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Contents of this Issue

Race War in New Orleans Averted

The action of the Criminal Court in New Orleans last week in dismissing the complaint against the management of the local street railway for violation of the "Jim Crow" law in that city is not at all surprising, but it seems not to have been anticipated by the patrons of the company or the prosecuting attorney. The court accepted the view of the company's legal representative that the law was unconstitutional because it delegated to street car conductors judicial powers which can only be exercised legally by the regularly constituted tribunals of the State. It was held that the question of determining the race of a passenger was not within the province of the conductor. Moreover, the law was defective in not fixing the maximum and minimum penalties to be inflicted for its violation. It is expected, however, that the case will be carried to the Supreme Court of the State for a ruling.

The Louisiana statute was particularly offensive to a large class of intelligent and respectable citizens who resented the imputation that they were negroes, but could not sustain the claim that they belonged to the "pure white" race, and it was likewise opposed by the negroes when any attempt was made to restrict them in their movements. Likewise, white men who were huddled together in a contracted space while there was plenty of room in the part of the car assigned the negroes, resented the inconvenience which they were forced to suffer. Consequently there was much clashing, and feeling ran so high that bloodshed was feared at times, and a race war was threatened. Happily the danger is now averted. The removal of the law from the statute books will relieve the situation, and will be welcomed by the street railway companies throughout the State, as well as by passengers, white and black, who have been inconvenienced through its operation.

Sand and Sand Cars

A clean rail is important to efficiency, economy and safety in operation, and railway companies spend considerable sums of money every year for cleaning and sanding of track. Operation on slippery rail is not only uncomfortable to the passengers, but it is conducive to increased wear and tear of machinery, increased power of consumption, and is a breeder of accidents of the worst kind. The season of bad slippery rail, on every road with heavy traffic, is reflected in the statement of accidents and the resultant damage claims. Strenuous efforts are usually made at such times to keep the rail in good condition, but it is surprising how poorly equipped many roads are for doing this necessary work promptly, economically and effectually.

A slippery rail seldom gives any warning to the motorman. After a few moments of heavy fog or light, drizzling rain a good, dry rail may become as slippery as ice over an entire railway system. That necessary evil, the sprinkling cart, or a deposit of dew or frost, or a few golden autumn leaves, rightly placed, will bring about the same condition. Grasshoppers, potato bugs and other insects, having arrived at the season when life has no further charms for them, make a most excellent lubrication for the rail where none is needed. For such conditions sand is the almost universal antidote. When of the right quality, properly dried and screened, and when deposited on the rail in the proper quantity it does its work well.

The first problem is to obtain sand of the proper quality, to screen and dry it, and to handle it between the source of supply and the final placing on the rail as economically as possible. The next problem is to get it on the rail as quickly as possible when needed, and to deposit only the requisite amount, and to place it on the top and not in the flangeway of the rail or on the paving stones or the asphalt. Too much sand is almost as objectionable as no sand at all.

The methods of handling the sand on many roads between the source of supply and the final disposition are surprisingly crude and wasteful. It may be that this is one of the proverbial small items which, in the press of seemingly more important matters, is escaping the attention of railway managers. A certain large

urban and suburban system with which the writer is familiar works its own sand pit, and secures sand therefrom of a fair quality to supply its whole system. A foreman with a gang of six or eight men is almost constantly occupied at the pit in uncovering, screening and handling the sand and loading it on flat cars for delivery at the different depots and terminals. A regularly organized gang of flat-car men is kept busy delivering the sand. On arrival at the depot or terminal it is handled with shovels and thrown into the receiving bin. It is then shoveled into the drier, and when dry is again put through a finer screen to remove the small gravel, and is then shoveled into the dry or storage bin. From there it is shoveled by hand into the sand cars, or placed in the sand boxes on the regular cars. The cars, as a rule, have no oscillating hopper, and it is necesary to send along one or two men with shovels to feed the sand to the spouts on either side. It will be seen that between the source of supply and the final disposition this sand is handled by hand six or seven times. A considerable portion of the labor is done by conductors and motormen, who are paid at the rate of 20 cents to 23 cents per hour, which is rather high pay for common unskilled labor.

An examination of the sand cars in operation on this company's lines showed that the spouts or chutes were delivering as much or more sand on the pavement and in the flangeway than on the rail itself. The plan of shoveling the sand into the chutes resulted in a very uneven distribution, some places being left practically bare while in spots the sand was dropped by the handful. The conclusion was unavoidable that not more than 25 per cent of the sand which came from the pit and was handled at so much expense was being used effectively on the rail.

Sand, like coal and other similar materials, may be handled with some regard to economy with hopper or drop-bottom gondola cars, bucket and chain conveyors, elevated bins and chutes to deposit it in the sand car, and thereby minimize the cost of labor. With properly designed sand driers and storage bins the loading of the sand car is done quickly, and much valuable time is saved in getting the sand on the rail when needed. The design and construction of the sand car is of quite as much importance as the other details of handling the sand, and the fact that some few roads in recent years have been experimenting to improve their sand cars indicates that interest in the matter is awakening.

Overdoing a Good Thing

Man is an imitative creature, and nowhere does this atavistic character show itself more strongly than in copying a frequently successful policy irrespective of the fitness of things. In modern engineering no line of advance has been marked by more conspicuous successes than the electrical transmission of power. It is already no mean factor in the distribution of industry and we may safely say that its past achievements will be altogether overshadowed by its importance in the future. Yet the very brilliancy of the results attained has served to dazzle the perception of a good many intelligent people who ought to know better. And while electrical power transmissions have in the vast majority of cases led to sound economic results, we are bound to say that numerous cases have come to our notice in which it has been unwisely used and leads to a steady financial loss. Moreover, we are sorry to say that electric railroads have been numbered among the unwise enthusiasts whose judgments have been warped by the influence of current fashion. In short, we are strongly of the opinion that electric roads have, in not a few instances, overdone the power transmission business and involved themselves in a situation which means permanent increase in motive power expenses. As a mere matter of engineering it would be entirely possible to operate, let us say, all the street railways in Iowa from a single central power station, with sub-stations scattered over the State, but the economic side of the proposition is a totally different matter. Unless transmitted power is cheaper than power locally generated there is seldom good reason for the transmission.

Now, in railway working there is a peculiar temptation to overindulgence in power transmission. It may be quite demonstrable that the cost of fuel is so nearly uniform over the region covered by the system as to preclude a direct saving by transmission, but there still remains the uncertain and almost indeterminable saving due to improvement in the load factors. In point of fact the practical data on this saving are very meagre, but the saving undoubtedly exists, and is sometimes of considerable importance. Yet upon this dubious factor really hinges the saving in power transmission in, perhaps, the majority of cases. If we consider the conditions in a large electric railway network, putting aside the utilization of hydraulic power, it is well within the truth to say that in the majority of cases the cost of fuel is nearly enough uniform over the district to make any direct saving by electrical transmission wholly illusory. There are, however, two indirect sources of economy, considerable enough to be important. First, the substitution of a single generating station for scattered stations enables power to be more cheaply generated, irrespective of the conditions of load. Second, the conditions of load may greatly improve at the same time. Of the two, the first is the easier to evaluate, since the question resolves itself into the efficiency of the apparatus effect of increased attendance which can be readily computed. The effect of increased atendance which can be readily computed. The change in load factor, however, is very difficult to predict in advance, and it is, besides, a quantity which remains far from constant as time goes on, so that it is extremely hard to estimate the advantage to be gained from it.

In examining a network of electric roads with respect to the economical distribution of power, the fundamental fact to remember is that all power transmitted and delivered to the lines via substations, with rotaries, is subject not only to losses in transmission but to additional charges due to the fixed charges, upkeep and attendance on the transmission system and sub-stations. In other words each kilowatt-hour delivered to the working conductors via a transmission system costs considerably more than it did at the central generating station. The exact increase in price depends on many factors, but it is always considerable, probably 30 per cent to 50 per cent, even under rather favorable circumstances, 75 per cent to 100 per cent in less fortunate situations. And the cost of power at the central station cannot be computed in the ordinary way in making such a comparison—it must include full allowance for fixed charges, depreciation and replacements. These usually amount to 35 per cent or 40 per cent of the total cost of power, so that if one hears that a certain road put energy on the busbars at three-quarters of a cent per kilowatt-hour, it is perfectly safe to say that the items usually omitted would bring the real figure to one cent or one cent and a quarter. And save in the largest stations figures like these are very seldom reached. The upshot of the matter is that in power transmission for railroads it is hard to show a saving unless there happens to be a very favorable situation for a central power station, conjoined with the certainty of a reasonably good load factor. We could mention several conspicuous instances in which there is the best of reasons to believe that the adoption of power transmission involves a positive and permanent loss in the motive power department.

And in case of demonstrable equality of cost between transmitted power and that obtained from distributed generating stations, the advantage lies wholly with the latter on the score of reliability. A well-planned modern transmission system is wonderfully reliable, but in transmission for railway purposes the consequences of a breakdown, even of an hour or two, are so serious in loss of revenue and demoralization of service that it is hard to go too far in recommending caution. In case of a transmission from waterpower, where the saving in cost is large, the proper upkeep and guarding of the lines can be most liberally provided for, and in very large urban distributions to sub-stations the maintenance of the lines sinks to relatively small importance. But on large and scattered systems fed from a single steam-driven station, the care of the lines not in the way of ordinary maintenance, but for proper insurance against interruptions of service, is a rather serious matter and one to which altogether inadequate attention has generally been given. We do not desire to croak or to contravene the march

of progress, but we feel strongly that electric railway men are generally too incautious in taking up the transmission of power over large areas. That it has been accomplished with exeellent results in many eases is undeniable, but this is very far from asscrting its universal applicability. The argument from analogy is peculiarly unsafe in the premises, since the questions involved are delicate questions of degree and not merely of kind. No such enterprise should be undertaken without eareful investigation and the best of adviee. In the reeent growth of electrie railroads we are eonstantly faeing new problems in power distribution, and to solve them in the best way requires the greatest astuteness and finesse. Generalizations in such matters are peculiarly unsafe.

The Construction of Electric Interurban Cars

A few years ago there was probably much more diversity of opinion as to the general features which should be ineorporated in a ear for interurban service than there is at the present time. It is not long since single-truck cars were being built for interurban service. Many such are still in operation. It soon beeame evident, however, that if high speed was to be maintained, the single-truck car must be abandoned for interurban service. Giving a fast eleetric interurban service with a single-truck ear is about the equivalent of attempting to haul fast limited passenger trains on a steam road with switch engines. Even with track conditions very perfect, danger of derailment at high speeds is considerable, and as the track is often far from perfect on interurban lines, the case is made still worse against the single truek car. The maximum traction type of truck has likewise been abandoned for fast interurban service, because of the small amount of weight on the pony wheels of the truck, and the liability to derailment. As far as trucks are concerned the consensus of opinion among master mechanics who have had experience in the operation of interurban lines is, undoubtedly, favorable to a truck either along master car builders' lines, as adopted by steam roads, or a truck on the same general principles, modified or simplified. By the same general principles is meant the use of a swing bolster and two sets of springs, one between the bolster and truck frame, and another set between the wheels and truck frame.

In the matter of wheel treads, much discussion has taken place in these columns in the past two years. Unfortunately the wheel tread from which it would be desirable to adopt is very often prohibited by the shallow flangeways in the city track over which interurban cars must pass. Probably the average of the present practice as to the interurban wheel treads is the standard M. C. B. form, modified by having the width of tread and depth of flange reduced.

What promises to be the standard interurban car body of the future, is one having a motorman's cab at one end of the car only, and not open to passengers; the baggage compartment immediately behind the motorman's cab provided with seats for smokers; behind which is the main part of the car, with leather, plush or rattan cross seats, seating from 40 to 50 passengers. Where baggage and express is not carried the front compartment is made simply a smoking compartment instead of combination baggage and smoking. One plan which seems to accommodate itself very well to the needs of the combination baggage and smoking compartment is to place stools around the sides of the car, which can be pulled down for use, and which are counterbalanced so as to fold up automatically to the side of the car as soon as a person leaves a stool. Some roads provide smoking compartments separate from a baggage room, but on the whole the two seem to work in very well together, and give a greater flexibility than if there is a partition between. There are still, of course, many roads which run their interurban cars either way, and have controllers at both ends of the car. The tendency is, undoubtedly, toward having all the controlling and heating apparatus in the compartment with the motorman, where it cannot be disturbed by the traveling public.

In this connection it should be noted that the motorman's cab of an interurban car is the most difficult place to keep warm that there is on the car, and next in difficulty of heating comes the baggage and smoking eompartment immediately behind the motorman's cab. These compartments being at the front end of the car get the full benefit of whatever high wind might be blowing, and unless more than usual precautions are taken to heat the front of the ear, it will be too cold for the motorman and very uncomfortable for smokers. Hot-water heating has been generally adopted in some of the Western States as the proper thing for long interurban cars, and where heaters of this kind are used, the most natural thing to do, in view of these conditions just spoken of, and the one which is being done by those experieneed in these matters, is to locate the hot-water heater in the motorman's eab. It takes up less valuable room there than anywhere else in the car, ean be attended to by the motorman, does away with the dust and dirt incident to a fire in the passenger compartment of a ear, and puts the greatest heat at the point where it is most needed, viz.: at the front end of the car. With this arrangement the water circulating in the hot-water pipes is the coldest at the rear of the car, and the result is that the heat distribution throughout the car is fairly uniform, since there is a tendency for the air which inevitably enters the car at the front end when running at a high speed to leave around the doors and windows at the rear end.

As to the size and weight of interurban cars, praetice is still far from settled. The constant tendency is towards an increase of weight as the maximum to be made is increased from year to year. Car bodies and trucks have to be made stronger for the higher speed, and high speeds also call for heavier motor equipment. Weights of double-truek interurban cars at present run all the way from 30,000 to 64,000 lbs. Some of the slower speed interurbans have probably purchased equipment which is much heavier than is necessary, while for those making the higher speeds the heavier equipments are none too strong. The gap between city and interurban cars is a wide one. An interurban car for high speed, like a steam railroad car, is made not only to withstand the wear and tear of high-speed service, but with a view of the consequences of derailment. The street car is made to carry its ordinary load with the minimum weight possible. An interurban car is made to survive wrecks, and were it not for this fact could be made much lighter.

Labor Clause and Pennsylvania Tunnel Franchise

The action of the Pennsylvania Railroad Company in voluntarily raising the wages of its employees east of Pittsburgh should disarm opposition to the proposed tunnel franchise, because of the refusal of the company to bind itself to certain conditions proposed by labor organizations, which it is conceded by those urging their adoption cannot be enforced under the law. The announcement of the action taken by the Pennsylvania Company came in the nature of a surprise, but it was in accordance with the policy of the management, and it swept away every argument against the tunnel project, based on the assumed hostility of the company to the interests of its employees and to the rights of labor to organize. Instead of antagonizing labor and exacting the maximum of service for the minimum of wages the company has recognized the fact that the cost of living had advanced, and has voluntarily increased the wages of its employees sufficiently to meet the new conditions. This increase will be uniformly 10 per cent, and will apply to all employees receiving less than $200 per month. It will affect 106,000 men, or about 89 per cent of the company's force, and will add upwards of $5,000,000 to the annual pay roll. This of itself should be sufficient guarantee that the interests of labor would be recognized and respected by the company, and that the distrust which the politicians and their willing tools in the labor organizations assume to feel is wholly unwarranted. It would seem to an unprejudiced observer that the action of the Pennsylvania Company places the opponents of the tunnel franchise in a most ridiculous position, and shows how reckless they are of the true interests of the city. Their rule or ruin policy has greatly delayed the work on the tunnel, and has really jeopardied the entire project, without securing any material benefit for the city or labor.

An Important Freight Handling Road

One of the most important subjects under the consideration of the management of interurban roads is that of adopting steam methods in handling freight. Many of the electric roads throughout the country have entered into the business of carrying package freight, but only one or two of them have gone so far as to purchase their own standard freight equipment and place a freight solicitor in the field, yet this feature of electric railroading is one which promises within the next few years to develop as rapidly as has the interurban passenger business during the last decade. In spite of the fact that it is questionable whether all electric railroads will be permitted to use standard freight equipment through the towns on their lines, this question will have to be solved by each individual line for itself, but it appears from the experiences of the few lines which have attempted this practice, that the smaller towns will make few objections to the operation of freight cars through the streets providing this service is confined to hours when the streets are not crowded.

The Toledo & Western Railway, operating 68 miles of road, running into Toledo, is unquestionably one of the foremost roads in the country in respect to freight handling. In the October souvenir issue of the Street Railway Journal this year, brief reference was made to this road, and its terminal freight station at West Toledo by Albion E. Lang, and some of its freight trains were illustrated. Additional data on the extent of this work and the methods employed follows:

TYPICAL FREIGHT, EXPRESS AND PASSENGER STATION ON TOLEDO & WESTERN RAILWAY

At Sylvania, 8 miles from Toledo, the road branches into two divisions, one running northwest to Adrian, Mich., and the other almost due west closely following the Michigan State line to Fayette. Plans are being made to extend the northern division to Jackson and the western division to the Indiana State line, and possibly beyond, to connect with other roads building or in operation in Northern Indiana. When completed these lines will form a through route to Chicago.

The two divisions of the Toledo & Western differ considerably in the character of the trade upon which they depend. The northern division to Adrian closely parallels the "old road" of the Lake Shore & Michigan Southern Railway, touching several towns whose transportation facilities have long been developed, thereby bringing the electric line into direct competition with one of the strongest steam lines in the country.

On the other hand, the western division traverses a territory which, heretofore, has been absolutely isolated from transportation facilities, and which for many years has been actually begging for the facilities now afforded. This district has a peculiar history, offering few parallels in the well-populated Middle West. Years ago the district comprised the Black and Cottonwood swamps, a country almost impassable and practically useless. When the Lake Shore, the pioneer of the Western roads, pushed out towards Chicago, it avoided this district by taking a northern route through lower Michigan. Later, when the "Air Line" was built, it was inclined southward through Delta, Bryan and other towns. In the meantime drainage transformed these swamps into one of the most productive sections in the Middle West. Numerous towns sprang up, and for a time thrived, but the poor transportation facilities eventually brought matters to a standstill. During the last few years, it is claimed, the population of the district has actually fallen off, the farmers moving away disgusted with the handicap of being forced to team from 12 miles to 15 miles, north or south, to a railroad. Naturally the electric line promoters met with a good reception when they promised a road which would offer every convenience of a steam road and lower rates.

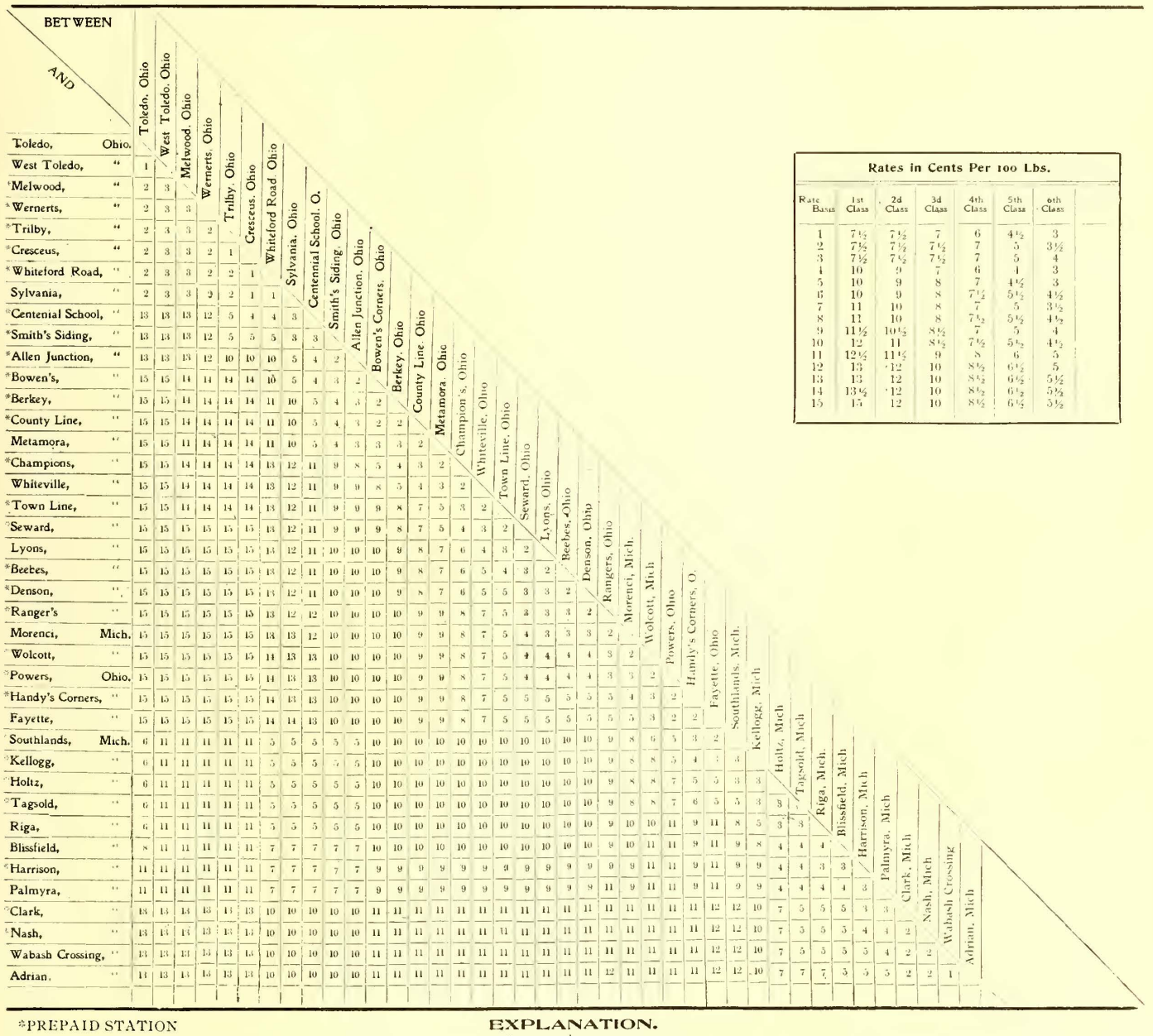
With a view to serving this section to the full extent the Toledo & Western has been equipped to take care of every class of trade that a steam road could handle. The rolling stock includes standard steam freight cars, stock cars, flat cars, gondola coal cars in addition to the ordinary package express cars used by other electric roads. During the last season they have utilized two combination coaches, three express cars, twelve box cars, eight hopper-bottom gondolas, and twenty flat cars, of 60,000 lbs. each, and three 50,000-lb. stock cars, which are constantly in freight service. Additional equipment is now being procured for this department.

Grain elevators are being built in several towns, and at each station there is a stock pen for cattle and horses. At all towns there are well-equipped stations with ample sidings, where freight cars may be loaded. Freight of all kinds is handled on the same basis as on steam roads, and there are regular scheduled freight trains operating over both divisions of the road. Of course these trains are not permitted to enter Toledo, but at West Toledo, about 4 miles from the center of the city, there is maintained a terminal freight station, consisting of a warehouse and tracks, capable of holding about fifty standard steam cars.

There are six sub-stations, located at Morenci, Lyons, Metamora, Adrian, Blissfield and West Toledo, which are utilized in promoting and handling the freight and express business. These buildings are all of similar design, and the accompanying cut, showing the station at Blissford, may be accepted as a typical view of the class of structures which have been erected for this purpose. They are located in the villages, making them convenient for passenger and freight requirements, and are of unusually attractive design. They are two stories high, and are built

of paving brick with stone trimmings, and cost about $3,500 each. The ground floor is occupied by the ticket office, waiting-room and baggage room, with the electrical equipment in the rear, and the upper floor is fitted up for living apartments for the attendant and his family. As rent and light are furnished free to the attendant, a very superior class of help is thus secured at reasonable wages. The attendant has entire charge of the station, taking care of the electric equipment as well as handling baggage and freight, selling tickets and performing the other general duties of station agent in small towns. He is also supposed to keep the passenger and freight solicitor informed as to opportunities for being offered to manufacturers at attractive figures to induce them to locate along the line. During the summer the car-load business has averaged over twenty cars per day, and this promises to increase each summer as the farmers learn to appreciate this method of shipping their produce.

