Bulletin 44470 on its GE-264 light-weight railway motor the hourly rating of which is 25 hp. on 600 volts with input of 37 amp. Details of construction are given and illustrations shown of armature, pressed steel gear case, brush holders, exciting and commutating field coils in addition to data concerning weights, trucks, etc. Characteristic curves for different conditions of operation also are included.