The class of business just mentioned is entirely distinct from the package freight business, which is handled as on numerous other roads, the package freight cars operating to the center of Toledo and delivering their goods at the union freight station, which was fully described in the October convention issue of this paper. The package freight cars make two trips a day over each line, and



Rates in Cents Per 100 Lbs.

Rate Basis	1st Class	2d Class	3d Class	4th Class	5th Class	6th Class
1	7½	7½	7	6	4½	3
2	7½	7½	7½	7	5	3½
3	7½	7½	7½	7	5	4
4	10	9	7	6	4	3
5	10	9	8	7	4½	3
6	10	9	8	7½	5½	4½
7	11	10	8	7	5	3½
8	11	10	8	7½	5½	4½
9	11½	10½	8½	7	5	4
10	12	11	8½	7½	5½	4½
11	12½	11½	9	8	6	5
12	13	12	10	8½	6½	5
13	13	12	10	8½	6½	5½
14	13½	12	10	8½	6½	5½
15	15	12	10	8½	6½	5½

*PREPAID STATION

EXPLANATION.

To arrive at rates between any two stations on The Toledo & Western Railway take the rate basis number, shown in table, opposite the Station to and from which rates are desired and use the class rates shown opposite corresponding rate basis number in rate sheet.

EXAMPLE:—To arrive at rates between Toledo, Ohio and Adrian, Mich., in Table taking rate basis, number 13 is shown as applying between these two Stations Opposite Rate Basis No 13 in Rate Sheet appears the following class rates, 13, 12, 10, 8½, 6½, 5½.

LOCAL FREIGHT TARIFF BETWEEN ALL STATIONS ON THE TOLEDO & WESTERN RAILWAY

securing business. At these stations patrons are allowed to use the telephone in ordering goods to be shipped over the electric road. At Blissfield there is a freight station in addition to the usual rotary station, and at several of the smaller places there are neat frame buildings provided for this service.

This fall the Toledo & Western handled a large portion of the grain and produce raised by the farmers along its northern division and practically all the crops of those on the western division. Since the advent of the line the country has taken on new life, and several churches and stores and numerous new dwellings have been erected, the electric line handling all the lumber, brick, stone and other materials required for the work. Manufacturing establishments are springing up, and the company has purchased lands desirable for building sites, which is they are handling on an average of from 35 tons to 40 tons per day. The rates for both these classes of business are practically the same, and are determined by the standard freight classification, the tariff chart for which is shown herewith. After looking up the class the agent can instantly determine the rate from any point to another. The blanks used in handling both classes of freight are practically the same as those used on steam roads, and several varieties are shown herewith. A way bill accompanies each shipment. When freight is received from the consignor a receipt is made in duplicate, one copy going to the consignor and another kept on file for reference and tracing. When goods are delivered to the consignee a receipt is received in duplicate, a copy going to the consignor. A book of cash receipts and cash disbursements is kept, also a record book of freight bills received.

AGENTS REBILLING CARLOAD SHIPMENTS MUST FILL OUT THIS TABLE

ORIGINAL POINT OF SHIPMENT

ORIGINAL CAR

INIT ... NO. ...

Form 2e 5-1-5m

LOCAL FREIGHT WAY-BILL.

W. B. No. .....

The Toledo & Western Railway Company ..... 190.

CAR INITIALS .....

FROM ..... TO ..... CAR No. .....

FROM WHOM RECEIVED	CONSIGNEE AND DESTINATION	NO. PKGS.	ARTICLES	WEIGHT	RATE	FREIGHT	ADVANCES	PREPAID

TRANSFERRED

INTO CAR

AT

DATE

The Toledo & Western Railway Co.

ABSTRACT OF LOCAL WAY-BILLS FORWARDED.

From ..... *Station, for the Month of* *190*

See Note on Back.

Date W B	No. of W B	WEIGHT	FREIGHT	Advance Charges.	Prepaid	Date W. B.	No. of W B	WEIGHT	FREIGHT	Advance Charges.	Prepaid

THE TOLEDO & WESTERN RAILWAY CO.

ABSTRACT OF WAY-BILLS FORWARDED.

At ..... *Station for the Month ending* ..... *190.*

Date	W B No.	STATION	Weight	Collect	Prepaid	Date	W B No.	STATION	Weight	Collect	Prepaid

FORM 74.--7-1-2M.

The Toledo & Western Railway Company,

G. M. No,.....

.....Station.....190..... Agent's No.....

REPORT OF FREIGHT OVER, SHORT, DAMAGED OR WRONGLY CONSIGNED.

From.....Way-Bill No.....Date.....Car No.....

Received from Train No.....Date.....190.....Conductor.

Consignee, Marks and Destination.	ARTICLES BILLED	State whether Over, Short or Damaged. Give Full Particulars.

.....Agent.

FORWARDING AGENT ANSWER FOLLOWING QUESTIONS.

By whom and in what condition loaded?.....

By what train?..... Car No..... Conductor.....Forwarded?

For what other Station car loaded?.....

For what other Station did you load similar freight?.....

If OVER freight is from you, furnish billing and advise?.....

Are you short, and on what billing?.....

Have you any record of freight over?.....

Was freight properly and securely stowed?.....

.....Agent.

NOTE—Agents must make a separate report of each consignment and send one each to Billing Station and General Manager by first train.

Report for General Manager to be filled out with copying ink.

FORMS ADOPTED IN FREIGHT DEPARTMENT OF THE TOLEDO & WESTERN RAILWAY

An abstract of freight way bills, received and forwarded, is sent to the auditor once a month, as well as a monthly balance sheet. There are also blanks for freight over and freight short, goods damaged and for the correction of errors in way bills.

Distinct from both the car-load freight and the package freight business is the milk business, which is quite an item. Milk is handled at a straight rate of 15 cents for 10-gallon cans for any distance. Tickets are sold at this rate by the agents, and one is attached to each can on shipment. A milk car makes a trip over both divisions every day, and the cars all run to the union station in the center of the city. A considerable revenue is also derived from United States mail, which is handled on the combination cars.

The antagonism of steam lines toward electric lines has made it impossible thus far to interchange car-load freight business with the steam roads, but occasionally individual shippers have had cars transferred over the electric road, and it is believed to be only a matter of a short time before satisfactory arrangements can be made with the steam roads whereby car-load business can be interchanged. There seems no good reason why such arrangements should not be made, since the Toledo & Western does not attempt to cut rates where it comes into competition with the other roads for car-load business.

C. F. Franklin, general manager of the Toledo & Western, is a steam road man of long experience. Prior to accepting this position he was general superintendent of the Toledo, St. Louis & Western Railway, and before that he held a similar position with the Ohio Southern Railway. He has introduced steam methods into every department where practical, and in the auditing, freight and passenger departments has surrounded himself with men of experience in handling similar work on steam roads. For trainmen and station agents he has selected, as far as possible, experienced steam road men. "Trains," instead of single cars, are operated, and while the despatching is at present handled by telephone, it is the intention later to install a telegraph system and handle train instructions from the several stations, using the telephone system as an auxiliary for calling up between stations or for use when the telegraph is out of order.

Under the present despatching system there are telephones at all stations and at switches. The despatcher's office is located at

The Toledo & Western Railway Co.

TRAIN ORDER BLANK.

Date *190*

Order No. ..... *Time* ..... *M.*

To M. & C. of Train No. .....

Car No. ..... *At* .....

Run .....

From .....

To .....

Motorman .....

O. K. by .....

Dispatcher.

EXTRA TRAIN ORDER; CLEAR ALL REGULAR TRAINS FIVE MINUTES

The Toledo & Western Railway Co.

TRAIN ORDER BLANK.

Date *190*

Order No. ..... *Time* ..... *M.*

To M. & C. of Train No. .....

Car No. ..... *At* .....

Work Extra between .....

And .....

Motorman .....

O. K. by .....

Dispatcher.

WORKING ORDER; WORK BETWEEN TWO POINTS AND CLEAR ALL REGULAR TRAINS

The Toledo & Western Railway Co.

TRAIN ORDER BLANK.

Date *190*

Order No. ..... *Time* ..... *M.*

To M. & C. of Train No. .....

Car No. ..... *At* .....

Meet Train No. ..... *Car No.* .....

At .....

And .....

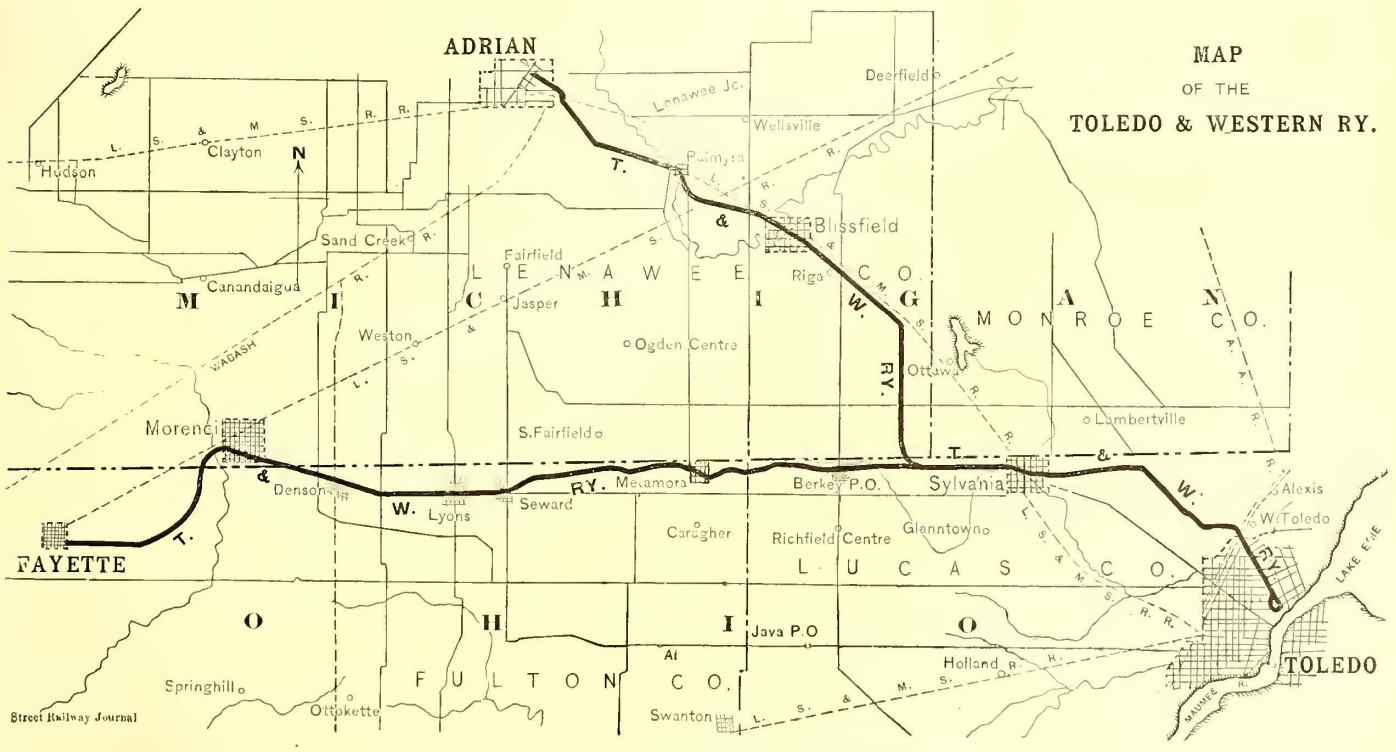
Run to ..... *And Call.*

Motorman .....

O. K. by .....

Dispatcher.

MEETING ORDER



SECTION SERVED BY THE TOLEDO & WESTERN RAILWAY

the headquarters at Sylvania. There are three varieties of orders, with blanks for each. They are: The regular meeting order; the working order, which permits trains to work between two points, clearing all regular trains, and order for extra trains, which must clear regular trains by five minutes. The blanks are in duplicate, the motorman taking down the order and handing a copy to the conductor. There are three classes of trains: First class, or passenger trains; second class, or package freight trains, and third class, or freight trains.

The first section of the road, from Toledo to Sylvania, 9 miles, was placed in operation in April, 1901. Those from Sylvania to Adrian, Mich., 25 miles, and from Sylvania to Morenci, 28 miles, were completed early this year, while the western extension to Fayette has just been completed. The tributary population, including Toledo, which has 132,000, is about 200,000. The leading towns on the two divisions, with the population, the distance

The Toledo & Western Railway Co.

AGENT'S WAY-BILL CORRECTION SHEET.

Station, 190

Mr. , Agent at

W. B. No. From to

Car No. Dated

READ THUS:

CONSIGNEE And Kind of Freight.	Weight.	Per Cwt.	Rate.	Net or Local Freight.	Advances	Prepaid.	Foreign Proportions Prepaid.
Footing of W. B. as rendered							

SHOULD READ:

Footing as Corrected.							

Corrected as above 190

Agent *Agent*

INSTRUCTIONS.—Never correct more than ONE Way Bill on this sheet.
These corrections are to be made promptly, with two impression copies, sending both hard paper and impression copies to the Agent who made the error.
The Agent receiving this correction should examine AT ONCE. If found correct, sign all copies, send hard paper copy to the General Freight Agent and one tissue to Agent from whom correction was received. If not correct, return all copies to Agent making correction stating the reason why not accepted.

FORM FOR CORRECTIONS IN AGENT'S WAY BILL

from the union passenger station at Toledo, together with the rate of fare for single trip, round trip and special Sunday round trip (good returning Monday), are shown in the accompanying table:

MAIN LINE

Population	Miles	Name of Station	Fare	Round Trip	Sunday
900	48	Fayette	$0.90	$....	$....
1,500	40	Morenci	.75	1.35	.80
400	32	Lyons	.60	1.10	.75
150	29	Seward	.55	1.00	.70
....	26	Whiteville	.49	.88	.65
300	24	Metamora	.43	.72	.55
200	20	Berkey	.35	.65	.45

ADRIAN DIVISION

Population	Miles	Name of Station	Fare	Round Trip	Sunday
10,000	37½	Adrian	$0.60	$1.10	$0.75
200	31½	Palmyra	.55	1.00	.70
1,300	27	Blissfield	.45	.85	.60
200	24½	Riga	.40	.75	.55
700	12½	Sylvania	.20	.35	.25

Rates are made to commuters, and the company sells a mileage book at $8, which entitles the holder to $10 worth of travel within a year. There are coupons, each representing 1 cent, and the conductor pulls the regular fare in coupons.

Under an arrangement with the White Star and Detroit & Cleveland lines of steamers, the company sells combination round trip tickets from any of its stations to Detroit or Cleveland.

The New York office of the Sao Paulo Tramway, Light & Power Company, the Mexican Light & Power Company, and the Trinidad Electric Company has been removed from 621 Broadway to Room 220, 29 Broadway. The business offices of F. S. Pearson, L. J. Hirt, W. P. Plummer, H. L. Cooper and R. D. Mershon have also been moved to the same place.

Trackless Trolley Car for Freight

In the issue for March 1, 1902, of the Street Railway Journal a short description was published of the trackless trolley passenger cars installed by Max Schiemann, of Dresden, in the Biela Valley, near Dresden. The system has been operated very successfully, and considerable freight is now being hauled over the road. Fig. 1 shows a view of a motor car and a trail car taken on the occasion of a visit to the line by the Dresden Elektrotechnische Verein last summer. The motor car shown in the photograph is usually used for the transportation of light express matter, and the trail car for coal and other heavy goods. The train in actual operation is shown in Fig. 2, which is a view taken after a light fall of snow to show the condition of the roads during late fall. The train is steered by means of the front wheels of the first car, and it has been found that the wheels of the second car, being of the same gage, will track absolutely after those of the first car.

FIG. 1.—TRACKLESS TROLLEY CARS FOR HANDLING FREIGHT

FIG. 2.—OPERATING TRACKLESS TROLLEY FREIGHT CARS AFTER SNOW STORM

The trolleys, as previously stated, are provided with a sliding contact. The motor car has a weight of 4 tons, and is capable of carrying a weight in packages of 1 ton. The trail car weighs 1.5 tons empty and 5 tons loaded, making a total weight of the loaded train of 10 tons. On a level the cars run at a speed of 15½ miles an hour.

Wendell & MacDuffie, of New York, have just opened a factory at 51 Dey Street for the manufacture of armature and field coils and the rewinding of armatures. The company's offices will be continued as heretofore for the sale of electric railway material of all kinds, and the new plant will make possible the supplementing of the large supply business with an excellent repair department. The concern is to be congratulated on the enterprise and prosperity which this new move indicates.

Pay Department of the Metropolitan Company's Construction Department

Paying the men off once a week on the Metropolitan Street Railway Company's construction work entails a great deal of careful preparation and exact calculation, and a regular routine is observed each week.

The timekeepers on the several jobs first enter the names of the men, who are already on the work, in the timebooks. As each name is added to this list the man is given a ticket (see Exhibit I), upon which is written his pay number and name. The color of the pay ticket is changed each week, for the benefit of the pay department. The tickets are also numbered consecutively.

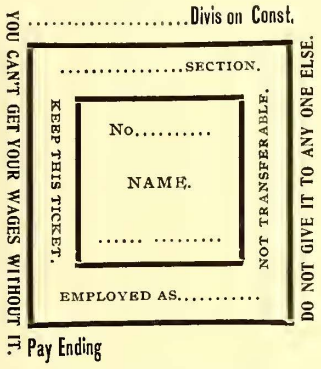


EXHIBIT I—WORKMAN'S TICKET

Form 3 C.

Metropolitan Street Railway Company

CONSTRUCTION DEPARTMENT,
621 BROADWAY.

WORKMAN'S PAY TICKET.

This ticket is good only when presented by the man to whom it is issued Men will at all times carry this ticket on their persons, and show it to Time Clerk when he asks to see it. No time will be allowed to any man who fails to show his ticket, and no wages will be paid unless this ticket is presented.

EXHIBIT IV.—BACK OF WORKMAN'S TICKET

In the case of the Italian laborers who are employed each is given a brass check, with a number upon it. This takes the place of a name upon the pay roll and timebooks, for it would be beyond the average American to wrestle with some of these foreign names. Then, too, comparatively few of them speak English at all. The brass checks answer every purpose and save much time.

It should be mentioned that the advantages of having different colored tickets would be obvious to any one who would endeavor to pay off a gang of men from the pay wagon. For instance, yellow is the color of tickets to be redeemed on a certain pay day, and a man hands a blue one, the paymaster at once knows that it is an old ticket, and that the man, for some reason, did not receive his pay. As the old pay envelopes are not carried out in the pay wagon, but are kept in the safe at the office, the man with the blue ticket is instructed to present it at the office, where back pay can be obtained. As the tickets each week are numbered consecutively, it is easy to tell if a man has been paid, or if his pay is on hand, as the envelopes are likewise arranged consecutively. The different classes of labor are, of course, kept by themselves in the timebook, making it simpler to transfer to their respective sheets, such as laborers, rockmen, etc. These books are sent to the pay department the latter part of each week. Each clerk takes a book and copies the names it contains on large sheets, with headings and columns similar to that shown in Exhibit II. Each sheet enumerates the classes of labor to be found on it, and the rate of pay for each man as well as the man's pay number is inserted with his name. The names which are in the timebooks are all transferred by Friday or Saturday morning to their respective sheets. Each set of sheets belonging to one job is, of course, kept together.

Saturday the pay envelopes (Exhibit III) are made out for such names as are already entered. The man's number and rate are put in, and the class of labor is printed on the pay envelope opposite the blank space intended for the man's name. In the upper left-hand corner is the space for the pay number. It will be noticed that there is also a space for deductions from the wages of the man. He may lose one of his tools, or, in the case of the clerks, there may be a deduction on account of fines, which are imposed because of errors. This regulation has been found necessary to make employees exercise greater care in their work.

Everything is now ready for Monday morning. The timebooks are again turned in early on that day with the records complete for the previous week. Any new names which have been added are placed on the bottom of their respective labor classification, on the particular job sheets, with their pay numbers and rate.

It will be seen by again referring to Exhibit II, that the sheets are divided into couplets of columns, marked "N" and "D," representing day time and night time of each day worked. Laborers and ironmen work ten hours a day, while bricklayers and pavers work eight. In both cases, however, they get paid time and a half for working overtime. If a man works two hours overtime, his regular time as in the case of a laborer would go in the "D" column, and his overtime, three hours, in the "N" column. The two columns, taken together, thus represent a day. The date of such day is placed over the couplet. The aggregate amount of time is then extended, and the amount to be paid beyond this. The "remarks" are synonymous for deductions. The total of each job is taken and signed by the clerk who figured it. Pay envelopes are then made out for the new names which have been added and placed at the bottom of the pile of envelopes of each job, which are kept separate. Each lot is then taken and the time and pay for the week are inserted. This is copied from the pay-roll sheets. The envelopes are then carefully compared with the sheets.

Form 11 C. 30M-3-1902.

Interurban Street Railway Co.

No. Lessee

Metropolitan Street Railway Co.

CONSTRUCTION DEPARTMENT.

Pay Ending, ...*190*

.....**Laborer.**

		$	Cts.
No. of Days	*Rate $1.50.*		
Less			
Balance due			

NOTICE.—If there is any ERROR in this payment, SAVE THIS ENVELOPE and speak to TIMEKEEPER. ERRORS will not be corrected WHILE PAYING OFF.

EXHIBIT III.—PAY ENVELOPE

Monday night, or early Tuesday morning, the sheets are sent to the superintendent of construction, who signs them. They then go to the auditor's office, where the check for the amount is drawn on some bank. The amount is generally between $40,000 and $50,000 each week. The pay wagon then proceeds, with a couple of clerks, to the bank, and the money is taken direct to the pay office. It is then placed on a high counter in the center of the room. It makes a large pile, being mostly in the smaller denominations. The money is first counted in bulk, and then each package is counted, to see that the amount received is exactly what the check called for.

The money is arranged in piles at one end of the counter in front of the paymaster, who takes the first pay envelope, No. 1, counts out the amount indicated on the envelope and passes it forward, with the envelope, to one of the clerks stationed on each

IRONMEN Form 70 E.

Metropolitan Street Railway Co.,

CONSTRUCTION DEPT.

_____ DIVISION.
_____ SECTION.

Pay for____ Weeks Ending_____

_____ **Contractor.**

Name	No.	Occupation	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	Aggreg. Amt. of Time	Rate per Day	Amount Paid	Remarks	Paid

EXHIBIT II.—FORM OF PAY SHEETS

side of the counter. Each man's pay thus has a check on it. The clerk counts the money and puts it in the envelope, then shoves it to the end of the counter, where it is sealed and placed in a metal box in its proper numerical order. It is very important that everything be finished so as to enable the paymaster and his assistants to go on the works early in the morning.

In case of not striking a balance the envelopes have to be all gone over until the error is found.

A reliable and experienced driver who understands the work is kept especially for the pay wagon. He must know the best routes about the city, must be an expert in handling horses, and must be constantly on the alert for a signal, either from the detective or the paymaster, to drive on. Great care must be exercised, as a crowd gathers very quickly, and sometimes becomes rather troublesome, as was the case some years ago at the corner of Fourth Avenue and Twenty-Third Street, when the crowd became so great that the wagon and horses were actually forced up over the curb against the building. The wagon is not very apt to attract attention, there being no marks to show what its mission is. It is built very strong though.

In paying the men every precaution is taken to guard against fraud and to see that the money reaches the proper hands. The men hand in their pay tickets at the pay wagon window. The envelopes having been arranged consecutively, it is a simple matter to get the man's pay from the pay number on his pay ticket. The paymaster asks the man how much is due him for the last week. If his demand agrees with the record in the envelope it is given him, but in case he asks for more or less he is asked for the number of hours he worked. If it still looks like a mistake, and the man claims more than the pay roll calls for, he is paid what the pay-roll calls for; if less, he is paid what he asks for. A notice on the envelope (Exhibit III) governs the correction of errors. Exhibit IV is the reverse side of Exhibit I.

All pay which is not called for is held in the pay department for some time, when it is turned over to the auditor's office. This uncalled for pay is made up mostly of small amounts credited to men who have worked an hour or two, and for some reason regarded their pay for this time too small to call for. It amounts up in the course of a year, though.

When the pay is given the man in exchange for his pay ticket the pay ticket is punched and kept on file in the office.

Multiple Unit, Voltage Speed Control for Trunk Line Service*

BY. H. WARD LEONARD

In February, 1894, I read a paper before this Institute describing a system which I considered applicable to the operation of a trunk line electric railway. The essential features of this system were:

First. The generation and transmission of a high-tension single-phase alternating current, the power houses being placed as far apart as the insulation of an alternating-current transmission would permit.

Second. The entire elimination of sub-stations.

Third. A transformation of the energy upon the locomotive so as to secure a voltage speed control for the electric motors, thereby obtaining smooth acceleration and efficient control of the locomotive at any desired speed and in either direction.

At that time there were no engineers, so far as I know, who agreed with me that these features were essential for the operation of a trunk line railway by electric motors.

In the recent past, however, many prominent engineers, both abroad and in this country, have declared themselves in favor of these essential features, and I, therefore, feel warranted in describing an improvement upon the system I originally proposed, by which I can secure the important and now well understood advantages of a multiple control of any desired number of locomotive units.

The accompanying cut illustrates diagramatically one form of my multiple unit voltage speed control as applied to two locomotive units for trunk line service.

The current is generated in the form of a single-phase alternating current at as high an e. m. f. as is practicable to-day, say 20,000 volts. A moving contact leads the single-phase alternating current upon the locomotive. If desired, static transformers can be placed at suitable points along the line of the railway which will reduce the initial e. m. f. to any desired lower e. m. f. upon the contact conductor.

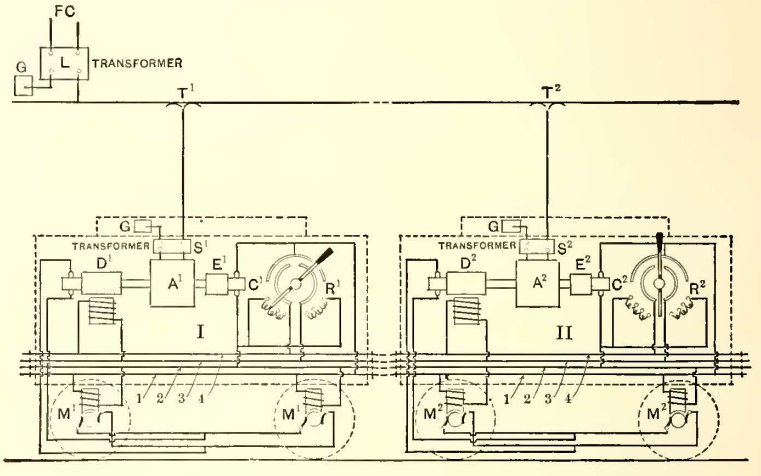
In many instances it may be desirable to place upon the locomotive a transformer s' for reducing the tension of the alternating current led to the synchronous motor A^1.

A single-phase synchronous motor on the locomotive receives this alternating current and is driven by it continuously at a practically constant speed; the current after passing through the motor, being led to ground through a moving contact. This single-phase motor A^1 drives continually a small exciter E^1 and also a large continuous current dynamo D^1, whose field is separately excited by the exciter E^1 and has in its field circuit a reversing field rheostat R^1. The armatures of the propelling motors are connected in multiple directly across the terminals of the armature of the dynamo D^1. The field magnets of the propelling motors M^1 are separately and constantly excited by the exciter E^1.

By manipulating the reversing field rheostat R^1, the current through the armatures of the motors M^1 necessary to obtain the required tractive effort, can be obtained at any desired voltage from the lowest voltage to the full speed voltage, and in either direction.

A perfectly smooth and rapid acceleration can thus be obtained with minimum energy from the source of supply.

The simultaneous multiple control of the several locomotive units is obtained by means of the four small wires 1, 2, 3, 4, which are lead along the train.



TWO LOCOMOTIVE UNITS WITH MULTIPLE UNIT VOLTAGE SPEED CONTROL

In this cut the operator is supposed to be upon the locomotive I. The exciter E^1, which is producing a constant e. m. f., has its terminals connected to the wires 1 and 2. Across these wires 1 and 2 are connected the field windings of all the propelling motors on the two locomotives, so that they are all constantly and fully excited.

The wires 3 and 4 are also supplied by a current from the exciter E^1, but the reversing field rheostat R^1 is in the path of this current. The fields of the two dynamos D^1 and D^2 are connected in multiple across these wires 3 and 4 which extend along the train.

It will be evident that by manipulating the reversing field rheostat R the operator can vary simultaneously and similarly the field exciting currents supplied to D^1 and D^2 and that therefore he can cause the voltage of these two dynamos to vary in exact unison from zero to the maximum voltage in either sense. Thus, the operator can cause the two locomotives to start, accelerate, run at full speed, retard, and reverse in perfect unison, always dividing the load perfectly under these various conditions.

By placing the controller R^1 in its open position and going to the other locomotives, the operator can similarly control the two locomotives simultaneously by means of the controller R^2.

By the use of this system I expect to be able to secure the following advantageous features:

First. The haulage over existing roadbeds, grades, bridges, etc., of very much heavier trains than can be hauled by any steam locomotive.

Second. A material reduction in the cost of maintenance of the locomotives as compared with steam locomotives.

Third. A material saving in the maintenance of the roadbed because of the absence of hammer blow, shouldering, rocking and skidding.

Fourth. A material increase in the weight of the train which

*Read at the meeting of the American Institute of Electrical Engineers, New York, Nov. 21, 1902.

could be hauled around a certain curve by a locomotive having a certain weight on drivers.

Fifth. A material increase in the load which could be started upon a certain grade by a locomotive having a certain weight on drivers.

Sixth. A material reduction in the dead load necessarily hauled by a steam locomotive, represented by the part of the steam locomotive and tender not on drivers.

Seventh. A very large increase in the number of trains of given weight and speed which could be operated from a given power house compared with the series parallel or cascade systems. Or, to state this another way: a very much higher rate of acceleration with the same maximum output from the power house, the same conductors, the same weight per train and the same watt hours per ton mile, than is possible with the series parallel or cascade systems.

Eighth. As each locomotive unit can be equipped with any desired number of driving axles and any desired number of locomotives can be operated under mutiple control, the amount of power which can be applied to a single train and controlled by a single operator is practically unlimited.

Ninth. Fifty per cent of the energy now wasted on friction brakes can be saved in the form of useful electrical energy restored to the system.

Tenth. The first cost of equipment will be very much less than that of any system, for equivalent service, which involves the use of sub-stations.

Eleventh. The cost of haulage per ton mile will be greatly reduced as compared with steam locomotives, especially because of the large increase in the weight of the train which can be hauled.

Twelfth. Difficulties due to electrolysis would be reduced to a minimum.

DISCUSSION

S. F. Dodd.—There is one question I would ask Mr. Leonard, and that is what facts he can give us in regard to the weight and efficiency of such a locomotive as he describes. It will be impossible to apply such a system in single or small units, and the only field for such a locomotive will be for trunk-line service. Now, let us consider a large locomotive like the Baltimore & Ohio tunnel locomotive, whose weight is 96 tons. I do not know exactly how much waste room or waste weight there is. I do not think there is much of either. These locomotives are operated by a motor generator set, which weighs 36 tons. It raises the voltage from 500 volts to 700 volts. Suppose it generated 700 volts. To develop that amount of current it would require about a 750-kw motor generator, weighing somewhere between 50 tons and 60 tons, and making the total weight 150 tons. Thus, it will be seen, for large locomotives they would get a weight somewhere in the neighborhood of 150 tons, which will cut the weight efficiency down less than we could expect to have it in electric motors of this style.

N. W. Storer.—Mr. Dodd struck the nail on the head. Such a system, I believe, will increase the weight of the locomotive far beyond what is ordinarily required for the power of the locomotive. I believe if you take a large locomotive scarcely any excessive weight will be necessary, particularly if you take into account the motors and other necessary parts, and, I believe, if you add to that a motor generator outfit you will have a locomotive which is 50 per cent heavier than it should be.

H. Ward Leonard.—I will not spend any time on the Baltimore & Ohio locomotives, which, although historic, we all know are absolutely uncommercial for freight haulage on trunk-line service. I think it is likely there is not much room on that particular locomotive for a motor generator. I know the company which built it considered whether it should put a motor generator on it, and apparently it did not find room for it. As to the particular question of the effect of the motor generator in locomotive practice, I beg to point out that the best constructed locomotives which have been made in recent years are the Decapod locomotives, and these have about 50 per cent of the entire weight on drivers, which is put there to secure better power results and to secure larger tractive effects. The next difficulty that was met with was that they would skid the wheels if the weight on the drivers was not sufficient to take care of the power produced, and various complicated devices have been invented in recent years to shift a part of the weight of the locomotives, and endeavor to secure more weight on the drivers. It is, therefore, not only important, but really essential that you get more weight upon the drivers of any locomotive, such as I am considering. Furthermore, admit for the sake of argument that the point is well taken that the weight hauled is increased by the motor generator, I still wish to point out that a motor generator would not be designed whose weight would compare with the weights of the motor, or with the weight of the motor generator, which is put in a sub-station. A motor generator employed on a locomotive would resemble closely a generator driven by a steam turbine, as to size and weight. Members who are particularly interested in following the matter further will find quite detailed figures as to the weight of a motor-generator relative to the total weight of the locomotive in a paper by Mr. Huber, last March, describing locomotives for the Zurich Company, which were built on my system, and which will go into commercial use in the next few months. The present steam locomotive, in having 50 per cent of its weight on drivers, could double its present horse-power, and such a locomotive would doubtless show great economies in the haulage of freight. There is scarcely a railroad in the United States to-day that is not struggling with the problem of hauling its freight, and what is wanted is a locomotive which will haul twice as many tons as is now hauled. The fact that a few more tons, 50 or 60 at most, are placed on the locomotive, is entirely insignificant when compared with the entire weight of a 3000-ton train.

Efficient Discipline*

BY W. W. WHEATLY

"Order is Heaven's first law." Permanence and stability depend upon law and order. The proper management of large enterprises, such as armies and railway systems, requires the united action of a large number of individuals. It is essential that the individual units work with one common purpose, and that individual energies be concentrated. This is usually done by focusing power and authority in one individual, be his title president, general manager or superintendent. He secures united action by asking obedience to certain regulations or laws which are intended to restrain action within certain bounds and direct its course. As the cars are guided by the rails upon the permanent way, so do rules and regulations guide the action and energy of railway employees within certain limits. The ability of the manager is reflected in the skill with which he makes laws and enforces them, and in the facility with which he brings into harmonious relations the component parts of his organization so that, while each will perform its proper function independently of the other, there will be a time and place where the energy and action of all will unite and work together for a common purpose.

The existence of rules and regulations presupposes the authority and power to enforce them. Unless the power goes with the authority the very best rules are imperfect and impotent. In the army and navy the power to enforce the rules and regulations is embedded in the law of the land, but in the railway service it must depend upon the voluntary consent of the parties concerned. For the purposes of this paper efficient railway discipline will be considered, first, as synonymous with instruction and training in accordance with established rules, and second, as synonymous with punishment inflicted by way of correction and training.

1.—INSTRUCTION AND TRAINING

The generally accepted idea of discipline, that it is entirely punitive, is wrong. The railway officer who proceeds upon the theory that punishing the offender is the beginning and the end of discipline, is making a serious mistake. Discipline is or should be primarily educational and the railway officer must be the teacher—upon him must rest the responsibility of educating and training his men. The instruction and training of railway employees, especially those engaged in the train, station or car service, has not been given the attention its importance demands. After a long and varied experience in steam and electric railway operation the writer has become greatly impressed with the lack of systematic methods of instruction and training. New and untried men come into the service as apprentices and graduate into responsible positions under the guidance of some older man. The instructor may not himself have been properly instructed or trained, or if properly trained he may not have the faculty of teaching others. Later, these new men undertake to instruct others. The new man without any special attention upon the part of anyone becomes part of the great machine. Proper training depends not alone upon a thorough acquaintance with the rules and regulations and the general or specific requirements of the service, although this is a primary requisite; it depends largely upon a methodical and systematic course of inspection to determine whether there is proper observance of the rules and an honest pride in the service. To know the rules is one thing, to observe them habitually is another. Furthermore, the strict observance of rules is not the end of training—no code of rules can cover all the varied requirement of a perfect railway service; good judgment and discretion must begin where the rules end, and these things can only be instilled into the apprentice by continual inspection of his work and the correction of his faults.

* Read before the New York Railroad Club, Nov. 21, 1902.

The admirable discipline in the army and navy comes from constant and persistent training and inspection. The instruction is given by men selected and educated for the purpose and frequent inspection is made by the higher officers. This training kept up through a long period enables the apprentice to secure an assignment to active service. Then when the supreme emergency arrives for which he and his companions have long been preparing they go into action as one man, guided by one mind, and become a mighty force. In railway service the instruction and training of the apprentice is more often a matter of chance than of system; left to pick up what he can he does not always get what he should have. To know just enough of the rules and of the business in general to pass an imperfect examination and get to work as quickly as possible is the controlling idea in his mind. Too often he expects only to use his position as a stepping-stone to something that temporarily pays better, and he is filled with a restless craving for change. He does not expect to become a careful, earnest worker in this field; nobody makes him do it, and therefore he does not do good work. This lack of inspection and instruction permits many poorly trained men of this stamp to pass into and out of the railway service, and their presence is inimical to good discipline.

Some of the electric railroads have established schools of instruction and nearly all of them have more or less effective methods of inspection. The schools of instruction are equipped with skeleton cars exposing to view the operations of motors, controllers, trucks, brakes and showing clearly the wiring and all the mechanical and electrical details of the cars. Competent instructors are present and here the older men, as well as the apprentices, are given instruction concerning their routine duties. Lectures on technical subjects by experts are given periodically, and there are occasional talks before large numbers of the men by one or more officers of the company. The steam railroads have maintained for many years air brake instruction schools, but their efforts, as a rule, have gone no further.

If it is expected that those who are in the service to-day and those who enter it hereafter are to make it their life work the question of proper methods of instruction and training is an important one to the men as well as to the company. It is due to the men that they should be fitted for advancement; that their work should be watched, and that they be advised and encouraged whenever they fall short.

2.—PUNISHMENT INFLICTED BY WAY OF CORRECTION AND TRAINING

To enforce laws, rules or regulations there must be a recognized authority with power to fix penalties for infringement. The responsible officer of a railroad must become the judge and jury, take the evidence in every case, establish the facts and render judgment. It is better to prevent disobedience by careful training and systmatic inspection than it is to punish the offender. But there will always be those who will shirk their duty or who will take chances, as well as those who may unwittingly err. It should become generally known that each and every infringement will be taken up and punished without fear or favor.

That is generally the best government which is supported and upheld by the governed, and which accomplishes the end of its organization with the least friction and the least display of arbitrary authority. While it requires great executive ability to carry large enterprises forward to successful issues, it also requires the rarest kind of executive ability to administer punishment for wrongdoing in a manner that will be considered by all men as fair, just, righteous and honorable. In determining what the system or method of punishment shall be we must consider what purposes are sought in inflicting the penalty. They are two-fold, viz.: (1) to vindicate the law and secure obedience to it, and (2) to set an example to others, to benefit them as well as the subject. The most merciful and righteous penalty which will secure these ends would appear to be the best. The old method of punishment by means of suspensions and fines appears to be giving way to a more enlightened and merciful method which not only answers the same purpose, but has a greater educational value. Every occurrence for which punishment may be administered ought to be turned to the benefit of the transgressor and be so handled that he may look upon it as an object lesson and a stimulus to better things. The system or method of punishment, whatever it may be, should encourage rather than discourage the subject. Its effect should be instructive. It should have a tendency to increase the efficiency and loyalty of the subject rather than the reverse.

Many of the large roads of the country have within recent years adopted one or another modification of the system known as the "Brown or Fall Brook System" of discipline without suspension, and have reported its good results. Volumes have been written in its advocacy, and we shall probably hear much of its workings from those who take part in this discussion. Without going into its details, it is evident that the best-managed railroads of the country are committed to the principle involved and it may be concluded, therefore, that the argumentative stage has been passed. The writer believes thoroughly in the underlying principle and thinks that all roads should adopt some modification of the essential idea. Its adoption will not, however, alone bring successful results; something more is required than to inaugurate the principle. To secure the best results the men must become willing and earnest workers and be induced to take pride in their vocation. They must become attached to it. Show me a road or a business where the tenure of position is secure, where the wages are satisfactory, where promotion for merit is certain and where there is ample provision for sickness, disability, old age and death, and I will show you a service where the administration of discipline is easy and the results satisfactory. In such a service men gladly become earnest and loyal workers and take an honest pride in the successful conduct of the business.

CONCLUSION

Returning now to the idea of the concentration of individual energies as expressed in the beginning of this paper, you are requested to look around and say whether it is not apparent in every department of business and of labor. Is it not true that the one thing which forces itself strongly upon our notice is the superseding of individuality by concentration? Have not the great aggregations of capital and the aggregations of labor grown greater and stronger? Is not authority and power to act concentrated in fewer hands? Have they not for many years been strengthening themselves, extending their organizations, perfecting their discipline, and trying by every means within their power to attach men to them and to increase the earnestness and loyalty of every unit of the great combinations? We are just beginning to comprehend that irresistible economic forces are at work, and that the universal desire for a more compact and better disciplined organization is in response to the instinct of self-aggrandizement or self-preservation. Recent troubles in the industrial world have shown that mixed with our boasted national supremacy and material prosperity there are throbs of discontent and the conflict of opposing elements. Organized boards of conciliation and arbitration may for a time plaster over the breach, but the crack in the wall remains an element of weakness and of danger. If such is the condition now, when times are prosperous, what may happen when the times are bad, competition keen and profits disappearing?

The opposing elements are not irreconcilable, but the danger is greater than ever before, because of the combined power and strength of the contestants. There will be no halt in the march of intelligence and progress, but there may be a realignment of the opposing forces. It is a time when employers and employed should understand one another better and cultivate a spirit of frankness and conciliation. The master and man idea should be dispelled; in its stead there should come a higher idea of the relation of the employer and employee and its foundation stone should be co-operation. The manager of every large institution should not meet his men only when trouble arises; he should meet them, as does President Vreeland, at regular intervals, touch elbows with them, talk with them about their routine work and show them by his actions that he has an interest in them and a genuine regard for their welfare. By such means, doubt and distrust are overcome and a more perfect confidence is encouraged. These are the fundamental priciples of efficient discipline.

Establishing and Enforcing Discipline*

BY C. H. KETCHAM

When speaking of discipline, it is generally thought by the men as meaning suspension from service; but the Century Dictionary says it means teaching, instruction, cultivation of the mind, government and special training to act in accordance with rules. We understand the meaning of discipline to be the means of securing the best results we are now desirous of accomplishing. First, a staff of officers is necessary, men who are thoroughly conversant with their duties, who have complete control of themselves—having been well disciplined. A man who cannot control himself in the handling of men should not have control of others, because he will do himself injustice and certainly do injustice to the men under his charge.

The work of the train rules committee of the American Railway Association has made the establishment of rules governing employees in train service easier than formerly, and as most roads have adopted standard rules, it has improved the work and education of trainmen. The local conditions, however, of each road must be carefully considered, taking into consideration the facilities; special rules can take care of such matters.

The best discipline would discover irregularities and correct vio-

* Abstract of paper read before the New York Railroad Club, Nov. 21, 1902.

lations of rules or lack of good judgment before loss of life or destruction of property occurs, making it necessary to inflict punishment. Close watch should be kept, and when it is found that the conductor, engineman or other trainmen are violating rules that may lead to trouble, get as many together as possible, tell them what these violations are and what they will lead to, and inform them that you are doing this because you want to keep them out of trouble, and obtain good service. A case in question on a certain railroad occurs to me. Speed was restricted on dead freights down a certain grade, but the slow speed order had been long neglected; a train of twenty-five cars became derailed because they were not able to stop where a rail was up, although flagged a mile distant, and four new engines were wrecked at the foot of the grade. The superintendent changed shortly after; the incoming superintendent heard of the wrecks; had his master mechanic get together as many enginemen as possible at one time, told them all about it, informed them that the speed limit was going to be enforced on second-class trains, and that it was necessary for all to run their trains to make the same time. This case was used as a text for special instruction. Ten years have now elapsed and there has not been a wreck there since.

When promoting a trainman to conductor, or fireman to engineman, after they have been examined by master mechanic and train master on machinery and train rules, good results, I think, are obtained by the superintendent taking them in hand and bringing to their attention their increased responsibilities, what is expected of them, and cautioning them not to take any chances, but if in doubt to put their train on a siding, stay there, and ask the despatcher for advice, that it will not be considered a reflection but a desire to be right; tell them of irregularities that have occurred, how they occurred and how they could have been prevented. Impress upon them the responsibility of themselves and the company to the public, and let them know that if they obey rules and show good judgment the superintendent will not be compelled to administer discipline—that they make the cases and, like a judge in court, he has to do his duty as an officer of the company.

The officer who has to inflict or decide punishment for violations of rules should be fair, honest and conscientious, appreciating that he represents the company, the public and the men. If he knows of an employee whose record is such that the man should not be kept in the service, but does not dispense with his services, he has indirectly and to a certain extent assumed responsibility for the man's acts. The court would not excuse, neither would the public, who look to the officers to protect them from disaster. That punishment is necessary for violation of rules, cannot be denied. If we violate the laws of the State, we have to stand the punishment inflicted; if we violate the laws of health, our body suffers—in both cases to the extent of our violations. All men are not of the same temperament, therefore they cannot all be handled alike. Some men feel keenly a reprimand or a record placed against them, and with them such punishment has good results; whereas other men must feel the rod, and suspension of certain duration seems to be the only punishment that will get the best results out of them. Employees should know that they are going to get the benefit of their record, and, if suspended for two weeks for a certain offense, know that another man getting into the same trouble, but without their good record would be suspended thirty days; they should realize the reason why this is so. Where several wrecks of the same nature have occurred the temptation to discharge the third man regardless of record, because the officer thinks it must be stopped, does not look like justice. The third man involved should be handled for his act on its merits. Thorough investigation should be conducted and all possible efforts made to obtain the facts; if in doubt, take the necessary time to make sure that you are satisfied who is at fault. Try and make plain to the person responsible where he violated the rule or lacked in good judgment; but after you have concluded that the employee should not be kept in the service, he should never be re-employed. To discharge a man is a very serious matter; therefore the conclusions should be drawn only after very careful consideration. If a man is good enough to re-employ he should not have been discharged. The custom of discharging a man while expecting to re-employ him destroys effective discipline; the superintendent's approval should be required before discharging an employee. The enforcement of rules should be very exacting, especially where the train movement is affected.

As to what punishment is the most effective, a record or a reprimand in some cases is sufficient; at other times a moderate or long suspension is necessary. Each case must be considered on its merits; no set plan can be laid down that can be followed with invariably good results. The "Brown" system has been juggled to such an extent, to meet the wishes of an officer who has a desire to be slack on discipline or who lacks the courage to enforce it, that it has lost its effectiveness; whereas, had that officer tried to build up the man he would not have an unpleasant duty to perform. Our judges would not be long tolerated if they failed to do their duty, so an officer should do his duty without fear or favor, but tempered with mercy and justice. From information received in conversation with the rank and file on some of the roads, I am led to believe that many superintendents courted the Brown system because formerly their ranking officers frequently reversed their decisions and destroyed their usefulness as disciplinarians. Now the Brown system saves them from embarrassment. The superintendent should be the officer to whom the men look to settle their cases; if he knows them as he should, and is the right man in the right place, the company, as well as the men, will be fully protected.

Organization and Discipline*

BY G. W. SLINGERLAND

It was recently stated by a great public educator that "The world has been made over during the last fifty years." With this process, you gentlemen of the railway and steamship service have had much to do; within a very few of those years we have seen the making over of your forces in the conversion of the inefficient and careless sectionman into the faithful, vigilant, storm-defying track and road watcher; we have appreciated the transformation of the uncouth, muffle-voiced brakeman, who kicked so hard against the "badge of servitude" when first he put the uniform on, into the natty trainman of to-day, who, after assisting "passengers off first, please," and helping others on, steps inside the car as the train starts, and, in a distinct voice, announces, "Jonesville next stop—next stop is Jonesville," repeating it before the station is reached; we have noted the alert and silent motorman on the end of the car erstwhile occupied by the jolly, gossipy driver, as well as many other familiar incidents of this great evolution, which is still going on.

Leaving the discursive line of thought engendered by the breadth and age of our theme I will, if you please, devote the remainder of my time to some types of discipline in other than railway organizations; and in order that this paper may not greatly exceed the minimum of time to be consumed in its reading, I will confine it to references to three widely differing kinds, all of interest to railroad men, all with the "full and free consent of the governed," one of which is supported by voluntary contributions or assessments of its members, the second partly by its own revenue and partly by public taxation, and the third a revenue-earning transportation company. Before doing so, however, permit me to say that in my opinion the "efficiency" of any discipline is so largely judged from the view-point of the observer, and those view-points so frequently change—as has been the case with some of us concerning that of the slipper the shingle, the birch and the ruler—each must decide for himself as to the "effectiveness" of any method, or leave it to old Father Time and results.

The first of these types is the American Federation of Labor, which, regardless of our views as to its principles, purposes or tendencies, we must admit presents a discipline which trains its members to absolute obedience and subjection to the control and direction of its officers, the sinking of individuality and abnegation of self, and maintains zeal, spirit and confidence in the face of all discouragement, even when striking against the rock on which is implanted the banner of forces that believe in the inherent right of every man to sell his own labor, skill or ability to his best advantage—a rock around which its many very able and energetic chieftains have not yet found a safe course to steer.

The second selected type is one of our dear old Uncle Samuel's departments. I refer to that department of our government which more than all others appeals most strongly to our civic pride—that one which is almost invariably used as an argument in favor of government ownership or control of public utilities by a very few generally well-informed and well-meaning citizens, a very large number of others who think they think, and politicians of both parties who wish to stir the public pulse for party advantage or personal gain, viz.: The Post Office Department of our general government. To the popular belief that its discipline is the embodiment of all that is perfect and an important factor in producing its efficient service, we may humbly bow; but it is my individual opinion that many other much more important factors have aided in the development and perfecting of our magnificent postal service than has its autocratic discipline by the Revised Statutes. Prominent among these factors we may mention the extraordinary facilities provided by railroad and steamship companies, frequently at nominal cost—our sublime and childlike faith that government can do no wrong, which causes us to pay both for transportation of our mail matter and taxes for transportation of other people's freight by mail—and the much decried "spoils system" which,

*Abstract of paper read before the New York Railroad Club, Nov. 21, 1902.

making political bosses of its fourth-class postmasters and officials of higher grade, for a long period gave to the government, without adequate pecuniary compensation, invaluable services sometimes of the very highest administrative ability, which, if paid for in cash, would either have swelled the appropriations to an unwarrantable and unobtainable extent or reduced the value of the service by its withdrawal from crossroad hamlets. May we not also, but with equal humility, question whether this severe discipline aids as rapidly as might a more liberal one in the development of the great and unquestioned proficiency of its intelligent, uniformed force, and particularly its mail clerks in the Railway Postal Service.

For my third (and last) type I wish to call your attention to the discipline of a great transportation company which applies to all its force, a small army of men working in and traversing thirty States and territories and all the Canadian provinces, of agents and shipping correspondents in every commercial port and city of the Old World subject only to the governmental regulations or commercial customs of different nations in which their work is done, and fits nearly every phase of the lexicographers' definitions, including also "prevention" and the "open door"—a definition which I think was coined by the president of this club. Its education and training of its employees is broad and comprehensive, tending always to the rapid and careful performance of many diversified duties.

The first of its general instructions is: "A printed circular is issued from the president's office monthly for the information and instruction of employees only, etc." The heading of this monthly circular reads, "Suggestions tending to simplify details, further economy or increase the efficiency of our system for doing business are cordially invited from all connected with the company, and will be duly considered." These circulars are always educational and are eagerly looked for and carefully studied by employees who are trying to fit themselves for promotion, and that covers the majority of them. Another of the general instructions says, "The most polite and gentlemanly treatment of all customers—whether men, women or children, rich or poor, white or black, or however insignificant their business—is insisted upon. It must not be forgotten that the company is dependent on these same people for its business"—and violations of this rule are never excused or condoned. You will note that as a preventive it is very politely intimated to the employee that if the company does not get patronage on account of his incivility it will have no use for him, and there is no question that it is so read and applied.

No civil service examination to ascertain their knowledge of astronomy or geology and like subjects is required of applicants for positions, nor are they asked their religious or political creeds or affiliations—the requirements are good character, fair physical condition, good eyesight and hearing, intelligent appearance, and, of course, ability to read and write. The lowest grades of service are label-boys, porters and wagon helpers. Promotion for efficiency is the invariable rule of the American Express Company (which is the one referred to herein) and as its officials of every grade have been promoted from its ranks the ambitious young men in all grades are always trying to fit themselves for promotion; there is usually more than enough to fill the better positions, and it is very rarely that a new man can find an opening which will give him a big salary on the start.

It is the only commercial or industrial concern of which I know, 80 per cent of whose employees, scattered over the world as these are, make written contracts, which, while binding on the company (frequently in large amounts), are operative when signed by the employee and without being vised by the home office, and on which the company is only released from obligation when, after passing through many hands and quite possibly crossing continents and oceans, they are completed by some other employee distant from the point of agreement; so effective is its discipline that although many tens of thousands of such contracts are made by its employees daily, the instances in which they are not executed both in letter and spirit are infinitesimally small when compared with the entire number.

It is this educational discipline which qualifies its men rapidly and carefully to perform many widely differing daily duties, the list of some of which makes that famous one of the "country station agent" pale into insignificance. While some of its employees could not pass a government civil service examination the practice which makes perfect, their ambition and the methods of the company make them proficient much more rapidly than does other discipline. As an illustration of this (and it is also brought up because of the discussion at our last meeting on the subject of loading cars) it might not be out of place to say that on one of the leading trunk lines from this city the United States Railway Mail Service sends about eighteen exclusive mail cars during twenty-four hours; in addition to our business for points within 150 miles of the city and long-distance shipments sent out earlier in the day, we load at our principal depot in this city between seven and nine o'clock every week-night, eighteen exclusive express cars carrying matter for Northern New England, Canada, around the Great Lakes, the Missouri River and the Gulf of Mexico, and over the Rocky Mountains to the Pacific Coast and the far Orient. These cars are loaded for various principal points and branch routes and the business is always loaded in station order, and the packages in them are placed in sealed trunks or cases which are also destined to cities and smaller routes. Its men from the lower grades of service become so extremely proficient in the geography of the country that there is always a considerable portion of its depot force competent not only to sort, way-bill and load this matter quickly, but to name the proper route, trunk or identical place in the car where each shipment should be placed to insure its reaching its destination by the shortest and quickest route, even if such destination should be, as is frequently the case, a small hamlet off of railway lines.

Another phase of its discipline, which has a very important bearing on its efficiency, is both preventive and corrective, namely, that covered by the general rule that "who breaks, or loses, pays." This rule is rigidly applied in every case where it is shown that the loss or breakage occurred through the carelessness or negligence of the employee or was preventable by him; but it is not enforced when it is shown that the result was owing to causes beyond the employee's control—the utmost care always being used not to do the man injustice. There are several other prominent features of its discipline to which we might further allude, but I fear it would trespass too greatly on your time, and, therefore, will not detain you further in regard to this illustration of what we think is very "efficient discipline." I will close with the following quotation from an anonymous author: "Discipline, like the bridle in the hand of a good rider, should be ever active, both as support and as a restraint, yet seem to lie easily in hand. It must always be ready to check or to pull up, as occasion may require, and only when a runaway should the action of the curb be perceptible."

Northwest Railway Club

At a recent meeting of the Northwest Railway Club there was a brief discussion on the merit system, prompted by a paper read at a former meeting on "The Best Form of Discipline for Engine and Train Men." The Brown system of debit and credit was explained, and George Dickson, of the Great Northern Railway, discussed the advancement in the character and intelligence of the men of late years. The engineer of seventy years ago was a mechanical genius, he said, and was selected because of his familiarity with his locomotive, whereas the successful engineer of to-day is careful, conservative and obedient. Discipline is of higher importance to-day than formerly. Mr. Dickson, in closing his remarks, made a suggestion regarding the disposition of cases of discipline brought under the rules:

"I believe that where so many men of one class are engaged in the one kind of work, as in the case of road men, there should be one man whose business it should be to sit in judgment on all men who are unfortunate enough to come under the rules of discipline. He should be a man capable of rendering an honest and just decision, treating all men alike, whether the system be one of merit marks or suspension. There would be a sameness in the judgments meted out and the superintendent would be relieved of an unwelcome duty.

"I believe that merit marks should be given when a certain number of miles has been made without accident, and the man who is successful in rolling up a big mileage, especially during the busy season, should receive his just reward."

H. T. Gould, of the Minneapolis, St. Paul & Sault Ste. Marie Railway, said: "It is a very difficult matter for anyone to get at this subject in a satisfactory way. You can always see the bad points in a man, because they are always reported to you, but when you come to his good points it is a different proposition. In handling a personal record under the Brown system, I think it is the duty of every man in the employ of the train service to look at the merit side as well as the debit side. I think that the trainmen and the enginemen are a little jealous of one another, and for that reason you do not see the good qualities, where you always get the bad. I am speaking now from the standpoint of the operating department. I am not as well versed in the mechanical side of it. But I always find that we have debits to place against a man's record, when undoubtedly some credits are overlooked through not being reported. And therefore I think, in order to make that system a success, the trainmen and the enginemen should report to their respective heads of the departments the good qualities of the men and not always the bad."

Vice-President Falther closed the discussion with the following observations: "There seems to be a very general consensus of

opinion that if a man is to be debited for an error committed, or for some slight mistake or fault, he should certainly be credited by an equal amount, if he shows good qualities, in order to wipe out the debit against him. Otherwise it would seem that it must be a question of time only when these debits accumulate to such an extent that he cannot at all eliminate them, and he must quit the road and find employment elsewhere, thus bringing about the very reverse of what was intended; that is the improvement of the service. The question of improvement of the service should be borne in mind, I think, throughout, and if we have, as the last speaker has stated, debits against a man, we should certainly also have credits for him."

The next feature of the programme was a paper by M. H. A. Ferguson, of the Chicago Great Western Railway, on "Draw-bar Pull Rating of Engines," and the discussion it provoked. The paper was accompanied by two curves made from records obtained by dynamometer car tests covering a period of over six months, and including 10,000 cars. The curve showing the pounds per ton draw-bar pull was very regular. It was also shown how much less the pounds per ton is for heavy cars than for light ones; but when the pounds per ton is multiplied by its proper weight of car, the character of the curve is entirely changed, showing the importance of taking care of the resistance of each car separately, instead of the "adjusted" method of adding a fixed average factor to each car regardless of weight. The curves given are for a straight and level track. In order to find the draw-bar pull for any weight of car for any given grade and curve, direction is given to add the draw-bar pull due to grade alone to the draw-bar pull for level tangent, and, if there be any curve, also add the product of the degree of curve times 1.35. This result, multiplied by the weight of car in tons, gives the total draw-bar pull for that car on the given grade. Mr. Ferguson said that he had found, during the course of some road tests, that the following was a simple and quite accurate way of obtaining the draw-bar pull of various weights of cars over any grade or curve, it only being necessary to know the figures for a level tangent: "Let us suppose that an engine, exerting a draw-bar pull of 20,000 lbs., hauls a train of thirty cars, weighing 1500 tons, over a certain grade and curve at the required speed. If we divide 20,000 by thirty, the number of cars, we find that the average draw-bar pull per car is 669 lbs; also, by dividing 1500 tons by thirty we find that 50 tons is the average weight per car; then by dividing 667 by fifty we get 13.34 lbs., as the average draw-bar pull per ton for a 50-ton car. The draw-bar pull for a 50-ton car on a level tangent is 2.6 lbs. Therefore 13.34 minus 2.6, or 10.74, is the pounds per ton draw-bar pull for that grade or curve, and is constant for any weight of car. For other weights than fifty, add to 10.74, their level tangent resistance in pounds per ton, multiply by the weight of car, and we have the figure for our loading table."

British Electric Railway Practice

At the meeting of the British Institution of Civil Engineers on Tuesday, Nov. 11, a paper was read on "Electric Tramways," by C. Hopkinson, M. Inst. C. E., B. Hopkinson, and E. Talbot, M. Inst. C. E.

The authors stated that when, about the year 1897, electric tramways had begun to be constructed in Great Britain on a large scale, there had already been many thousand miles in operation in America, and a vast amount of American experience had been available in connection with this branch of engineering. Consequently, British tramways had been constructed largely according to American methods, and showed a good deal of the uniformity characteristic of American practice. The authors' experience had been gained principally in the construction of the tramway systems of Leeds and Newcastle-on-Tyne, and the paper discussed a number of important points in tramway practice, which were illustrated by reference to these two systems of tramways. The paper was divided into four sections, viz.: (1) Generation of power. (2) Transmission of power to the cars. (3) Rolling stock. (4) Earth returns.

The nature of the load on a tramway generating station was discussed, and it was shown from actual records to what extent increasing the number of cars resulted in making the load more uniform. With seventy cars or more, the load was so nearly constant that the steam consumption per unit was substantially the same as though it were constant and equal to the mean. Hence in a station of this size, equalization of the load by means of a storage battery was of no use as regarded economy, though in a small station it might be of great value. A storage battery equal to replacing one-third of the generating plant for one-half hour, should, however, be installed in a continuous-current power station for the purpose of replacing a generating unit in case of breakdown, and for running cars at night. The effect of short circuits on the generator was considered; in the worst case there might be a force equal to three or more times the normal force applied at the periphery of the armature for a period of one-tenth of a second, that being the time which a circuit-breaker took to open. This necessitated a very strong connection between armature and fly-wheel. Another effect of the opening of the circuit-breaker was the sudden diminution of the load on the engine to nothing, which necessitated special arrangements for preventing the engine from running away. This required either very quick governing or a heavy fly-wheel. Except for short circuits, an ordinary governor and an ordinary fly-wheel were sufficient. Tachograph records showing the rise of speed on one of the Newcastle engines when the load was thrown off were discussed. The question of over-compounding dynamos was considered, and dynamos wound for constant potential were recommended.

The simplest method of transmitting the power to the cars was to make the trolley wire into an electrically continuous network and to feed the current into it at several points. In practice, however, it was found necessary to divide the trolley line into sections insulated from each other, each section being fed at one point. The points of division in the center of a city were determined by considerations of safety; in the outer districts, questions of economy and the necessity of keeping the variations of line potential within limits might come in. The principles were illustrated by reference to Newcastle-on-Tyne. There was no objection to the line potential occasionally dropping 100 volts below normal; and this led to the result that a two and one-half minute service of cars could be worked up to a distance of 2 miles from a feeding point. The most economical size of cable was next considered; the mean current density should rarely exceed 300 amps. to the square inch. This entailed a mean drop of potential of about 13 volts per mile of feeder, and feeds could be carried to a distance of 1 mile or 1½ miles without boosting. The loss in the trolley wire in supplying ten cars on 1 mile of double track from one end was between 2 per cent and 4 per cent of the power given to the cars. The conclusion was that on the outer sections the line might be divided into sections 2 miles long. In many cases excessive traffic on a particular route had to be dealt with on a few days of the year, the traffic being small on other days. This was illustrated by reference to a case in Leeds where fifty cars had to be supplied with current on twenty days in the year at an average distance of 3½ miles from the generating station. The method by which this was done with continuous current and boosters was discussed, and was compared with and found preferable to three-phase high-tension transmission and conversion. The Leeds tramway system was as extensive a system as could be economically served by a single continuous-current generating station, placed in the center of the system.

The most important requirements in a motor car for use in city systems were that it should be capable of rapid and well-sustained acceleration, and that it should be able to go quickly up hill. These requirements could be fulfilled only by motors capable of traveling on the level of speeds far above what was allowable in practice. Curves were given showing the acceleration of the car from rest with various motors and under various conditions. A mean acceleration of 3 ft. per second per second up to a speed of 10 ft. per second could be obtained with motors of a type found to be satisfactory in Leeds and Newcastle. The effect of bad driving on starting was considered.

There was much difference of opinion on the subject of earth returns. In Great Britain the Board of Trade restriction of the rail drop to 7 volts had made cases of electrolysis by return currents very rare, but it could not yet be said that absolute safety was secured for metallic pipes in the neighborhood of tramway tracks. The resistance of the rails and bonds used in tramway practice as determined in experiments by the authors was given. In a new fished and bonded joint a good deal of current went through the fish-plates and sole-plates. The Falk cast-welded joint was described and also the Thermit-welded joint. It was considered unadvisable by the authors to use such joints on sharp curves or on crossing a bridge with steep approaches on account of the effect of expansion and contraction. On straight track, however, the lateral support to the rails prevented variations of temperature from doing damage. Experiments were described from which it appeared that from one-sixth to one-fourth of the current in the rails was diverted into the earth. A service of about ten cars per double mile could be worked over a distance of 2 miles, the feeding point being at one end, without the 7-volt limit being exceeded. The system of return feeders in Newcastle and Leeds was described. Where the Board of Trade limit was exceeded, if all the current were taken out of the rails close to the power station, the extension of the return feeder to points about ½ mile distant from the power station would produce a very marked reduction in

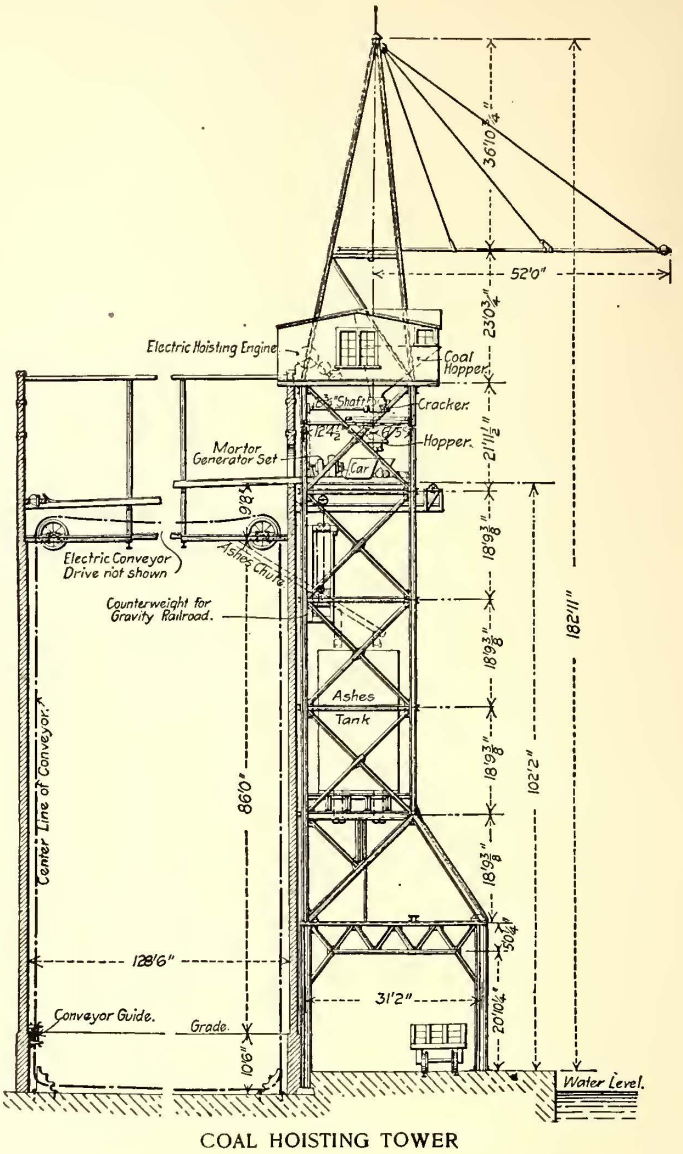
the rail drop, owing to the fact that the great concentration of current which took place in the center of the city with converging routes was thereby avoided. This was the system now adopted in Newcastle-on-Tyne, but provision had been made on the switchboard whereby the cars could be divided into two groups, each group being run by its own generator. The first comprised all the cars outside a radius of 3 miles, and a second all within that radius. In Leeds the greater part of the current would be taken out of the rails close to the power station, but a portion sufficient to bring the drop of potential in the rails within the legal limit would be drawn back through a number of return feeders about 1 mile long. Exceptional traffics at particular points were dealt with by special boosters and return feeders. The authors' experiments showed that a current of 300 amps. in the rails between two points, 2 miles apart, implied a potential of about 5 volts between those two points. The potential was proportional to the current within 1 per cent, which showed that the conduction of the leakage current through the earth was metallic in its nature and not electrolytic to any considerable extent. Examination of the current in the rails, and of the potential at various points of the tramway system, with a constant current of 300 amps. passing had shown that only a very small portion of that current got into the gaspipes. This result was discussed and was shown to be not surprising. The possibility of electrolysis with such currents as did get into the pipes was considered. Unless there were strata of such small extent and high conductivity compared with the average, and so placed as to cause a concentration of the current into the pipe to a density of a thousand times the mean current density or more, no corrosion of the pipe would take place, and the 7-volt limit might be exceeded many times without damage to the pipe. On the other hand, if such strata were present, electrolysis (with damage to the pipe) was quite possible, even though the 7-volt limit was not exceeded.

Electrically Operated Coal Hoist Having Variable Speed Control *

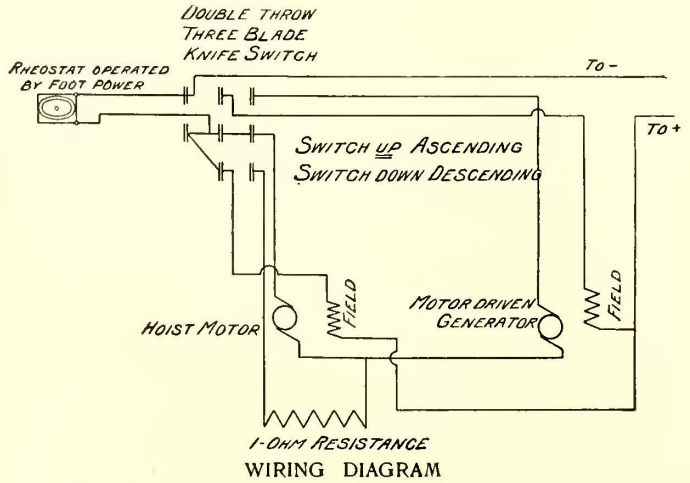
BY P. O. KEILHOLTZ

The use of electric machinery for coal hoisting has many advantages over steam machinery when the hoist is considerable. It has also the advantage of less cost of operation and maintenance. Its initial cost, however, is greater.

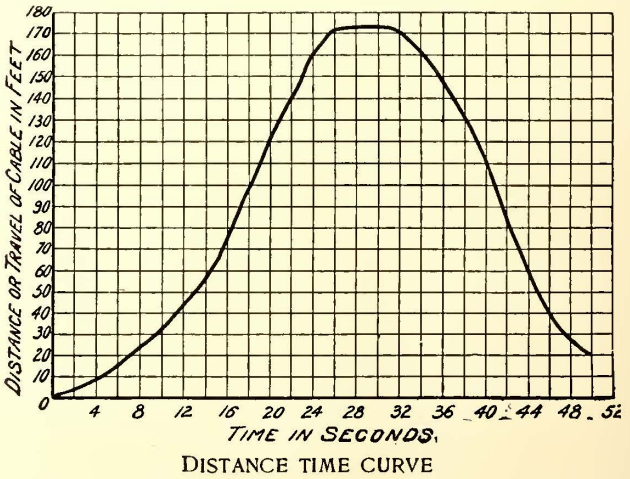
There are two distinct operations in coal hoisting: Raising the loaded shovel and lowering it empty. All that is required for raising is a smooth acceleration for closing and raising the shovel, and full power application as long as possible in order to decrease the time of hoisting. Full power application can be continued longer with an electric hoist than with steam, owing to the less inertia of the former. A smooth acceleration is required because the cables are without stretch and for very high hoists would introduce objectionable strains in the structure or damage to the gearing. It is in lowering the empty shovel that the electric hoist has marked advantages. With steam hoist the lowering is accomplished by braking, and with high hoists, large shovels and rapid lowering the large amount of heat generated by the brakes is difficult to get rid of. As brakes depend upon friction, which is a function of two things—the surface conditions and the pressure between the rubbing suraces—the amount of friction is uncertain, and braking, therefore, is objectionable because violent surgings are introduced in the boom structure and tower. With the electric hoist, owing to the perfect reversibility of the electric motor, the motor is used as a generator having a separately excited field and driven by the weight of the descending bucket. In its armature circuit is a rheostat to dissipate the heat generated. It is at once apparent that this heat dissipation can be better accomplished with a rheostat than with a brake band.



COAL HOISTING TOWER



WIRING DIAGRAM

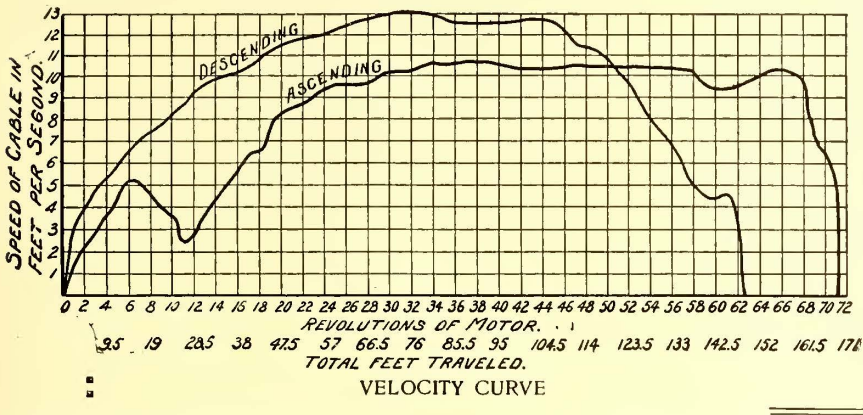


DISTANCE TIME CURVE

The Ward-Leonard system of control is used and the apparatus consists of a motor generator set and a hoist motor which receives its power from the motor generator set, the motor of which is supplied with 550-volt direct current. The field of the generator is separately excited and its strength is controlled by the operator by means of a foot operated rheostat. The field of the hoist

*Read at the meeting of the American Institute of Electrical Engineers, New York, Nov. 21, 1902.

motor is excited by the 550-volt direct current. By means of a double throw, three-blade switch, the foot rheostat is cut out of the generator field circuit and cut into the field circuit of the hoist motor; and the armature leads of the hoist motor cut from the armature circuit of the generator to the rheostat.



VELOCITY CURVE

Appended will be found sketches of coal-hoisting tower, wiring diagram, distance-time curve and a velocity curve, together with data of test and other particulars.

Weight of coal hoisted, average of seven shovelfuls	2,337	lbs.
Weight of shovel empty	2,900	"
Total weight lifted, exclusive of weight of ropes	5,237	"
Average lift	126	ft.
Readings of main motor:		
Volts	540	
Average current in amperes to close shovel	57	
Maximum current in amperes to close shovel	73	
Average current in amperes to raise loaded shovel	189	
Maximum current in amperes to raise loaded shovel	243	
Field current, not included in above, 2.8 amps.		

From the velocity curve (ascending) it will be seen that it took 11 seconds to close the shovel, and from the distance-time curve 26 seconds to close the shovel and raise it to the dumping hopper. Therefore, 15 seconds is the time taken to raise the loaded shovel; and as the lift is 126 ft., the average velocity is 8.4 ft. per second.

The efficiency is, $\dfrac{\frac{8.4 \times 5237}{550}}{\frac{189 \times 540}{746}} = 58\frac{1}{2}\%$

Performance test: Coal lifted, tons, 101.86; time, minutes, 87.33; rate, 70 tons per hour.

PARTICULARS OF ELECTRICAL APPARATUS

Main motor: M. P., 6/150, hp, 450; volts, 550.
Generator: M. P., 6/85, kw, 450; volts, 250.
Hoist motor: M. P., 6/100, hp, 200; volts, 250.

Steam Pipe Covering and Its Relation to Station Economy *

Before awarding a contract for covering the steam pipes in the Manhattan Railway Company's power house, a careful investigation and test of different types and thicknesses of covering was made under the author's direction. In order to get the necessary data it was decided to carry out a complete test of the various types of covering on the market, and also to investigate the effect of varying the thickness of the insulating wall.

The method adopted is illustrated in Fig. 1, and consisted in coupling up about 200 ft. of 2-in. iron pipe and mounting the same on wooden horses about 3½ ft. from the floor, the three lines of pipe being approximately 4 ft. apart and 4 ft. from the nearest wall, in order to avoid any errors due to heat connection and radiation. Sections 15 ft. in length were marked off on straight portions of the pipe, and so arranged as not to include any pipe couplings or bends; 2 ft. from each end of each section heavy potential wires were soldered onto the pipe, and at the extreme ends of the pipe 1,500,000 circ. mil copper-insulated cables were soldered on, the openings in the pipe having been previously closed by means of a standard coupling and plug. One of these cables ran direct to one terminal of a 250-kw, 250-volt, steam-driven, direct-coupled exciter, which was solely devoted to furnishing current for the test, and which could have its voltage varied within wide limits so as to furnish any current up to 1500 amps. The cable connected to the other end of the pipe was then connected to three ammeter shunts in series, in order to enable the readings to be easily checked, after which it was carried through a circuit breaker and switch to the other exciter terminal. The pipe covering test was carried on in a vault in which there was no source of heat and no possibility of draughts of air, and arranged so that the section in which the test was being carried on could be locked up in order to prevent interference with the test.

Invitations for bids were sent to all the principal pipe covering manufacturers and jobbers, specifying that each one would be expected to cover one or more sections of the 2-in. pipe for a competitive test, and that samples from the successful bidders' covering would be analyzed in the company's chemical laboratory, and no covering accepted which departed more than 3 per cent from this analysis.

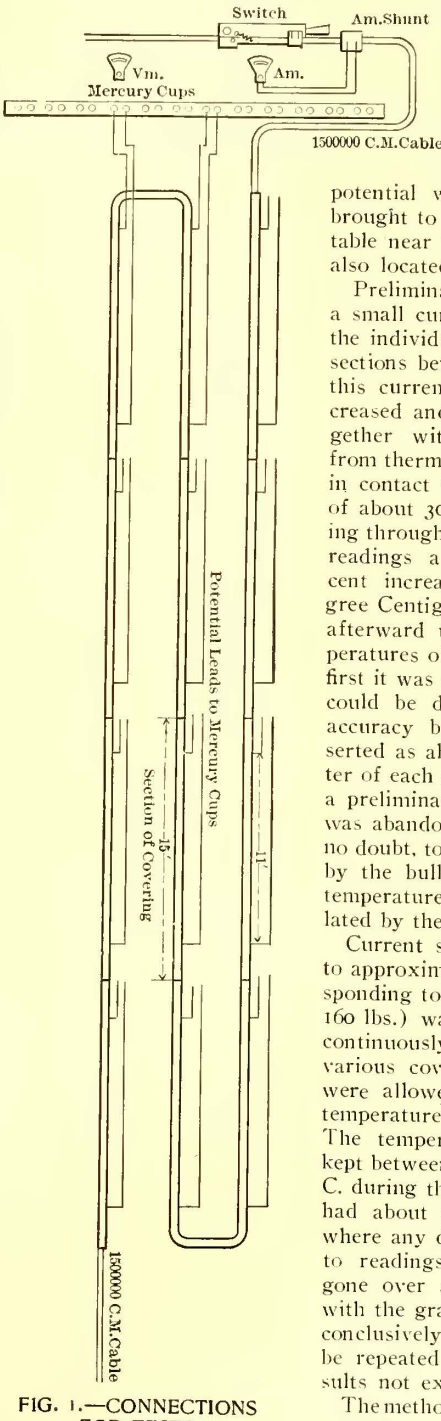


FIG. 1.—CONNECTIONS FOR TESTS

A special Weston milli-voltmeter was ordered, with which readings were taken from the potential wires, the latter all being brought to mercury cups on a testing table near which the ammeters were also located.

Preliminary tests were made with a small current in order to establish the individual resistance of the 11-ft. sections between the potential wires; this current was then gradually increased and more readings taken together with thermometer readings from thermometers having their bulbs in contact with the pipe at an angle of about 30 degs., the stems projecting through the covering. From these readings a coefficient of .4694 per cent increase of resistance per degree Centigrade was determined, and afterward used in determining temperatures of the various sections. At first it was thought that temperatures could be determined with sufficient accuracy by the thermometers, inserted as above described in the center of each section covered, but, after a preliminary series of readings this was abandoned as inaccurate, owing, no doubt, to the variable contact made by the bulb on the bare pipe. All temperatures were, therefore, calculated by the resistance method.

Current sufficient to heat the pipe to approximately 370 degs. F. (corresponding to a steam-gage pressure of 160 lbs.) was kept on for three days continuously, in order to dry out the various coverings, after which they were allowed to cool off to the air temperature before starting the test. The temperature of the room was kept between 27 degs. C. and 31 degs. C. during the entire test, each section had about 600 readings taken, and where any doubt existed in reference to readings, the entire series was gone over a second and third time with the gratifying result that it was conclusively shown that the test could be repeated with a variation of results not exceeding 2 per cent.

The method of test was to put a current of sufficient quantity through the pipe to heat it to say 220 degs. F., and keep this current on for a sufficient time to enable all sections to maintain a constant temperature (this period was found to be about ten hours) when readings of the milli-voltmeter were taken on each section with simultaneous ammeter readings. As all the sections were in series electrically, the current was, of course, the

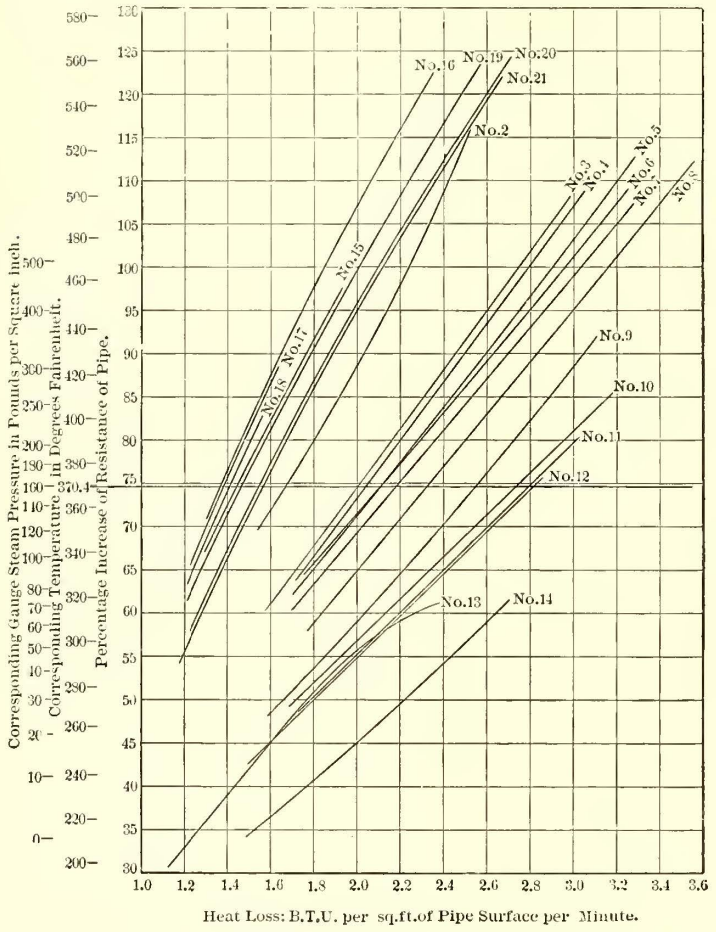
* Abstract of a paper by H. G. Stott read before the twenty-third convention of the Association of Edison Illuminating Companies, held at Mount Washington, N. H., Sept. 9, 10 and 11, 1902.

same, so that no error could arise, due to variation of current.

The object of leaving 2 ft. at the end of each section, or 4 ft. between potential wires, was to avoid any error due to conduction of heat through the pipe. Tests were made to prove the efficiency of this precaution, and showed that no perceptible error was introduced.

A constant temperature having been obtained, it is evident that the watts lost in each section give an exact measure of the energy lost in maintaining a constant temperature, and from the watts lost the thermal units are readily calculated. Fig. 2 shows the result of the test values being reduced to loss in B. T. U. per square foot of pipe surface at various temperatures in the curves, and at a temperature corresponding to steam at 160 lbs. pressure in the table.

After a series of readings had been completed, the current was raised sufficiently to give approximately 50 degs. F. rise in the



G. 2.—HEAT LOSSES AT VARIOUS TEMPERATURES

least efficient covering, and maintained constant for ten hours, when another series of readings were taken, and so on until the temperature of the pipe had reached a point far above anything used in practice. The extremely high readings were taken as a matter of interest, as they were gotten when the low efficiency coverings were only at working temperatures.

The first column in Table I refers to the number of the curves in Fig. 2. The second column gives the name of the covering which, in most cases, is sufficiently descriptive, but a brief description of each covering may be of interest.

No. 2. Solid sectional covering 1½ ins. thick, composed of granulated cork moulded under pressure, and then baked at a temperature of 500 degs. F., ⅛-in. asbestos paper next pipe, finished with resin paper and 8-ounce canvas.

No. 3. Solid 1-in. moulded sectional covering, composed of 85 per cent carbonate of magnesia, finished with resin paper and 8-ounce canvas.

No. 4. Solid 1-in. sectional covering, composed of granulated cork moulded under pressure and baked at a temperature of 500 degs. F., ⅛-in. asbestos paper next pipe, finished with resin paper and 8-ounce canvas.

No. 5. Solid 1-in. moulded sectional covering, composed of 85 per cent carbonate of magnesia. Outside of sections covered with canvas pasted on. Finished with resin paper and 8-ounce canvas.

No. 6. Laminated 1-in. sectional covering, composed of nine layers of asbestos paper with granulated cork in between; outside of sections covered with canvas pasted on, ⅛-in. asbestos paper next pipe, finished with resin paper and 8-ounce canvas.

No. 7. Solid 1-in. moulded sectional covering, composed of 85 per cent carbonate of magnesia, outside of sections covered with light canvas pasted on; finished with resin paper and 8-ounce canvas.

No. 8. Laminated 1-in. sectional covering, composed of seven layers of asbestos paper indented with ¼-in. square indentations, which serve to keep the asbestos layers from coming in close contact with one another; ⅛-in. asbestos paper placed next pipe, finished with resin paper and canvas.

No. 9. Laminated 1-in. sectional covering composed of sixty-four layers of asbestos paper, in which were embedded small pieces of sponge. Outside covered with canvas pasted on, finished with resin paper and canvas.

No. 10. Laminated 1½-in. sectional covering composed of twelve plain layers of asbestos paper, with corrugated layers in between, thus forming longitudinal air cells; ⅛-in. asbestos paper next pipe; sections wired on and finished with resin paper and 8-ounce canvas.

No. 11. Laminated 1-in. sectional covering, composed of eight layers of asbestos paper with corrugated layers in between, the corrugations forming small air ducts radially around the covering; finished with resin paper and 8-ounce canvas.

No. 12. Laminated 1¼-in. sectional covering, composed of six layers of asbestos paper with corrugated layers, forming longitudinal air cells; outside of sections covered with two layers of canvas pasted on and finished with resin paper and canvas.

No. 13. Solid 1-in. moulded sectional covering, composed of a magnesia compound mostly talc; ⅛-in. asbestos paper next pipe; finished with resin paper, and 8-ounce canvas. This sample was submitted for low temperature work only, such as boiler feed and drips.

No. 14. Solid 1-in. moulded sectional covering, composed of magnesian compound, principally talcfi ⅛-in. layer of asbestos paper next pipe, and finished with resin paper and 8-ounce canvas.

No. 15. "Remanit," composed of two layers wound in reverse direction with ropes of carbonized silk. Inner layer 2½ ins. wide, and ½-in. thick; outer layer 2 ins. wide and ¾-in. thick, over which was wound a net work of fine wire; ⅛-in. asbestos next pipe, finished with resin paper and 8-ounce canvas. Made in Germany.

No. 16. Two and one-half-inch convering, composed of 85 per cent carbonate of magnesia, ½-in. blocks about 3 ins. wide and 18 ins. long next pipe and wired on; over these blocks were placed solid 2-in. moulded sectional covering; outside covered with canvas pasted on. Finished with 8-ounce canvas.

No. 17. Two and one-half-inch covering, composed of 85 per cent. magnesia. Put on in a 2-in. moulded section wired on; next the pipe and over this a ½-in. layer of magnesia plaster covered with canvas pasted on and finished with 8-ounce canvas.

No. 18. Two and one-half-inch covering, composed of 85 per cent carbonate of magnesia. Put on in two solid 1-in. moulded sections with ½-in. layer of magnesia plaster between; two 1-in. coverings wired on and placed so as to break joints. Finished with 8-ounce canvas.

No. 19. Two-inch covering, composed of 85 per cent carbonate of magnesia put on in two 1-in. layers so placed as to break joints and finished with 8-ounce canvas.

No. 20. Solid 2-in. moulded sectional covering, composed of 85 per cent magnesia; outside of sections covered with canvas pasted on. Finished with 8-ounce canvas.

No. 21. Solid 2-in. moulded sectional covering, composed of 85 per cent magnesia; outside of sections covered with canvas pasted on. Finished with 8-ounce canvas.

Nos. 2, 4, 6 and 15 were excluded by the specifications, which stated that "no inflammable material would be considered," but a test was made at the request of the manufacturers in order to give a comparison with the other materials.

It will be noted that two samples covered with the same thickness of similar material give different results; for example, Nos. 3 and 5 and also Nos. 20 and 21, though of practically equal thickness, show quite a perceptible difference in loss per square foot. Upon investigation, the cause of this difference was found to be in the care with which the joints between sections were made. A comparison between Nos. 19 and 20, showing two coverings having exactly the same total thickness, but one applied in a solid 2-in. section, and the other in two 1-in. sections, proved the desirability of breaking joints.

An attempt was made to determine the law governing the effect of increasing the thickness of the insulating material, and for all the 85 per cent magnesia coverings the efficiency varied directly as the square root of the thickness, but the other materials tested

did not follow this simple law closely, each one involving a different constant.

The fifth column of Table I shows the percentage of heat saved by the different coverings, compared to bare pipe, at a pressure of 160 lbs.

In Table II an attempt has been made to reduce all coverings to the same thickness, and thus show the relative efficiency of different types of material at a wide range of pressures. One-inch covering was adopted as the standard, and only those coverings nearly 1⅛ ins. thick were used in the comparison, in order to avoid errors in calculating the losses in materials which did not follow the square root law closely.

An inspection of the table shows that the carbonized silk covering is the most efficient, having a relative efficiency of 86.9, while 85 per cent magnesia comes second with 84.2 per cent. efficiency. The two other samples of 85 per cent magnesia show efficiencies of 83.1 and 83.2 per cent, thus confirming in a remarkable way the results on the other samples.

RELATION TO STATION ECONOMY

To determine which covering is the most economical the following quantities must be considered:

1st. Investment in covering. 2d. Cost of coal required to supply lost heat. 3d. Five per cent interest on capital invested in boilers the stokers rendered idle through having to supply lost heat. 4th. Guaranteed life of covering. 5th. Thickness of covering.

From an inspection of the first three quantities it is apparent that the covering which shows a minimum total cost of the three at the end of a specified time is the best covering to adopt, for the loss in heat at the end of ten years may readily cost over three times as much as the first cost of covering. To enable this to be seen more clearly Table III was calculated.

TABLE I.—RESULTS SECURED IN TEST

	Covering	Aver. Thick Inch	B. T. U. Loss per sq. ft. at 160 lbs. Pr.	P. C. Heat Saved by Covering
2.	Solid cork: Sectional	1.68	1.672	87.1
3.	Eighty-five per cent magnesia: Sectional	1.18	2.008	84.5
4.	Solid cork: Sectional	1.26	2.048	84.2
5.	Eighty-five per cent magnesia: Sectional	1.19	2.130	83.6
6.	Laminated asbesto cork: Sectional	1.43	2.123	83.7
7.	Eighty-five per cent magnesia: Sectional	1.12	2.190	83.2
8.	Asbestos air cell [indent]: Sectional [imperial]	1.26	2.333	82.1
9.	Asbestos sponge, felted: Sectional	1.24	2.556	80.3
10.	Asbestos air cell [long]: Sectional	1.70	2.750	78.8
11.	"Asbestocel" [radial]: Sectional	1.22	2.801	78.5
12.	Asbestos air cell [long]: Sectional	1.29	2.812	78.4
13.	"Standard" magnesia: Sectional	1.12	....	....
14.	"Magnesian:" Sectional	1.23	....	....
15.	"Remanit" [silk]: Wrapped	1.51	1.452	88.8
16.	Eighty-five per cent magnesia: 2" Sectional and ½" block	2.71	1.381	89.4
17.	Eighty-five per cent magnesia: 2" Sectional and ½" plaster	2.45	1.387	89.3
18.	Eighty-five per cent magnesia: 2-1" Sectional and ½" plaster	2.50	1.412	89.1
19.	Eighty-five per cent magnesia: 2-1" Sectional	2.24	1.465	88.7
20.	Eighty-five per cent magnesia: 2" Sectional	2.24	1.555	88.0
21.	Eighty-five per cent magnesia: 2" Sectional	2.21	1.568	87.9
	Bare pipe [from outside tests]		13.000	

TABLE II.—RESULTS REDUCED TO COVERINGS WITH A STANDARD THICKNESS OF 1 IN.

	Covering	B. T. U. Loss per sq. ft. at 160 lbs. Pr.	P. C. Heat Saved by Covering
3.	Eighty-five per cent magnesia: Sectional	2.060	84.2
4.	Solid cork: Sectional	2.170	83.3
5.	Eighty-five per cent magnesia: Sectional	2.192	83.1
6.	Laminated asbesto cork: Sectional	2.395	81.6
7.	Eighty-five per cent magnesia: Sectional	2.184	83.2
8.	Asbestos air cell [indented]: Sectional ["imperial"]	2.465	81.0
9.	Asbestos sponge, felted: Sectional	2.683	79.4
10.	Asbestos air cell [long]: Sectional	3.380	74.0
11.	"Asbestocel" [radial]: Sectional	2.920	77.5
12.	Asbestos air cell [long]: Sectional	3.015	76.8
13.	"Standard" magnesia: Sectional	....	....
14.	"Magnesian:" Sectional	....	....
15.	"Remanit" [carbonized silk] wrapped	1.708	86.9
	Bare pipe [from outside tests]	13.000	....

An inspection of the curves showed that before deciding upon what is the most economical thickness of covering to be used, it is first of all necessary to know how long the covering is expected to last. For example, suppose that a temporary plant is being erected which is not likely to be required for more than two years, a 1-in. covering will be the most economical. For covering guaranteed for ten years, as required by the Manhattan Railway Company, 1-in. covering would show a total cost of $53,663, whilst a 3-in. covering would show a total cost of $38,668, making a net saving of $14,995 at the end of ten years, or $1,499.50 per annum, which, capitalized at 5 per cent, represents $29,990.

From the above example it will be seen that while pipe covering is a relatively small portion of the many problems confronting the engineer, yet its scientific solution will yield rich results out of all proportion to the time required to solve it.

I would only add that there seems to be no reason for the former practice of putting on different thickness of covering on different sized pipes, excepting the mechanical difficulty of applying a very heavy covering to a small pipe. This difficulty can be overcome by putting the covering on in two separate layers, and this plan should be used on all sizes in order that the joints may be broken, as poor joints may reduce the efficiency of the best covering 6 per cent or more.

TABLE III—TOTAL EXPENSE.—COST OF COVERING AND HEAT LOSS

		$10,000		$20,000		$30,000		$40,000		$50,000		$60,000	
Thickness	First Cost	Per Cent 1st Cost	Per Cent Loss	Per Cent 1st Cost	Per Cent Loss	Per Cent 1st Cost	Per Cent Loss	Per Cent 1st Cost	Per Cent Loss	Per Cent 1st Cost	Per Cent Loss	Per Cent 1st Cost	Per Cent Loss
1.25"	$5,550	55.5	44.5	27.8	72.2	18.5	81.5	13.9	86.1	11.1	88.9	9.3	90.7
2.00"	7,880	78.8	21.2	39.4	60.6	26.3	73.7	19.7	80.3	15.8	84.2	13.1	86.9
2.50"	8,660	86.6	13.4	43.3	56.7	28.9	71.1	21.7	78.3	17.3	82.7	14.4	85.6
3.00"	9,550	95.5	4.5	47.8	52.2	31.8	68.2	23.9	76.1	19.1	80.9	15.9	84.1

A specific number of square feet of pipe surface has been used in working out the total cost, but it is evident that the curves may be used to determine the most economical thickness of covering, irrespective of the total amount of surface to be covered, as long as the cost per square foot of material for different thicknesses varies in the same manner as for 85 per cent magnesia, which has been used in calculating the accompanying tables.

As the geometrical dimensions of the covering are a function of the cost of the increased thickness desired, it will generally be found that increasing the thickness of the material will increase the investment in as was shown in the curves for 85 per cent carbonate of magnesia.

Manhattan Leased by Subway Company

The activity in Manhattan stock, which has attracted so much attention during the last two weeks, is now explained by the official announcement, issued on Wednesday afternoon, that the Interborough Rapid Transit Company will lease the Manhattan on a basis of a 7 per cent dividend guarantee of the latter company's stock by the former.

The lease was authorized Wednesday at meetings of the boards of directors of both companies, the general proposition for such action being approved by both boards of directors. The details of the lease are to be worked out by the officers, under advice of counsel, and the completed document will be submitted for approval to the directors and to the stockholders. The lease will take effect on April 1, 1903, and will be for 999 years. It will cover all the franchises and property of the Manhattan Railway Company. The rental from April 1, 1903, to Jan. 1, 1906, will be the net earnings of the Manhattan Company, not exceeding 7 per cent.

After Jan. 1, 1906, the rental will be 7 per cent per annum on the stock of the Manhattan Railway Company guaranteed by the Interborough Rapid Transit Company. The Manhattan Railway Company stock is to be increased at once to $55,200,000, for the purpose of completing improvements already planned; the present stockholders of the Manhattan Railway Company to have the privilege of taking the new stock pro rata at par.

Provision is to be made in the lease for the ultimate increase of Manhattan stock to the total amount of $60,000,000, including outstanding stock, and due provision is to be made for the application of the proceeds of the sale of the increased stock to the further improvement of the Manhattan property.

The Interborough Company will pay $10,000 per annum to keep up the organization of the Manhattan Company, in addition to the dividend rental which shall be paid to the stockholders, and the Manhattan stock will be stamped with a contract of the Interborough Company to this effect. The lease will provide security satisfactory to the Manhattan Company for the payment of the dividend rental.

The present capital stock of the Manhattan Railway Company is $48,000,000 and the increase of $7,200,000 to $55,200,000, therefore, represents an increase of about 16 per cent. Investors estimated that the rights to subscribe would be worth about 7. The bonded indebtedness of the Manhattan Company amounts to $39,883,000.

Statements were given out by Alfred Skitt, representing the Manhattan interests, and August Belmont for the subway owners, embodying the facts here summarized. Mr. Belmen said in part:

"It is believed that this plan, when perfected, will work out a prompt and satisfactory system of interborough transit, both lessor and lessee being thereby engaged in a common effort to stimulate, increase and develop facilities for transportation rather than—as would have been the case if the properties had remained separate—being engaged largely in the effort to divert traffic the one from the other.

"It is not intended by this arrangement that any of the plans for the development of the Interborough system shall be interrupted or departed from. In the meanwhile, however, before these extensions can be completed, the two systems will work in harmony. Nor is it intended to dispense with any additions which are desirable for the Manhattan property. The proposed authorized, but unissued, increase of capital stock of that company beyond the $55,200,000 up to $60,000,000, an important part of the plan, has been provided for to that end.

"It is impossible in any brief statement to give in detail the advantages which—as the negotiations for a lease have progressed—have appealed to those who will be practically identified with the management of the united system, but these advantages affect both economy of operation and convenience of public traffic. As I have said, however, in coming to the conclusion arrived at, it has been considered by the directors of the Interborough Company that they were not alone charged with the duty of caring for the best interests of the stockholders, but also that they carried the responsibility of the management and development of a quasi-municipal enterprise, and they have come to this decision with the conviction that they were acting for the best interests of the city and the traveling public both for the present and the future."

Further details are promised in a later statement to be issued upon the completion of details.

Equipment and Organization for Properly Handling Snow Storms*

BY J. F. CONWAY

A street railway company should begin preparations for its war with the elements while there is peace. At the close of the summer season we should go over all lines and have them carefully inspected. This inspection should include the poles, trolley wires, especially on all curves, and the roadway. All catch basins should be cleaned out, and all waterways, both the natural and the artificial, should be opened for the reception of surface water. If an extended line is to be gone over I would offer as a suggestion that all natural waterways be opened first, as they can more readily be located at this time, while the artificial ones are generally well known to the employees, whose duty it is to look after this kind of work.

Trackmen under a capable foreman should be employed to go over the lines for the purpose of inspection and preparing for the safe operation of plows. All stones that have fallen by the roadway should be removed to avoid the danger of breaking a shear or wing when a plow is running with wings out, and also to eliminate to a certain extent the liability of derailments. All high places, both in between the tracks and on the brows, should be removed and carried away.

In this connection it is a good plan to take a plow that cuts close to the rail, immediately after a rain storm in the early fall, while the ground is soft, and run it carefully over some of the suburban lines. By so doing you will remove many high places that might later give you trouble. It also helps to shape the brow so that when you run out on the first storm your plow will not give you the difficulty you otherwise might have.

Guard rails should be thoroughly inspected, so that no ends may be left to catch the nose, shear or digger and thus cause a derailment at a time when it might cost the tying up of a line. Bolted guards should be cut so that a plow or snow-scraper attached to a car could easily pass over without fear of catching and breaking. Where T-rail is used as a guard at the entrance of switches, or at protected ends of turnouts, it should be put in with the ends bent down and never left with a square end. On sections of track where there is a loam top dressing and a clay bottom, the matter of proper drainage becomes an important factor. In properly placing such a line in a safe and passable condition for the winter, it appears to me best to keep this top down below the top of the rail and provide the very best of drainage possible under the conditions. Water will get in between this top and the clay during a winter storm, and will result in no end of trouble and bother, such as the dragging of motors and gear cases, making it impossible for a plow to get the middle low enough for cars to pass over; especially is this true if the car following has a 30-in. wheel. Care should be used to protect the snow-scrapers on the cars and remove everything that would have a tendency to break or disable a scraper or hanger of the plow. No doubt many men connected with the operating of lines have difficulties to overcome in trying to get cars through when snow is drifting badly, simply because a snow-scraper hanger has been broken either by carelessness on the part of the crew backing a car before lifting the scraper, or by sudden contact with some hidden object. Small as this matter may appear in itself, it has caused many an anxious telephone call trying to locate a belated car and serious inconvenience in properly running plows at a critical period of the storm.

Proper drainage of the roadway is a matter which I think is beginning to get more attention than in years gone by, but it is a part that if well attended to will go far towards maintaining a safe and durable roadbed. City lines should be inspected to remove or replace paving that might be destructive to the equipment of the cars and plows.

Many of us can remember the old horse plows and track sanding devices of horse-car days, when it was necessary to have a man driving the plow who could handle as many horses as it was necessary to hitch on, and when it was absolutely necessary to have enough men on the plow to turn it around at the terminus of the line.

The manner of operating and the type of plow has changed so that the class of men who could successfully run a plow a few years ago would in many cases not be fitted to take out on the road the heavy and ponderous plows of the present time.

For single-track lines on suburban and interurban roads the nose plow is, in my judgment, best adapted to the work, especially where the track is located on the side of the roadway, and I prefer a shear plow for work on double track. The snow plow commonly used is, of course, the single truck, with usually as many types of trucks as there are firms that manufacture plows. It has always appeared to me a mistake on the part of the purchasers to allow this condition of affairs. It would be better if all street railway companies would standardize their snow equipment just as much as possible and avoid the necessity of carrying a large stock of duplicate parts, which certainly must prove very unsatisfactory. I am much in favor of a double truck and four-motor equipment for plows, constructed on lines that will not make them too heavy for the rail or too wide for safely passing cars waiting on sidings or on double track, when there are but 4 ft. between rails. Less trouble would be experienced with plows of this character binding in curves and riding off the rail than there is with the single-truck plow, and they would prove stronger, and better work would be accomplished. Plows of this character could be constructed so that the man operating them could be in a compartment by himself. This compartment could possibly be built out over the nose or shear so that he could look at either side of his plow and know at all times what his plow is doing, and at the same time be where he could direct those working under him. Whatever the type of plow, I am of the opinion that it should be fitted with a durable and convenient type of leveler for carrying the snow away from the rail and for leveling along the streets.

It would appear that sufficient attention had not been given to the matter of developing a suitable hand or power brake for the protection of the man who has the responsibility of running plows of the various types through the streets; especially is this true before and after storms. My experience has taught that there is far more liability to accident before and after a storm than during one.

It would appear good policy for street railways to investigate the matter of equipping all plows with a power brake. The necessity for them is as apparent on city as on suburban and interurban lines. Just how they could be placed and suitably protected from the water and snow as plows are at present constructed, is a matter that would require considerable thought and study. However, I am satisfied that our master mechanics could devise some way that would be feasible should they work from the text, "Necessity is the mother of invention." Personally, I consider it a matter worthy of the thought of all men connected with the operation of a road. It is indeed a pleasure after a long and hard

* Paper read at meeting of New England Street Railway Club, Nov. 25.

storm to get to the end of the line and decide it's all over, pick up to return to the house, and hear the foremen say: "We will follow the next regular in." It is at these times that he has not the snow to hold him and he must depend on the brake to steady his plow when passing teams and timid drivers are met on the road.

Plows should be furnished with some kind of an inside gage to indicate to the man running it the distance the shear or nose is from the rail. By this method injury to the plow is less liable to occur, as the man in charge can at any time determine just how far the nose is from the rail, and thus avoid the breaking of castings, etc., by sudden contact with any hard substance. It is also important that a serviceable digger and a convenient attachment for operating it should be on all plows, for very often the success of a plow is dependent on the proper operating of a scraper or digger.

Another matter which has always appeared to me as having been at times overlooked, is the equipment of a plow with a gong of proper size and so placed as to make it convenient to operate. There are times when running through a severe, blowing and drifting storm, that much depends on a proper sounding gong. A foot gong, operated by the old-fashioned plunger or tapper is not very desirable. While it is intended to add to safety it in reality adds to the liability of an avoidable accident. I say avoidable because it appears to me that a tapper should never be operated by foot power, but should be arranged so that any man in the plow could ring the gong, provided the man at the handles, at a critical moment, should be busy looking at his shear.

Gongs should never be placed under a plow, but in front and outside. By so doing you lessen the possibility of placing it where the sound becomes smothered. Gongs operated by battery are used, and are thought by some to be very desirable, but when this is not thought advisable I suggest that a clear-sounding gong could be successfully handled with a pull-strap, conveniently placed.

Precaution and good management would appear to warrant that all plows used on suburban or interurban work be supplied with an extra trolley pole and wheel, that can be used in case of disability of either of those with which the car starts.

It is also desirable to carry on plows used on suburban and interurban lines, where there is liability of accidental derailments, two good lifting jacks. It will also prove convenient if such plows are constructed with some provision made for lifting them bodily by providing a beam in the framing or channel-bar extending outside the plow body for this purpose. What is more annoying to the men in charge than in trying to locate a place to work a jack, when a plow drops off the rail, especially in a soft or awkward place.

During a severe storm, when plows are all out, I do not advise trying to maintain a regular schedule, as many lines are limited for power at these times. It is advisable on outside lines to drop off some of the regular cars, and give the plows the benefit of good power, and free the lines of any unnecessary delay, which is often caused by trying to run the regular schedule.

Serrated wheels are used by some roads on plows and cars, and are considered by some a success. The claim is made that they crack and break the ice on the rail and give better contact. As to whether the final results are better than when using the plain wheel is a matter that appears to me debatable. As I have not had experience enough to warrant an opinion I will leave this matter to your consideration and discussion.

A plow to give the best results would appear to be one whose nose and shear can be operated and placed in position at will, and whose action does not depend upon gravity. The best type of motors for a plow is a debatable question, and I will pass that by, saying that the motor should, I think, be of sufficient capacity to carry the plow with load, and also capable of standing severe strain. We have used a number of types and have had very good success with some of them, but as to which is best for plow service is largely a matter of fancy.

All plows should be fitted with a standard coupling and drawbar, to correspond to the equipment it is to be among, so that a plow can be hitched to any disabled or stalled car and assist it out of difficulty. It should be the aim of all systems to standardize this part of their equipment.

Previous to a storm, and, in fact, when plows are ready for the winter, they should be assigned to a particular line and a particular section of that line, as I am of the opinion that all work of this character can be better taken care of if the man assigned to a plow thoroughly understands how much he is supposed to look after, and can make a study of the line for any little defect that may be apparent to him.

A foreman should be appointed for each plow, and notified by personal conversation of what he is expected to do in regard to keeping his particular section open for the operating of cars.

It is very essential that you have confidence in your man and that he has confidence in you. When the section assigned to him to look after is known to him don't tie his hands as regards to hiring as much help as is needed to properly care for his track. It has been one of my plans to give to a foreman a time-book when he starts out on a storm, with instructions that if he finds that he should have more men on certain lines to properly care for the track, to hire them and turn the time in to me when he comes in. I also supply them with a number of metallic time checks, on which is stamped a number. When a man is hired a check is given to him. We pay no attention to names, simply pay for this number to whomever presents it. When working a gang of men of any considerable number we simply appoint a time-keeper from among the car men, who, when the men start in to work, passes along the line and takes the record of the check numbers. This is done three times a day, except in case of a large number of men cleaning out a line, when the time is checked six times a day. Time-keepers are kept busy the remainder of the time pushing the work along. In case a man is found loafing we usually speak to him once, if the man does not appear to intend to work he is immediately dropped from the gang, as he is a hindrance to the others.

Plows going out at night should always be provided with an oil headlight, especially if the plow is going on out-of-town lines. This is often found to be an important part of the equipment, in case of accidental derailment or other reasons, when it might be necessary and important for a man to be able to see ahead or under his plow.

A car replacer should be made a part of the equipment of the plow, which should also include a short piece of tram rail, which many times is of great assistance to men should the plow drop off the rail where the ground is soft.

I do not recommend that car-men be instructed to remove trolley wheels and run the car on the trolley harp during a sleet or ice storm, but many times by doing this a line can be successfully operated during bad sleet or frost ice. If this is permitted men should be thoroughly instructed in regard to the danger attached, and given positive instructions always to watch trolley closely when passing around sharp curves and over special overhead construction.

I am strongly in favor of some kind of sleet-cutting device for the trolley, that can either be put on in place of the wheel or that can readily and quickly be clamped on over the wheel. Personally, I prefer the latter, as it can more quickly be put into service and more quickly removed when the necessity for its use is past. There is something of this kind on the market, and perhaps some of the gentlemen present can give us information as to its use.

It is, I think, well and prudent to arrange on suburban lines a plan of sub-stations for supply of sand and salt for use during a storm, but stations of this character should not be drawn from except in case of necessity. It has been a custom with me to place at convenient places out on the lines barrels filled with salt and sand for this purpose, mixed in the proportion of about half and half. I do not advise the use of clear salt except in cases of switches and special work. When running plows, if it is necessary to cut the ice, a mixture of sand and salt at the ratio of two of sand to one of salt, will, unless the storm be of a very peculiar character, give the best results. When sand and salt are mixed the sand has a tendency to stick to the rail, and thus hold the salt on the rail, where it can act directly on the ice. The mixture also gives the plow better traction, as clear salt dropped through a spout or hopper does not stay on a clear rail or on a rail covered with ice, and it is wasteful if not used under the direction of practical and experienced men. It is not the amount of salt used during a storm that helps most, but the placing of that used where it will have the desired effect.

I have never had much experience in the use of snow fences, but from observation I am very much in favor of them. There seems to be quite a diversity of opinion as to what style of fence is best adapted to protect exposed points from becoming packed by drifts. A very simple and cheap fence can be constructed by putting posts into the ground at a sufficient depth to insure stability and simply construct a board fence, not less than 50 ft. from the part of the track you wish to protect. Still, a portable fence built so that it can readily be moved to any location desired, is a very convenient thing to have, and gives, I am informed by those who have used them, very good results.

Many times, when bothered by drifts that are a continual nuisance, it becomes necessary to put on men with shovels, and many times this labor amounts to but little, unless directed by someone in authority. Much labor can at times be saved if the men shovel all snow with the wind, rather than against it, as in many cases men will do. By so doing you will many times cause the drift to form on the opposite side of the street. If the drift

be a deep one and your rail is continually being buried, put your shovelers back on the drift and build up a wind-break, which will many times save you much labor and annoyance, even after the storm has stopped.

I have never had any personal experience with the rotary plow; they do not appear to me, however, as practical, safe or economical for constant use. They are, nevertheless, a very convenient apparatus for cleaning out a line when drifted badly, or when the snow becomes crusted, and with suitable motors and sufficient power it would appear an utter impossibility to stall such a plow in a snow storm. From observation, I believe rotary plows should be mounted on double trucks and equipped with four motors. Such a plow would be more satisfactory in rounding many short curves than a machine of its weight on a single truck and 7-ft. wheel base. A street railway that has many miles of suburban and interurban lines could ill afford to be without a good rotary plow among its snow equipment, for in one bad storm five men could save the company many dollars that now have to be paid out for men and shovels. On long and exposed lines, where the roadbed is sufficiently strong to hold them (for I am informed many of them weigh from 17 tons to 20 tons) they can be successfully operated, but should always be followed by the plow to wing out and cut down between rails, as some of them do not cut close enough to the rail to avoid the liability of hanging up the car following. I am told there is one good quality in a rotary plow, and that is it can fight or it can run at any time, it can advance or retreat at will, for should you find the snow getting in behind all that is necessary is to set the fan at the rear end in motion and run back. One gentleman told me he had run his rotary through a drift 127 ft. long and 7 ft. deep in seven and one-half minutes. When I mentioned that there must have been a good draught to the chimney, he honestly informed me that the funnel could be shifted at will.

In arranging your plans for winter storms you should always have the foreman's address at the office; see, too, that your car house man knows where the foreman lives. I always have my plowmen let me know if they are going out of town and if they will be back in case of storm. I also intend to know just where their house is, and also in what part of the house they sleep. This method will assist, to a great degree, when in the night it becomes necessary to call them. Having made this preparation, stand by your guns, ready to do battle with the elements. When it begins to snow get a move on quickly, put your plows out early. It is much easier to pull in plows that went out early than to pull plows out after storm has got the best of you.

If the foreman does his work and does it well, tell him so, it will have a tendency to encourage him to do even better. Never ask a man to do an impossibility, and above all never ask a man to do a thing you could not do yourself. Be firm and decided in the way you give your instructions, but do not get harsh with the men. It does not pay, and the old adage, "You can get more flies with molasses than with vinegar," will be equally true in a storm, and you are more likely to keep your lines open if your men can be made to feel that what they do is appreciated by their superintendent.

The fact that you are superintendent of the road and he is foreman of a plow makes no less a man of him, and you are in no manner his superior when man to man. The fact that you are superintendent and occupying a position of more responsibility is not of necessity evidence of lack of ability on his part; it may be that he has never had your opportunity.

During a storm, when possible to do so, get out among your plowmen, put on your fighting togs and ride a trip, encourage them by your presence, give them to understand that this work is no boy's play, but a work of necessity and emergency. Be careful to feed your men working on plows, tell them to get plenty of good food if they are where you can't get to them. Don't go home and get a hot dinner yourself and bring him a cold sandwich. Get into the game, so to speak, and if sandwich is to be his lunch let sandwich be your lunch. Experience has taught me that men notice this, and unless you are guarded they lose interest in their work.

I cannot give definite suggestions as to how to attack a storm; conditions will govern this matter to a great extent. Condition of rail and nature of storm will cause you to come to some decision, and no doubt will need no hurrying in the matter. I plan, however, at the beginning of a storm to have all special work and switch points salted first.

I do not allow the use of liquor on plow work. I know there is quite a tendency on the part of car-men to think they must have something of this kind when out in a bad, cold storm, and for this reason have always instructed my men to never allow it on the plow.

I don't know whether that Pennsylvania weather prophet has killed his goose yet and examined the breast bone for spots. He says he can tell what is in store for the winter storms, etc. Let us hope he did not find *snow*.

At the commencement of the Civil War, after Massachusetts troops had been attacked in the streets of Baltimore, and excitement was running high, and when more or less timid ones had formed a committee to wait on the President to give their advice and ask that no more troops be sent through the city, the first question the President asked was, "What, gentlemen, do you advise?" A canal was mentioned, a water trip, etc., and after listening, in a very quiet way, President Lincoln turned to the committee and said, "I thank you very much for your advice, gentlemen, but as there are no tunnels to go under Baltimore, and no railroads around it, and as the men can't jump or fly over it, I shall continue to march Massachusetts troops through the city."

Now the lesson to be derived is, don't dodge responsibility, don't try to get around it, don't attempt to dig under it, but stand on two feet, face the front and march through it. Electricity without work is harmless, it is when you give it something to do that it stings you. A small amount of snow does no harm, it's the heavy storms that we get out on and sting, and face and overcome that causes a good, big smile when it's all over.

Jim Crow Law Unconstitutional

The criminal proceeding instituted against the officers of the New Orleans Railways Company under the Jim Crow law have been dismissed, and the statute declared unconstitutional. On Nov. 19, when the case was called for trial, the attorneys for the company entered a demurer, claiming the unconstitutionality of the act on two grounds. First, it was claimed that none but judicial officers had the right to decide whether a person was a negro, and, second, the law failed to fix the maximum penalty for a violation, having only the minimum penalty fixed in the act, which was contrary to Act 155 of the Constitution.

The objections were detailed in brief from which the following specifications are quoted:

First.—The said statute, in the first and second sections thereof, seeks to delegate to the officers of street railway companies carrying passengers in their cars in this State the power and duty of determining and declaring the races to which the various passengers belong, and (by reason of such decision) of assigning each to one of the seats set apart for the race to which he is found to belong, all of which is a violation of the provision of the Constitution vesting the judicial power of the State in a Supreme Court, in Courts of Appeals, in District Courts, in Justices of the Peace, and in such other courts as are therein provided for, and also in this regard of the express prohibition contained in Article 96 of said Constitution against conferring judicial powers, except as committing magistrates, upon any officers other than those hereinbefore mentioned, or such as may be necessary in towns and cities, for the enforcement of municipal ordinances.

Second.—The General Assembly of the State, in respect of the offenses sought to be denounced and punished by the third section of the said statute (including the specific offenses in the affidavit herein alleged against the said H. H. Pearson, Jr., which is declared to be a mere misdemeanor) has not undertaken to fix maximum and minimum penalties as required by Article 155 of the Constitution.

And for further reason why he is not required by the law of the land to answer the charge in the said affidavits specified, the said H. H. Pearson, Jr., also says that the penalties fixed in the said Section 3 of Act 64 of 1902, for violations of its provisions by officers of the railway companies are so uncertain, indefinite and indeterminate that the said section is susceptible of being carried into execution, and does not permit any satisfactory determination as to the court vested with jurisdiction for the trial of offenses against its provisions.

Judge Aucoin rendered his decision, maintaining the demurrer, and ordering the affidavits dismissed.

Assistant District-Attorney Ferguson, who was present for the State, will give notice of an appeal and the constitutionality of the new law will be finally decided from the Supreme Bench.

Forty-Sixth Meeting of the American Society of Mechanical Engineers

The forty-sixth meeting of the American Society of Mechanical Engineers will be held in New York from Dec. 2 to 5. The headquarters of the society are at No. 12 West Thirty-First Street, where professional sessions will be held on Tuesday and Friday. On Wednesday and Thursday sessions will be held in the Sturtevant House banquet room.

The convention will be opened at 8:30 p. m. on Tuesday evening, Dec. 2. As the president of the society, Edwin H. Reynolds, is unfortunately ill and not able to be present, a paper, by Sidney A. Reeve, on "A Rational Solution of the Problem of Weights and Measures," will be taken up for discussion.

The second session will be held at the Sturtevant House on Wednesday morning, Dec. 3, at 10 o'clock. Reports of council, tellers and of committees, standing and special, will be received, and action on the proposed amendments to the rules will be taken at this session, also any new or general business outside of the professional papers.

Until the hour of adjournment after the executive business has been concluded papers will be taken up as follows: "The Metric System," by F. A. Halsey; "Entropy Analysis of the Otto Cycle," by S. A. Reeve.

Wednesday afternoon and Friday afternoon are left without definite assignment.

At the third session, to be held on Wednesday evening, at 8:15 o'clock, the following papers will be considered: "Apparatus for Obtaining a Continuous Record of the Position of an Engine Governor," by J. C. Riley; "Fly-Wheel Capacity for Engine-Driven Alternators," by W. L. Slichter; "Heat Resistance the Reciprocal of Heat Conductivity," by William Kent. There will also be topical discussions on "Smoke Consumption," "Elastic Resistance," "Oil Burners," "Oil Separation from Steam," "Oil-Tempering of Steel."

The fourth session will be held on Thursday at 10 a. m. Papers will be taken up as follows: "A 44-ft. Pit Lathe," by J. M. Barnay; "Finer Screw Threads," by Charles T. Porter; "A Surveying Instrument in the Machine Shop," by C. C. Tyler; "Gift Propositions for Paying Workmen," by Frank Richards; "Deflections of Beams by Graphics," by W. Trinks.

On Thursday afternoon it has been arranged that the stations of the Interurban Street Railway Company, at Ninety-Third Street; the Manhattan Elevated Railway Company, at Seventy-Fourth Street, and the Waterside Station of the New York Edison Company, at Thirty-Eighth Street, shall be open to members, numbered badges being sufficient to secure admission to any of these plants. As soon as a suitable party is formed at any station a guide will conduct them over the plant to explain features of interest and answer questions. No fixed itinerary has been outlined, but all three stations will be open between the hours of 1:30 p. m. and 5 p. m. The Interurban Street Railway Company has very generously offered to furnish free transportation for members and guests to and between stations for this afternoon.

On Thursday evening a reception and conversazione will be given at Sherry's, Forty-Fourth Street and Fifth Avenue. Members and guests will be received by the acting president and president-elect, and dancing may be expected after the reception. It has been arranged that supper shall be served from 10 to 12 o'clock continuously, instead of having it at a definite hour at which all must be served.

The closing session will be held on Friday morning, at 10:30 o'clock. Papers will be presented as follows: "Rotary Pumps," by J. T. Wilkin; "Filing System for Office Use," by H. M. Lane; "Analysis of Commercial Value of Water Power, per Horse-Power per Annum," by A. F. Nagle; "Centrifugal Machines," by Y. B. Vida; "Oil-Testing Machine and Results," by A. Kinsbury.

Storage Battery

A new type of storage battery has been brought out by the Smith Storage Battery Company, of Binghamton, N. Y., the chief claims for which are 40 per cent decrease in weight; 30 per cent increase in compactness; 30 per cent decrease in cost and a substantial increase in efficiency. The battery is of the lead-plate type, but instead of using ordinary jars the cells are arranged in trays in which the lead plates themselves are utilized for holding the electrolyte. The gridded plates are then formed into oblong trays, pointing toward the bottom, so as to permit of nesting.

In making up one of these batteries any desired number of trays can be nested on top of each other, separators of perforated sheets of hard rubber or other suitable acid-proof material keeping the trays from contact with each other. As nested, there is sufficient space between the trays to hold the electrolyte, which is as much in contact with the bottom of the tray above it as with the inside of the one which holds it. This permits of an equal chemical action upon the upper side of one plate and the under side of the one above it.

In preparing the plates, the under side of each tray is chemically treated to become oxide, and the upper side peroxide of lead. This makes the upper side of each tray the positive side and the under one the negative side of what in other batteries would be a single cell.

By adding another tray to the nest, the potential is increased by 2 volts, the same as adding another cell to an ordinary battery. The under side of the bottom tray and the upper side of the upper one are plain, and are inactive. The voltage of any battery will accordingly be twice as much as the number of trays minus one. A battery of eleven trays will accordingly give 20 volts, being the same as an ordinary battery with ten cells. In fact, the discharge potential is 2.1 volts per cell for a good share of the time on a normal discharge.

For regular work there is no connection between the plates of the battery execept the electrolyte, the use of "jumpers," between the plates, as in other batteries, being unnecessary. The negative terminal is connected to the top of the upper tray, positive terminal to the top of the bottom tray.

It is possible, however, to obtain any combination of series-multiple or multiple-series connections that can be obtained in any battery, by attaching terminals to as many of the trays as it is desired, and cutting in or out additional trays as the service demands. The voltage of that part of the battery used will always be practically twice as much as the difference between the numbers of the cells used. Thus, current taken from the top of the third and the bottom of the seventh trays will give 8 volts, and the potential between the upper side of the fifth and the under side of the twelfth will be 14 volts.

One of the advantages of this type of battery is its extremely low internal resistance. The discharge is at all times from the entire surface of all of the plates, and at the latter part of the discharge the current does not have to come up from the bottom part of the soldered joints or loose connections, as in other styles of batteries. For this reason the battery can be charged in a rapid or uneven manner without fear of buckling. Inasmuch as the discharge is from the entire surface of all of the plates, it makes little difference as to the length of time in which it is accomplished, or how changeable may be the demands for current.

The arrangement of the trays also results in obviating another trouble that is frequent in most styles of batteries. That is the deposit in the bottom of the jars of active material which is apt to cause a short-circuit between the plates. Such deposits usually come from the positive plate. With this battery, the positive side being up, there is no tendency for this loosening, and if it should occur, all particles which become free in this manner will lie just where they were before without danger of causing a short-circuit.

Pennsylvania Tunnel Permit Granted by New York Railroad Commissioners

The State Railroad Commissioners of New York have granted the application of the Pennsylvania, New York & Long Island Railroad Company for permission to construct a tunnel railroad in New York, for the purpose of connecting the Pennsylvania and Long Island roads. Testimony regarding the proposed new system was given by Samuel Rea, fourth vice-president of the Pennsylvania; Charles M. Jacobs, one of the engineers in the proposed work, and Charles A. Cone, a real estate broker of New York. Interesting facts were furnished by them in reference to the future operation of the system and the effect of the improvement on the conditions of business and the value of property.

Change of Control in Railways Company General

The announcement is made that control of the Railways Company General, which was organized by W. W. Gibbs in 1899, has passed from the Investment Company of Philadelphia into the hands of a group of Philadelphia and New York capitalists, headed by Evans R. Dick. Practically no change in the management will ensue. The capital of the company is $1,200,000, the par value of shares is $10, and the last recorded sales were at 4¾. Evans R. Dick continues as president and John J. Collier as secretary and treasurer. Mr. Collier is reported to have said of the change:

"The future of the company will be unaffected by the transfer. The Investment Company of Philadelphia has simply sold out its interest in the Railways Company General, consisting of 42,200 shares out of 120,000, to a syndicate of New York and Philadelphia men, headed by Evans R. Dick. It is the belief of the management that the company will be strengthened rather than weakened by the deal, the members of the purchasing syndicate being chiefly men now connected with the company."

One of the many instances that show how economies are worked in small cities where electric railways are operated is furnished in Northampton, Mass., where the city saved over $7 000 this year by transporting crushed rock for highway construction by electric cars instead of doing the work by teams.

Discussion of the Aurora, Elgin & Chicago Railway

The Chicago Electrical Association held a very largely attended meeting the evening of Nov. 21, at which Howard Brooks, assistant electrical engineer of the Aurora, Elgin & Chicago Railway Company read a paper on the electrical features of that road. The points brought out at the meeting were mainly those covered by the article in the Souvenir number of the STREET RAILWAY JOURNAL of Oct. 4, last. Some figures were given in the discussion by E. Gonzenbach, the electrical engineer of the company, regarding energy consumption of cars in actual service, which were not included in the article mentioned. It was stated that the recording wattmeter readings at the sub-stations showed a consumption of 123 kw-hours per car hour, and that the cars made a schedule speed of about 28 miles per hour, so that the energy consumption per car mile was 4.39 kw-hour. The cars make about 65 miles per hour on a level, at a maximum speed. They weigh 74,325 lbs. The current at full speed is 400 amps. Mr. Gonzenbach stated that they could be brought up to a speed of 60 miles per hour in 35 seconds, with a maximum current of 1200 amps.

Regarding the ability of the cars to make fast runs Mr. Brooks said that on one occasion a car behind time in regular service made 33.9 miles in 38 minutes, with 6 stops, or 53 miles an hour. Another time the same run was made in 42 minutes, with 7 stops.

The fluctuations in the power house load are very great. Seven cars make a good load for a 1500-kw generator.

The Twenty-Second Annual Convention of the Sherwin-Williams Company

The twenty-second annual convention of the Sherwin-Williams Company, held at Cleveland during the first week of November, was the largest and most successful in the history of the company. Each year the convention has increased in size, importance, and interest, until it is now considered by the management the chief event of the business year. By means of these annual meetings, the officials keep in close touch with the representatives, get a better insight into trade conditions, and the representatives obtain a fuller knowledge of the paint business.

The convention marked the close of the most successful of the many successful years of the Sherwin-Williams Company. It has been a year of expansion along all lines. The increase in sales has far exceeded the estimates; a linseed oil plant in which the company is crushing, treating and refining its own linseed oil, has been established at Cleveland; the plants at Chicago, Montreal and Newark have been materially enlarged; a new Southwestern division has been established at Kansas City, and the export trade has increased rapidly.

Although careful attention to business with valuable results was the feature of every session, social pleasures were not neglected. The annual banquet was held in the Cleveland Chamber of Commerce Auditorium, Friday evening. All the Cleveland employees and the visiting representatives were present, and six hundred sat down at the tables. After dinner speeches were delivered by Mr. Sherwin, Mr. Cottingham and representatives of the various divisions. The prizes for the different factory competitions were presented to the winners by President Sherwin, and souvenir badges were given to all at the banquet.

Turbo-Generators for Massachusetts Railway Plants

The Massachusetts Electric Company has recently contracted with the General Electric Company for ten 2000-kw turbo-alternators. The machines are to be used in three new generating stations, which, together with their sub-stations, will represent a capital outlay of $2,500,000. These plants are intended to increase the generating capacity of the Old Colony and Boston and Northern systems, and enable the companies to discontinue a number of small, inefficient stations. These new stations are to be located at Danversport, to serve the Boston and Northern lines, and the others at Quincy and Fall River, in the territory of the Old Colony system.

Annual Meeting of the Westinghouse District Managers

The district office managers of the Westinghouse Electric & Manufacturing Company, representing all the principal cities of the United States, spent last week in their usual annual visit to the works and offices of that company at East Pittsburgh. On the evening of Nov. 19 a very enjoyable dinner, in honor of the visitors, was given at the Duquesne Club, at which the engineers and executive officers of the company were also present.

New Equipment for Nashville

Percey Warner, receiver and general manager of the Nashville electric light and street railway system, who, during the past week, has been at the Waldorf-Astoria in New York, has completed contracts for the equipment of the electric light and street railway plants of Nashville for about $1,000,000. Contracts covering lighting and apparatus, cars, etc., were placed with the General Electric Company, J. G. Brill and other companies, and include an order for an electric locomotive. The present ownership of the Nashville system has made plans for the expenditure of $3,000,000 for extensions and betterments. It includes additional trackage, the construction of up-to-date car houses and the equipment of the entire street railway system with long double-truck cars in place of the present rolling stock, which have all been of the single, small truck variety.

Annual Meeting of the New York Railroad Club

The annual meeting of the New York Railroad Club was held at Carnegie Hall Nov. 21, and there was a good attendance. Papers were read on the subject of the discipline of employees by Messrs. Mitten, Wheatly, Strickland, Ketcham and others. Some of these papers are published in this issue, and others will appear in following issues of this paper. Officers for the ensuing year were elected as follows: President, H. H. Vreeland; first vice-president, W. W. Wheatly; second vice-president, A. M. Waitt; third vice-president, W. F. Potter; treasurer, C. A. Smith; executive members, G. W. West, W. McIntosh, H. S. Hayward; finance committee, W. B. Albright, R. M. Dixon, D. M Brady

More Increases in Wages for Street Railway Men

Following closely the anouncement of increases in wages for the employees of the Philadelphia Rapid Transit Company, Syracuse Rapid Transit Railway Company and the Georgia Railway & Electric Company, comes announcements of increases in wages for the employees of the Trenton Street Railway Company, of Trenton, N. J.; Scranton Railway Company, of Scranton, Pa.; Lebanon Valley Street Railway Company, of Lebanon, Pa.; Wilkesbarre & Wyoming Valley Traction Company, of Wilkesbarre, Pa., United Traction Company, of Reading, Pa.; Chester Traction Company, of Chester, Pa.; Schuylkill Valley Traction Company, of Norristown, Pa., and the Portland Street Railway Company, of Portland, Maine.

Announcement of the increase at Trenton was made Dec. 18. It results in an advance of 5 per cent. The men are at present receiving $2 a day, under the increase will receive $2.10 a day, or 17½ cents an hour. Although announcement of the new wage schedule was not made until Nov. 18, it became operative Nov. 14. This is the fourth time the wages of the employees of the company have been increased during the last few years, the rate being increased from $1.60 a day. The last increase was given about a year ago, when the rate was increased from $1.80 a day to $2.

The increase to the employees of the Scranton Railway Company amounts to a 5 per cent advance. The new schedule, which goes into effect Dec. 1, is 18 cents an hour for the first year, 19 cents for the second year, and 20 cents for the third year and thereafter. The increase was solicited by the men, and, as a result of the conference between the company and its employees, it is said that several modifiactions in the merit system of discipline which prevails will be modified.

The wages of the employees of the United Traction Company, of Reading, are increased from 16 2-3 to 17½ cents an hour. This will mean a raise of about $37 a year in the wages of each employee, and an increase in the pay roll of the company of about $12,000 a year.

The increase on the Lebanon Valley Street Railway is from 15 cents to 16 cents an hour; that at Wilkesbarre amounts to $2 a month, but the details of the increase on the lines of the Chester Traction Company are not available. The increase for the employees of the Schuylkill Valley Traction Company affects 200 men and means an increase in the pay roll of about $7,500 annually This advance is one cent an hour. The increase announced by the Portland Street Railway Company is 10 cents a day, fixing the rate of pay at $1.85 a day. The advance benefits 300 men.

All street cars on city and suburban electric railways in and adjacent to Salt Lake have been equipped with mail-boxes for the convenience of residents who live at a distance from the post-office.

Street Railway Patents

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

UNITED STATES PATENTS ISSUED NOV. 18, 1902

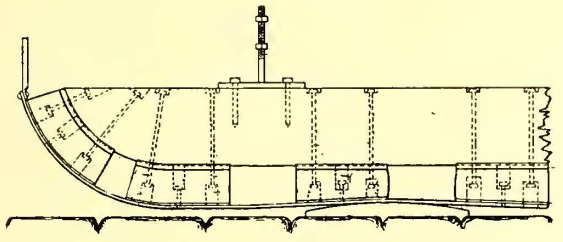
713,599. Trolley Pole; T. C. Buder, St. Louis, Mo. App. filed April 4, 1902. The harp sleeve can turn on the end of the pole when the wheel passes a curve in the wire, and in doing so it rises slightly to ease the wheel.

713,601. Rheostat; F. E. Case, Schenectady, N. Y. App. filed May 10, 1902. A series of resistance grids mounted in an open frame adapted to be secured under a car.

713,689. Brake-Shoe; W. D. Sargent, Chicago, Ill. App. filed Jan. 23, 1902. The brake-shoe is strengthened by a strengthening piece of ductile metal having a backward-outstanding flange extending longitudinally of the shoe and at one side thereof.

713,741. Means for Preventing Accidents at Railway Crossings; C. E. Brown, Johnstown, Pa. App. filed April 16, 1902. A gate at a railway crossing cannot be lifted to allow a trolley car to cross until the conductor goes to the other side of the track and operates a circuit closer.

713,742. Contact Shoe for Electric Railways; W. M. Brown, Johnstown, Pa. App. filed Nov. 30, 1901. A shoe having a flexible face permitting it to yield when passing over button contacts.



PATENT NO 713,742

713,790. Railway Track Structure; H. B. Nichols, Philadelphia, Pa. App. filed March 25, 1902. The ends of rails crossing each other at an angle are set in a metal plate, which is firmly secured in place but easily and quickly removable.

713,828. Automatic Releasing Device for Safety Trolleys; A. C. Wolfe, Denver, Col. App. filed Feb. 6, 1902. A centrifugal governor operates to release the spring from the trolley pole when the upward movment of the pole is abnormally great.

713,858. Latch for Controller Handles; F. B. Corey, Schenectady, N. Y. App. filed April 12, 1902. A mechanical arrangement for enforcing a step by step movement of a trolley handle containing a latch.

713,933. Railway Track Structure; A. Angerer, Ridley Park, Pa. App. filed July 29, 1902. Relates to means for fastening the wear-plate at the intersection of two tracks so that it may be easily removed.

714,021. Controller for Electric Motors; L. G. Nilson, New York, N. Y. App. filed May 15, 1902. Details.

714,068. Railway Track Structure; C. B. Voynow, Philadelphia, Pa. App. filed July 29, 1902. Relates to means for securing the wear-plate to the base-plate at the point where two rails cross at an angle. An extension is formed upon the wear-plate which projects into the base-plate, and a curved locking member is inserted through an opening in the wear-plate to engage said extension and base-plate.

714,076. Truck Side Frame; C. T. Westlake, Granite, Ill. App. filed May 5, 1902. The web of the frame has a bolster recess at its center, flanges extending transversely from the web at the sides of the recess to form truck columns, links pivotally mounted within said recess and a bolster connected to the lower ends of the links as required, to allow the bolster to swing endwise.

PERSONAL MENTION

MR. C. A. COFFIN, President of the General Electric Company, was elected last week a director of the United States Mortgage & Trust Company.

MR. JACOB WENDELL, JR., of Wendell & MacDuffie, sailed Nov. 25 for Europe, where the company has a large business, and where Mr. Wendell will stay until the middle of January.

MR. FREDERICK L. MERRILL, formerly of the Chicago office of the Westinghouse Electric & Manufacturing Company, has purchased an interest in the Standard Railway Materials Company, with J. H. McGill. This company has offices at Omaha Building, Chicago, and represents the R. D. Nuttall Company and the A. & J. M. Anderson Company. Mr. Merrill's experience and acquaintance as salesman in the Chicago territory make him well fitted to handle his new business well.

MESSRS. WATSON, RAVEN and CUDWORTH, engineers of the Northeastern Railway, of England, are in this country making a study of the application of electric traction to heavy railroad service. This railroad company, which is one of the main trunk lines in England, has decided to engage extensively in electric traction, and the visit of its engineers to this country is in connection with this proposed installation. Their visit is indicative of the great interest felt in electricity by the main railway lines of England, which, at present, seem to be giving more attention to the subject than the steam railroads in this country. It is predicted by some who are well acquainted with the railroad conditions of both countries that England will before long lead this country in the practical application of electricity to heavy electric railroading.

MR. S. S. NEFF has recently been engaged by W. E. Baker & Company, of New York, as superintendent of construction, operation and traffic in their various street railway enterprises. Mr. Neff has had a long and successful experience in both steam and electric railroad engineering. He was for ten years with the Pennsylvania Railroad in the maintenance and construction department, after which for four years he acted as superintendent of the Cornwall Railroad. He then accepted a position with the Great Northern Railroad as division superintendent, where he served for two years, resigning this position to build the Lake Shore & Indiana Railroad for the Cincinnati & Cleveland Iron Company and Jones & Laughlin. After the completion of this work he entered the electric railroad field as superintendent of the Union Elevated Railroad, of Chicago, with which company he remained four years. The most difficult engineering problem Mr. Neff helped to solve, however, was the construction and placing in operation of the Boston Elevated Railroad. Mr. Neff went with the company during the early period of the construction of this line, and he was superintendent of the elevated system in Boston for two years. With a man of Mr. Neff's experience and ability at the head of their construction, operation and traffic department, W. E. Baker & Company can handle any engineering problem which may present itself in the electric railway field.

MR. CHARLES C. BENSON, who for the past three and one-half years has acted as superintendent of the Citizens' Street Railway Company, of Newburyport, Mass., has left for San Juan, Porto Rico, where he will act as manager of the San Juan Light & Transit Company. Mr. Benson was born in Manchester, Me., June 4, 1866. He attended the public schools of that town and afterwards took a business college course at Augusta, Me. In 1886 he entered the employ of the West End Street Railway Company, of Boston, and in a short time became foreman of the construction gang for that company. He afterwards entered the firm of Woodbridge & Turner, contractors. After a short stay with that firm, in 1888, he entered the employ of the Thomson-Houston Company as constructing engineer, and while with the company assisted in installing street railway lines in many important cities in the United States. He was for some time in the employ of the Boston Electric Light Company, from which company he resigned to become connected with the Newburyport Street Railway Company. Bringing to this company an experience so varied he was especialy well qualified for the work of regenerating the system. Physical rehabilitation of the system took place, and the operating management was placed on a firm basis. As a token of the appreciation of the valuable services rendered by Mr. Benson the employees of the company presented him with a handsome diamond ring.

CHAS. C. BENSON

FINANCIAL INTELLIGENCE

THE MARKETS

The Money Market

Wall Street, Nov. 26, 1902.

The important development of the week in the money market is the freer offering of time money. Up to a week ago the unwillingness of bankers to lend on time contracts, especially for the shorter periods of sixty and ninety days, was widely commented upon as one of the most unfavorable features of the general financial situation. It was taken to mean that conservative institutions saw no immediate prospect of easier conditions, and were so doubtful of there being a sufficiency of funds to go around that they wished to discourage fresh borrowing as far as possible. On the contrary, when time money began to come forward in greater abundance, and even to equal the amount of the demands, it naturally encouraged the view that in conservative quarters the situation was considered to be very much improved. The basis for this opinion lies in the comparative strong position of bank resources, occasioned first by the wholesale liquidation of speculative holdings during the last few weeks, and second, by what appears to be the termination of the currency movement to the interior. Both last week and the week before the inland exchange ran slightly in favor of New York, the local banks gaining directly each time something over a million dollars. Banking authorities report that money is beginning to flow back from the West and South, while the only important movement in the other direction is that to New Orleans, where financing the sugar crop will create a demand for another month at least to come. Imports of merchandise do not slacken, and consequently the excessive customs revenue continues. But, owing to an increase in government expenditures, the Treasury is drawing less from the New York banks than it was either in October or in the early part of this month. Meanwhile sterling exchange hovers around the gold shipping point, and gold exports are still a possibility for the not distant future. The main check consists of the efforts which the Bank of England is making to prevent gold from leaving London. It has succeeded in forcing up London discounts sharply, and by this means causing an advance in sterling exchange at Paris. This advance in turn inures to the benefit of the New York market, by raising the specie export point. The indications are that while local bank reserves will decline and money rates remain around their present level from now until after the new year settlements, there will be no uncomfortable strain.

The Stock Market

The operations in the stock market during the last week have been influenced to a very large extent by the extraordinary rise in Manhattan Elevated stock. An advance of 25 points from the low price of a fortnight ago is explained by the announcement to-day of the lease of the elevated lines to the subway company. The majority of people in Wall Street had accepted the report that the road was to be leased or acquired by the new Interborough Rapid Transit or Subway Company, on a gradually ascending dividend guarantee. At the same time it was held in many well-informed quarters that if this was true it was only a part of the "deal," and that when the final disposition of the elevated lines was made it would be in a manner both satisfactory and profitable to the New York Central Railroad. There are also strong intimations that a substantial addition to Manhattan's capital will shortly be announced, and that the subscription rights to the new issue will be of sufficient value to account, to a considerable extent, for the recent advance in market quotations. Beyond question the present supply of Manhattan stock in the market is exceedingly limited, and the rise in the stock so far from resulting in a distribution has seemingly left holdings even more concentrated than they were before. The other traction stocks have quite naturally been favorites in speculative circles, but that their rise is anything more than sympathetic may well be doubted. In Brooklyn Rapid Transit and Metropolitan the supply of floating stock is hardly less limited than in Manhattan.

The recovery in the general market has proceeded with great rapidity, showing not only that the previous liquidation was very thorough, but also that a short interest of large dimensions was built up, which had to beat a precipitate retreat. Aside from the "traction deal" the important influences in the rise have been the easing of time money, and the widespread advance in freight rates inaugurated throughout the country. This latter development relieves the fears occasioned by the recent more or less compulsory raising of wages to the railroad employees, and its significance for the situation both immediate and future can scarcely be overestimated. The probabilities are that some reaction will succeed so sharp an upturn in prices, and, indeed, during the last few days a reaction of this sort has already appeared in numerous quarters. But confidence, which was severely shaken in the early part of the month, has now been restored, and the financial outlook, as a whole, is regarded more hopefully than for a long time past.

Philadelphia

The local traction stocks in Philadelphia have been left to follow the course of the general speculation during the week, without any particular efforts to accelerate the advance. This is shown by the exceptionally small volume of transactions which have averaged only a few hundred a day. It is worthy of favorable comment, therefore, that the principal stocks have gone up as easily as they have. Philadelphia Rapid Transit rose a point to 17¼, and Union Traction moved forward from 46⅜ to 47¼. Philadelphia Traction is unchanged at 98, and scarcely anything has been done in American Railways, which has merely held steady around 53¾. Railways Company General was firmer at an advance from 4¾ to 5, and thirty shares of Fairmount Park Transportation were reported at 25. Bond sales for the week included Electric People's Traction 4s at 98½, United Railways 4s at an advance from 88¼ to 90, Consolidated Traction of New Jersey 5s at 110, and Union Traction of Indiana 5s at 100¾.

Chicago

Only scattering sales are to be noted in the Chicago traction share market this week. Three hundred Northwestern Elevated common sold at 33, which is a recovery of 1½ per cent from the recent low point. The increase in the daily average traffic on this system during November is said to be some 17 per cent over last year. A few lots of Metropoliton Elevated common changed hands at 38, and of the preferred between 85 and 87. South Side sold at 107, and Lake Street at 9¼. Chicago City Railway in odd lots brought 210, but nothing has been done in Union Traction. There are no new developments regarding the reported merger of these two properties, but the feeling in financial circles is growing that a deal of some sort under the serveillance of Mr. J. P. Morgan is under way.

Other Traction Securities

Boston stocks have, as a rule, sympathized with the improvement in general market conditions during the week. Boston Elevated sold up to 156, later reacting to 154. Massachusetts Electric common rose a point and a half to 37¼, later losing the greater part of the gain. West End common sold at 94¾ and 95, and the preferred at 113½. No business worth mentioning, however, was done in any of these issues. Transactions in the Baltimore market have also been very light throughout the week. Nashville Railway stock, which recently went up as high as 6½, dropped to 3½. There were no dealings in the 5 per cent certificates. United Railway of Baltimore issues have held exceptionally firm, the income bonds particularly rising a point to 69. The general mortgage 4s sold up fractionally to 95, and the stock to 14, later receding to 13¾. The only other traction sales in Baltimore were Newport News and Old Point Comfort 5s at 107½, and Anacostia and Potomac 5s at 99. The complete record of transactions on the New York curb since last Wednesday morning is as follows: Brooklyn City Railroad at 247 and afterwards at 245½, Washington Traction (100 shares) at 16, the preferred at 45, American Elevated at 1, North Jersey Traction (10 shares) at 30, New Orleans common at 14⅜ to 15, the preferred at 48 to 49, the 4½ per cent bonds at 79¼ to 79, and Interborough Rapid Transit, the full paid stock rising violently from 104 to 123, while the stock on which 40 per cent has been paid, started at 107 and rose to 123. This movement is, of course, associated with the advance in Manhattan Elevated on the Stock Exchange.

Iron and Steel

It is now feared by authorities in the iron trade that the scarcity of fuel will continue throughout the winter months, and that it will continue to restrict, as it is now doing, the output of pig iron and steel. Buyers of pig iron who held off, expecting an easier situation after the ending of the coal strike, have come into the market as eager bidders, and it will require the utmost exertion of the conservative trade interests to hold prices in check. The trouble lies altogether with the freight congestion, which renders the railroads absolutely unable to handle the business offering to them. Demand for steel rails is reported to be, if anything, heavier than before. Quotations are as follows: Bessemer pig iron, $21.75 and $22.00; steel billets, $30.00 and $31.50; steel rails, $28.00.

Security Quotations

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

	Closing Bid Nov. 18	Nov. 25
American Railways Company	53	53½
Aurora, Elgin & Chicago	a37	32
Boston Elevated	155	154
Brooklyn R. T.	58¼	61¼
Chicago City	210	211
Chicago Union Tr. (common)	15	15
Chicago Union Tr. (preferred)	45	45
Cleveland Electric	84	88
Columbus (comomn)	58½	58½
Columbus (preferred)	106	106
Consolidated Traction of N. J.	69	69¼
Consolidated Traction of N. J. 5s	110¼	110½
Detroit United	86	b95
Electric People's Traction (Philadelphia) 4s	98¼	98⅜
Elgin, Aurora & Southern	a51	57
Indianapolis Street Railway 4s	86½	—
Lake Shore Electric	12	12½
Lake Street Elevated	9	9
Manhattan Railway	142	153⅞
Massachusetts Elec. Cos. (common)	35¾	36
Massachusetts Elec. Cos. (preferred)	96	96½
Metropolitan Elevated, Chicago (common)	36	37
Metropolitan Elevated, Chicago (preferred)	85	85
Metropolitan Street	137	139
New Orleans Railways (common)	14¾	15
New Orleans Railways (preferred)	48	48½
North American	119	118½
Northern Ohio Traction (common)	a67	—
Northern Ohio Traction (preferred)	92½	—
North Jersey	32¾	31
Northwestern Elevated, Chicago (common)	31½	32½
Philadelphia Rapid Transit	16⅜	17
Philadelphia Traction	98	98
St. Louis Transit (common)	28	28
South Side Elevated (Chicago)	105	107
Syracuse Rapid Transit	31	30¾
Syracuse Rapid Transit (preferred)	76	76
Third Avenue	123	126
Toledo Railway & Light	30	b37
Twin City, Minneapolis (common)	114	116
United Railways, St. Louis (preferred)	—	—
United Railways, St. Louis, 4s	84¾	84⅝
Union Traction (Philadelphia)	46½	46¾
Western Ohio Railway	26	27

a Asked. b Last sale.

Metals

Quotations for the leading metals are as follows: Copper, lake, 11⅜ and 11½ cents; lead, 4⅛ cents; tin, $25.90; spelter, $5.35.

HAVERHILL, MASS.—The Railroad Commissioners have approved an issue by the Haverhill & Andover Street Railway Company of shares of capital stock amounting at par value to $80,000. This issue is authorized to provide for paying in part floating indebtedness incurred by the company in the construction and equipment of its lines.

DANVERS, MASS.—The Railroad Commissioners have approved an issue by the Middleton & Danvers Street Railway Company of capital stock amounting at par value to $32,000. The issue is authorized to provide for paying in part floating indebtedness incurred by the company in constructing its lines.

WORCESTER, MASS.—The stockholders of the Boston & Worcester Street Railway Company voted to increase the capital stock of the company from $750,000 to $1,000,000.

MILFORD, MASS.—The Railroad Commissioners have been petitioned by the Milford & Uxbridge Street Railway Company for authority to issue additional bonds to the amount of $225,000 for the purpose of paying its floating indebtedness and for additional equipment.

BOSTON, MASS.—The Railroad Commissioners have approved an issue of $60,000 original capital stock by the Reading, Wakefield & Lynnfield Street Railway Company; $32,000 original capital by the Middleton & Danvers Street Railway Company, and $80,000 original capital by the Haverhill & Andover Street Railway Company.

BOSTON, MASS.—The Boston *News Bureau* says it is understood that the general results of the Boston Elevated Railway Company for the year ended Sept. 30 are not quite as satisfactory as those of previous years in that the normal increase in earnings was not maintained.

WEBB CITY, MO.—The deal for the purchase of the Southwest Missouri Electric Railway by Stone & Webster, of Boston, has been declared off.

EDGEWATER, N. J.—It is reported that the New Jersey & Hudson River Railway & Ferry Company has secured control of the Newark & Hackensack Traction Company.

SYRACUSE, N. Y.—It is stated that the recently formed Syracuse & Ontario Railway Company is negotiating for the purchase of the property of the Oswego Traction Company.

MINNEAPOLIS, MINN.—The Twin City Rapid Transit Company reports earnings as follows:

October	1902	1901
Gross receipts	$304,316	$270,955
Operating expenses	140,225	118,054
Earnings from operation	$164,091	$152,899
Fixed charges	77,733	75,664
Net earnings	$86,358	$77,235
Ten months		
Gross receeipts	$2,971,411	$2,611,117
Operating expenses	1,331,545	1,186,901
Net earnings	$1,639,866	$1,424,216
Fixed charges	765,966	736,437
Net earnings	$873,900	$687,779

SYRACUSE, N. Y.—The Syracuse Rapid Transit Railway Company reports earnings as follows:

Quarter ended Sept. 30	1902	1901
Gross receipts	$182,741	$166,796
Operating expenses	101,224	91,525
Earnings from operation	$81,517	$75,271
Receipts from other sources	1,572	1,572
Gross income	$83,089	$76,843
Fixed charges	57,075	57,021
Net earnings	$26,014	$19,822

SYRACUSE, N. Y.—There has been filed for record a mortgage in favor of the City Trust Company, of New York, trustees, given by the Auburn & Syracuse Electric Railroad Company for $2,000,000, to secure a bond issue. Over $1,000,000 of the bonds have been placed with N. W. Harris & Company, of New York.

DELAWARE, OHIO.—The Delaware, Berkshire & Sunbury Electric Railway Company, which plans to build an electric railway from Delaware to Sunbury, has issued bonds to the amount of $150,000, secured by a mortgage.

DAYTON, OHIO.—It is reported here that the syndicate headed by A. E. Appleyard, of Boston, is negotiating for the purchase of the Springfield Street Railway, of Springfield, and the People's Railway Company, of Dayton. The Appleyard lines operate over the tracks of both companies in the respective cities.

TOLEDO, OHIO.—It is stated that within two weeks title to the Detroit & Toledo Shore Line Railway will be vested in the Grand Trunk Railway. The Grand Trunk Railway will pay $1,500,000 for the property, which consists for the most part of a double-track line extending from Toledo to Trenton, Mich. To cover the extension of its lines into Ohio territory the Grand Trunk will issue $2,000,000 in bonds, paying for the completed portion of the shore line the amount stated, and utilizing the remaining $500,000 to extend the road north from Trenton to Detroit and to reballast the completed portion.

PITTSBURGH, PA.—The Philadelphia Company reports earnings as follows:

October	1902	1901
Gross earnings	$1,146,297	$1,019,527
Operating expenses and taxes	654,258	562,202
Net earnings	$492,039	$457,325
Other income	125,354	32,025
Total income	$617,393	$489,350
Deductions	115,269	43,587
Balance	$502,124	$445,763
Fixed charges	330,767	265,845
Surplus	$171,357	$179,918
From Jan. 1 to Oct. 30		
Gross earnings	$11,255,273	$9,911,050
Operting expenses and taxes	6,380,066	5,407,596
Net earnings	$4,875,207	$4,503,454
Other income	1,354,701	436,948
Total income	$6,229,908	$4,940,194
Deductions	921,746	373,589
Balance	$5,308,162	$4,566,605
Fixed charges	3,366,617	2,648,569
Surplus	$1,941,545	$1,918,036

PHILADELPHIA, PA.—The stockholders of the Philadelphia & West Chester Traction Company will vote Jan. 12, 1903, on a proposition to make a new mortgage to secure $600,000 of 4 per cent $1,000 fifty-year coupon bonds, interest payable Jan. 1 and July 1. They will be put aside of the new bonds, such as will be necessary to retire the existing $400,000 first mortgage 5 per cent bonds of 1898, which are subject to call at 105.

SPOKANE, WASH.—Control of the Spokane & Montrose Motor Railroad has pased into the hands of J. P. Graves, of Spokane.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. *a* Comparison is made with 1900 because in 1901 the earnings were abnormal on account of the Pan-American Exposition. *b* All capital stock owned by Detroit United Ry.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O.						
Northern Ohio Tr. Co.	1 m., Oct. '02	65,627	36,333	29,294	12,603	16,692
	1 " " '01	51,479	28,769	22,710	12,438	10,272
	6 " June '02	318,937	185,362	133,575	77,556	56,018
	6 " " '01	268,967	164,458	104,510	63,494	41,016
	12 " Dec. '01	617,011	* 350,845	266,166	136,162	130,004
	12 " " '00	513,725	* 317,475	196,249	141,133	55,117
ALBANY, N. Y.						
United Traction Co.	1 m., Sept. '02	132,606	81,990	50,616	23,866	26,750
	3 " " '02	414,635	251,739	162,897	71,598	91,299
BINGHAMTON, N. Y.						
Binghamton St. Ry. Co.	1 m., Oct. '02	17,107	10,693	6,414	------	------
	1 " " '01	16,884	9,293	7,591	------	------
	4 " " '02	82,360	44,675	37,685	------	------
	4 " " '01	80,044	40,317	39,727	------	------
BOSTON, MASS.						
Boston Elev. Ry. Co.	12 m., Sept. '01	10,869,496	7,336,597	3,532,899	2,896,359	636,539
	12 " " '00	10,236,994	6,828,110	3,408,884	2,932,839	476,044
Massachusetts Elec. Cos	12 m., Sept. '01	5,778,133	3,915,486	1,862,648	937,206	925,442
	12 " " '00	5,518,837	3,659,337	1,859,500	994,294	865,206
BROOKLYN, N. Y.						
Brooklyn R. T. Co.	1 m., Sept. '02	1,124,384	607,581	516,802	------	------
	1 " " '01	1,080,158	664,611	415,548	------	------
	3 " " '02	3,587,739	1,881,774	1,705,965	------	------
	3 " " '01	3,411,101	2,032,245	1,378,855	------	------
	12 " June '02	12,789,705	*8952214	3,837,490	------	------
	12 " " '01	12,101,198	*7970635	4,130,563	------	------
BUFFALO, N. Y.						
International Tr. Co.	1 m., *a* Sept. '02	321,355	161,525	159,831	77,502	82,329
	1 " " '00	255,322	108,934	146,388	81,931	64,457
	3 " " '02	1,019,518	506,664	512,854	235,741	277,113
	3 " " '00	791,470	344,745	446,725	245,793	250,932
CHARLESTON, S. C.						
Charleston Consol'ted Ry. Gas & El. Co.	1 m., Oct. '02	40,759	27,246	13,494	13,469	25
	1 " " '01	39,038	24 562	14,476	13,842	634
	8 " " '02	439,007	256,962	182,045	108,062	73,984
	8 " " '01	324,120	211,870	112,250	110,049	2,201
CHICAGO, ILL.						
Chicago & Milwaukee Elec. Ry. Co.	1 m., Oct. '02	15,731	6,548	9,183	------	------
	1 " " '01	15,253	6,312	8,941	------	------
	10 " " '02	163,139	66,395	96,743	------	------
	10 " " '01	147,412	62,430	84,982	------	------
CLEVELAND, O.						
Eastern Ohio Traction Co.	1 m., Oct. '02	17,365	10,142	7,224	6,033	1,190
	10 " " '02	161,071	89,603	71,468	54,574	16,894
Cleveland, Elyria & Western	1 m., Oct. '02	28,243	16,030	12,212	------	------
	1 " " '01	22,736	12,611	10,124	------	------
	10 " " '02	248,211	138,081	110,130	------	------
	10 " " '01	208,728	113,398	95,330	------	------
	12 " Dec. '01	249,266	136,865	112,394	57,023	55,371
	12 " " '00	179,698	102,393	77,304	34,562	42,742
Cleveland, Painesville & Eastern	1 m., Oct. '02	16,213	9,655	6,558	------	------
	1 " " '01	15,639	8,558	7,081	------	------
	10 " " '02	160,677	86,620	74,057	------	------
	10 " " '01	139,824	71,801	68,022	------	------
	12 " Dec. '01	164,971	* 87,102	77,869	72,500	5,369
	12 " " '00	141,112	* 89,592	71,520	72,500	† 980
COVINGTON, KY.						
Cincinnati, Newport & Covington Ry. Co.	1 m., Aug. '02	96,118	* 53,295	42,823	22,238	20,585
	1 " " '01	74,525	* 45,741	28,784	15,807	12,977
	8 " " '02	596,156	* 344,026	252,130	131,230	120,899
	8 " " '01	535,784	* 327,615	208,169	125,328	82,841
DETROIT, MICH.						
Detroit United Ry.	1 m., Oct. '02	302,368	174,325	128,063	------	------
	1 " " '01	267,081	153,504	113,577	------	------
	10 " " '02	2,881,084	1,623,824	1,257,260	------	------
	10 " " '01	2,512,923	1,382,366	1,130,557	------	------
	12 " Dec. '01	2,919,173	*1596765	1,322,046	652,277	670,129
	12 " " '00	2,575,277	*1439058	1,136,219	616,468	519,751
Detroit and Port Huron Shore Line (Rapid Ry. System)	1 m., Oct. '02	34,869	21,269	13,600	------	------
	1 " " '01	31,008	18,747	12,261	------	------
	4 " " '02	172 527	96,176	76,351	------	------
	4 " " '01	156,956	81,903	75,053	------	------
DULUTH, MINN.						
Duluth-Superior Tr.	1 m., Oct. '02	46,587	26,254	20,333	9,590	10,742
	1 " " '01	38,678	22,523	16,156	9,181	6,975
	10 " " '02	442,845	233,248	209,597	96,410	113,188
	10 " " '01	373,946	204,074	169,872	91,559	78,313
ELGIN, ILL.						
Elgin, Aurora & Southern Tr.	1 m., Oct. '02	33,648	21,041	12 607	8,333	4,274
	1 " " '01	28,578	16,964	11,614	8,333	3,280
	10 " " '02	341,890	200,165	141,725	83,333	58,391
	10 " " '01	304,144	170,289	133,855	83,333	0,522
FINDLAY, O.						
Toledo, Bowl'g Green & Southern Traction o	1 m., Aug. '02	24,340	12,033	12,307	------	------
	1 " " '01	16,849	9,025	7,824	------	------
	6 " June '02	111,972	60,838	51,134	------	------
	6 " " '01	80,340	51,464	28,876	------	------
HAMILTON, O.						
The Cincinnati, Dayton & Toledo Trac. Co.	1 m., Oct. '02	41,747	22,648	19.099	16,512	2,587
	5 " " '02	226,249	113,854	112,395	81,753	30,642
LONDON, ONT.						
London St. Ry Co.	1 m. Oct '02	11,645	7,408	4 23?	1 911	2,326
	1 " " '01	10,105	6,356	3,749	1,357	1,792
	10 " " '02	127,317	78,220	49,086	22,195	26,891
	10 " " '01	116,814	72,274	44,539	19,800	24,739
MILWAUKEE, WIS.						
Milwaukee El. Ry. & Lt. Co.	1 m., Oct. '02	239,853	114,902	124,951	67,814	57,137
	1 " " '01	206,812	99,249	107,563	63,409	44,154
	10 " " '02	2,254,794	1,061,410	1,193,383	664,625	528,758
	10 " " '01	1,992,060	977,589	1,014,471	624,810	389,661
	12 " Dec., '01	2,442,342	1,185,534	1,256,808	755,139	501,669
	12 " " '00	2,220,698	1,129,787	1,090,911	824,665	266,247
MINNEAPOLIS, MINN.						
Twin City R. T. Co.	1 m., Oct. '02	304,317	140,226	164,091	60,233	103,857
	1 " " '01	270,952	118,054	152,898	58,163	94,734
	10 " " '02	2,971,411	1,331,546	1,639 866	590,967	1,048,899
	10 " " '01	2,611,118	1,186,902	1,424,216	561,437	862,778
MONTREAL, CAN.						
Montreal St. Ry. Co.	1 m., Oct. '02	181,406	96,418	84,986	15,992	68,995
	1 " " '01	166,061	85,210	80,850	15,384	65,466
	12m., Sept. '02	2,046,209	1,135,176	911,032	------	------
	12 " " '01	1,900,680	1,105,267	795,413	------	------
NEW YORK CITY.						
Manhattan Ry. Co.	12 m., Sept. '02	11,583,546	5,545,395	6,038,151	2,712,089	3,326,062
	12 " " '01	10,455,872	5,328,649	5,127,223	2,683,132	2,444,091
Metropolitan St. Ry.	3 m., Dec. '01	3,887,936	1,723,972	2,143,964	1,151,140	992,824
	3 " " '00	3,786 030	1,699,649	2,086,381	1,138,467	947,914
	12 " June '02	15,866,641	7,385,883	8,480,758	4,815,421	3,665,337
	12 " " '01	14.720,767	6,755,131	7,965,636	4,534,068	3,431,567
OLEAN, N. Y.						
Olean St. Ry. Co.	3 m., Sept. '02	18,401	8,135	10,266	4,062	6,203
	3 " " '01	16,372	6,887	9,485	4,200	5,285
	12 m., June '02	56,055	29,118	26,937	16,318	10,619
	12 " " '01	52,018	26,228	25,790	16,755	9,035
PEEKSKILL, N. Y.						
Peekskill Lighting & R. R. Co	1 m., Oct. '02	9,023	5,706	3,317	2,083	1,234
	4 " " '02	37,696	21,586	16,110	8,333	7,777
	12 " June '02	86,795	*56,392	30,402	23.125	7.277
PHILADELPHIA, PA.						
Union Traction Co.	12 m., June '02	14,118,159	6,402,338	7,715,820	*6637781	1,078,038
	12 " " '01	13,431,681	5,836,186	7,595,494	*6734328	861,266
American Railways	1 m., Oct. '02	95,875	------	------	------	------
	1 " " '01	82,190	------	------	------	------
	4 " " '02	449,068	------	------	------	------
	4 " " '01	345,132	------	------	------	------
	12 " June '02	1,009,509	------	------	------	------
	12 " " '01	844,298	------	------	------	------
ROCHESTER, N. Y.						
Rochester Ry.	1 m., Sept. '02	93,762	46,063	47,699	24,833	22,866
	1 " " '01	82,428	45,854	36,573	24 942	11,632
	9 " " '02	821,853	433,691	388,161	223,361	164,800
	9 " " '01	758,110	449,253	308,858	222,018	86,840
SYRACUSE, N. Y.						
Syracuse R. T. Co.	1 m., Sept. '02	61,164	33,545	27,619	19,025	8,594
	1 " " '01	53,992	29,692	24,300	19,025	5,275
	3 " " '02	184,314	101,224	83,090	57,075	26,015
	3 " " '01	168,368	91,526	76,842	57,021	19,821
TOLEDO, O.						
Toledo Ry. & Lt. Co.	1 m., Oct. '02	124,488	60,484	64,004	38,833	25,171
	1 " " '01	114,666	54,617	60,050	37,813	22,237
	10 " " '02	1,193,546	607,072	586,474	381,541	204,933
	10 " " '01	1,073,766	515,502	558,264	339,543	218,721
	12 " Dec. '01	1,311,084	* 636,407	674,677	415,168	259,509
	12 " " '00	1,182,517	* 616,945	565,572	409,051	156,521
Lake Shore Elec. Ry. Co.	1 m., July '02	49,122	25,961	23,161	------	------
	1 " " '01	39,447	21,837	17,610	------	------
	7 " " '02	237,855	158,911	78,944	------	------
	7 " " '01	187,270	133,283	53,987	------	------
NEW BRIGHTON, S. I.						
Staten Island Elec. Ry.	3 m., June '02	56,635	35,622	21,013	25,000	† 3,986
	3 " " '01	56,936	35,600	22,336	25,000	† 2,663
YOUNGSTOWN, O.						
Youngstown - Sharon Ry. & Lt. Co.	1 m., Sept. '02	39,618	* 22,401	17,217	------	------
	3 " " '02	114,522	*63,040	51,482	------	------
	6 " June '02	198,050	*110,391	87,659	------	------